Douglas Partners
Geotechnics / Environment / Groundwater

Integrated Practical Solutions

Report on
Detailed Site Investigation (Contamination)

Arthur Phillip High School South Site
175 Macquarie Street, Parramatta

Prepared for
Grimshaw Architects LLD

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## 1. Introduction

This report presents the results of a detailed site investigation (DSI) undertaken for contamination purposes at Arthur Phillip High School South Site at Macquarie Street, Parramatta NSW (the site). The investigation was commissioned by Louise Browne of Grimshaw Architects LLD and was undertaken in accordance with Douglas Partners' (DP) proposal SYD160465 dated 7 April 2016.

It is understood that the DSI is required to inform the design of the proposed redevelopment of Arthur Phillip High School and the adjacent Parramatta Public School. The redevelopment involves the demolition of some existing buildings and the upgrading of other buildings on site.

The aim of the DSI was to address data gaps in previous reports as identified in DP report *Review of Reports – Site Contamination, Arthur Phillip High School and Parramatta Public School, Macquarie Street, Parramatta*, Project 85374.01 R.001, dated 9 March 2016 (DP, 2016a).

The DSI included a site walkover, sampling from six locations and laboratory testing of selected samples. The details of the field work are presented in this report, together with recommendations for further works or remediation.

## 2. Scope of Works

The scope of works for the DSI was as follows:

- Assessment of the analytical data to assess the impact of the limited extent of analysis of the filling undertaken for the identified contaminants of potential concern (CoPC) to inform the requirement for further sampling and analysis;
- Further statistical analysis of the lead concentrations recorded in filling and natural soils;
- Seek confirmation from site personnel whether or not dangerous goods (e.g. underground or above ground storage tanks, chemicals etc) are currently, or have been historically, stored on site;
- Drill six hand auger boreholes to depths of between 0.4 m and 1.1 m;
- Drill one borehole using a truck mounted drilling to a depth of 10 m (Borehole MW1);
- Collect soil samples from the near surface then at regular intervals and where signs of contamination are observed;
- Screen each sample for volatile organic compounds (VOC) using a photoionisation detector (PID);

- Construct a groundwater well in the borehole MW1 (Well MW1);
- Analyse selected samples for the following contaminants of concern to assess suitability for re-use and classification for off-site disposal:
  - Metals (eight priority metals);
  - Total recoverable hydrocarbons (TRH);
  - Benzene, toluene, ethylbenzene and xylene (BTEX);
  - Polycyclic aromatic hydrocarbons (PAH);
  - Organophosphorus pesticides (OCP);
  - Organophosphorus pesticides (OPP);
  - Polychlorinated biphenyls (PCB);
  - Phenols;
  - Poly-fluoroalkyl substances (PFAS, including PFOS and PFOA);
  - Asbestos (500 mL sample);
  - pH and cation exchange capacity (CEC);
- Analysis of the following (soil) samples for QA/QC purposes will also be undertaken:
  - 5% Intra-laboratory replicate soil samples for metals and TRH/BTEX;
  - One trip spike sample for BTEX; and
  - One trip blank sample for BTEX.
- Development of three groundwater wells (Well MW1 as well as two wells previously constructed on the adjacent APHS-N and PPS sites[1]) by removing a minimum of three well volumes or until each well is dry;
- Collection of groundwater samples from all three monitoring well using a peristaltic sampling pump. The physical parameters of pH, conductivity, dissolved oxygen and oxidation / reduction potential will be measured and recorded whilst sampling;
- Conduct laboratory analysis on three groundwater samples (plus QA/QC) at a NATA accredited laboratory for the following common contaminants and parameters:
  - Metals (arsenic, cadmium, chromium, copper, lead, mercury, nickel, zinc);
  - Total recoverable hydrocarbons (TRH);
  - Monocyclic aromatic hydrocarbons (benzene, toluene, ethylbenzene and xylene – BTEX);
  - Polycyclic aromatic hydrocarbons (PAH);
  - Phenols;
  - Polychlorinated biphenyls (PCB);
  - Organochlorine pesticides (OCP);
  - Organophosphorus pesticides (OPP);
  - Volatile organic compounds (VOC);
  - Poly-fluoroalkyl substances (PFAS, including PFOS and PFOA);

[1] Arthur Phillip High School – North (APHS-N) and Parramatta Public School (PPS)

- Hardness;
- QA/QC:
  - One replicate sample for metals and PAH;
  - One trip spike sample for BTEX; and
  - One blank sample for BTEX.

# 3. Site Identification and Description

## 3.1 Site Identification

The site is located at the junction of Macquarie Street and Smith Street, Parramatta and is currently in operation as a High School (Arthur Phillip High School). The site Information is provided in Table 1 and the site location is provided on Figure 1 below and Drawing 1, Appendix A.

**Table 1: Site Identification**

| Item | Description |
|---|---|
| Site Address | 175 Macquarie Street, Parramatta |
| Legal Description | Lots 1, 2 & 3 D.P. 115296 and part Lot 414 D.P.820542 |
| Approximate Area | 9,000 $m^2$ |
| Local Council Area | Parramatta City Council |
| Current Zoning | B3 Commercial Core (including educational establishments) LEP 2011 |
| Previous Zoning | B3 Commercial Core (including educational establishments) LEP 2007 |

The site is an irregular shape and is bound by Parramatta Public School to the east, Macquarie Street to the north, residential housing and parkland to the south and Smith Street to the west.

**Figure 1: Site location and approximate site boundary (red)**

## 3.2 Site Description

A site walkover was undertaken by a DP Environmental Scientist on the 19 April 2016. The observations made at that time are summarised below. The site layout is shown on Drawings 1 and 2 Appendix A. Photographs are provided in Appendix B.

The following features were observed:

- A number of multi-storey brick buildings containing classrooms and school administration encircled the site (Photograph 1);
- Occupying the centre of the site was an asphalt courtyard with seating areas and marked games areas (Photograph 2);
- A small bitumen asphalt paved car park was located in the northwestern corner of the site, the asphalt appeared to be in relatively poor condition (Photograph 3);
- The entire surface across the site was covered with bitumen asphalt;
- A small metal awning was located in the northern side of the central courtyard (Photograph 2);
- There were several raised planters throughout the playground (Photograph 1) as well as garden beds spread sporadically around the perimeter;
- A small 15 m by 15 m shade cloth covered part of the central courtyard in the western corner;

- Anecdotal evidence from the maintenance staff identified no underground storage tanks, above ground storage tanks or areas for dangerous chemical storage on site;
- No signs of distressed vegetation were observed during the site walkover; and
- No signs of gross contamination were observed during the site walkover.

The site is located on the edge of Parramatta CBD with major roads and surrounding sites comprising a range of commercial and residential uses, as well as sporting ovals and parkland.

# 4. Regional Topography, Geology and Hydrogeology

## 4.1 Topography and Surface Water

The site slopes towards Macquarie Street at an elevation of between 14 m and 12 m AHD. The regional slope is towards Parramatta River approximately 380 m north east of the site.

## 4.2 Geology

Reference to the Sydney 1:100000 Geological Map indicates that the site is underlain by Ashfield Shale of the Wianamatta Group. Ashfield Shale typically comprises black to dark grey shale and laminite.

## 4.3 Soil Landscape

The Sydney 1:100,000 Soils Landscape Sheet indicates that the site is underlain by the residual Blacktown soil landscape group. The soil landscape group typically occurs on gently undulating rises on Wianamatta Group shales and Hawkesbury Shale where the local relief is up to 30 m and slopes are usually <5%. It is also typical of broad rounded crests and ridges with gently inclined slopes. The soil types typically include shallow to moderately deep (<1000 mm) red and brown podzolic soils on crests, upper slopes and well drained areas and deep (1500 mm to 3000 mm) yellow podzolic soils and soloths on lower slopes and in areas of poor drainage. This soil group tends to be moderately reactive and highly plastic with low soil fertility and poor soil drainage.

The NSW National Resource Atlas Acid Sulfate Soil Risk Map indicates that the site is located in an area of 'no known occurrence of acid sulphate soil'.

The Department of Infrastructure, Planning and Natural Resources Salinity Potential in Western Sydney map 2002 indicates that the site is located in an area of moderate salinity potential. Soil salinity was considered in the previous geotechnical investigation 'Alliance Geotechnical Report; *Geotechnical Investigation Report, Arthur Phillip High School and Parramatta Public School, Macquarie Street, Parramatta*, Report Number: 1915-GR-1-1, dated 31 July 2015 (AG, 2015b) which provides recommendations for the proposed development.

### 4.4 Groundwater

Local contours suggest groundwater at the site is expected to conform with the anticipated regional groundwater and flow towards the north-east in the general direction of Parramatta River, approximately 380 m from the site.

A search of the NSW Department of Primary Industries, Office of Water registered groundwater bore database on 31 May 2016 revealed no registered groundwater bores within 500 m.

## 5. Site History Assessment

The following sections summarise the site history based on previous reports and a review of EPA public databases. Review of Council records, including 149 Certificates, and records of the storage of dangerous goods held by SafeWork NSW was not part of the agreed scope of works for this DSI.

### 5.1 Previous Reports

#### 5.1.1 Alliance Geotechnical Reports

The following existing site contamination reports were reviewed by DP (2016a) which are summarised below:

- Alliance Geotechnical Report; *Detailed Site Investigation, Arthur Phillip High School and Parramatta Public School*, Report Number: 1915-ER-1-1, dated 11 August 2015 (AG, 2015b); and
- Alliance Geotechnical Report; *Remedial Action Plan and Asbestos Management Plan, Arthur Phillip High School and Parramatta Public School*, Report Number: 1915-ER-1-2, dated 14 August 2015 (AG, 2015c).

AG (2015b) comprised a detailed site investigation for Parramatta Public School and the adjacent Arthur Phillip High School, and included a site history review, a site walkover and an intrusive investigation comprising soil sampling and analysis. The following relates to the Arthur Phillip High School South Site only.

The site history review indicated that the site appeared to have been used for educational purposes from the early 1880s till present, with the exception of Lot 414 DP 820542 (the eastern section of the site) which passed through a series of owners (including a merchant and a builder) between 1914 and 1918 before being purchased as Crown land. The site was used as a school and possibly other public uses until the present day. Minor earthworks and the construction and demolition of buildings had occurred on the site over the years.

The findings of a site walkover conducted by AG on 9, 10 and 13 July 2015 were similar to those encountered during the site walkover for this DSI (Section 3.2).

The fieldwork comprised a total of fifteen mechanically advanced boreholes (BH23 to BH37) (refer to Drawing 2, Appendix A).

AG (2015b) included a sampling and analysis plan, which comprised data quality objectives, soil sampling methodology, decontamination procedures and laboratory analysis and an assessment of quality control and quality assurance procedures. AG (2015b) concluded that based on the results of the field and laboratory QA/QC program the '*soil data is of an acceptable quality upon which to draw conclusions regarding the environmental condition of the site'*. Whilst, in some instances, there is no rationale for some of the decisions made and there are a couple of omissions, such as no trip spike sample, this is not considered sufficient to undermine to conclusion in AG (2015b). Therefore the data provided in AG (2015b) has been considered suitable for inclusion in this DSI.

The filling was encountered to depths of between 0.2 m and 0.4 m below ground level (bgl) and comprised brown gravelly clay with foreign material such as igneous gravel.

No indicators of contamination, other than the foreign materials, such as hydrocarbon odours, asbestos-containing materials (ACM) or staining were observed in the site soils.

Natural material below the filling across the site comprised red to brown clay to depths of between 0.7 m and 1.2 m bgl.

All recorded concentrations of metals, PAH, TRH, BTEX, OCP, OPP and PCB were below the laboratory limit of reporting and the site assessment criteria (SAC). However, only one sample of filling was sent for analysis.

AG (2015b) concluded that '*the site is able to be made suitable for residential with accessible soils land use with the following recommendations*':

- Preparation of a remediation action plan (RAP);
- Preparation of an asbestos management plan (AMP) to manage asbestos during redevelopment; and
- Preparation of a validation report to demonstrate adequate remediation of any unexpected finds, and to provide a statement on the suitability of the site for the proposed use.

AG (2015c) comprises a RAP and asbestos management plan (AMP) and includes the following:

- A scope of additional assessment works;
- A review of remediation options;
- A remedial plan;
- A contingency plan;
- A validation plan; and
- An AMP.

AG (2015c) concluded that '*the site can be made suitable for the proposed residential with accessible soils land use'* subject to the successful implementation of the measures detailed in the RAP.

DP (2016a) recommended that the following are undertaken in addition to the recommendations in AG (2015b):

- Seek confirmation from site personnel whether or not dangerous goods (e.g. underground or above ground storage tanks, chemicals etc) are currently, or have been historically, stored on site – Refer to Section 3.2 of this DSI;
- Re-assess the copper, nickel and zinc results against EIL calculated based on site derived criteria (soil samples analysed for CEC and pH) or based on reasonably conservative assumed values of CEC and pH for the soils types encountered- refer to Section 11.2 of this DSI;
- Undertake a detailed assessment of the analytical data to assess the impact of the limited extent of analysis of the filling undertaken for the identified CoPC to inform the requirement for further sampling and analysis either prior to or during redevelopment works – refer to Section 7.3 of this DSI; and
- Further statistical analysis of the lead concentrations recorded in filling and natural soils – refer to Section 11.2 of this DSI.

### 5.1.2 DP Hazardous Building Materials Report

DP report *Review of Reports – Hazardous Building Materials, Arthur Phillip High School and Parramatta Public School, Macquarie Street Parramatta NSW, 21 March 2016* (DP, 2016b) provides a review of existing and historical Hazardous Building Materials (HBM) reports relating to the proposed redevelopment of Arthur Phillip High School and Parramatta Public School. A summary of the findings of the review which relate to Arthur Phillip High School South Site is presented below.

- Asbestos-containing materials, lead-containing paint and synthetic mineral fibre products were identified. There is laboratory confirmation of asbestos materials but not of the lead paint coatings;
- Due to the limitations of the survey: the number of non-accessed areas, no investigation of other hazardous materials and absence of invasive survey techniques the documents are insufficient to meet the requirements of a pre-demolition survey and Register of asbestos and other hazardous materials;
- Further survey works and update of Register to be undertaken; and
- In accordance with Work Health and Safety Regulations 2011 (NSW) (specifically chapter eight) and associated Codes of Practice (How to Manage and Control Asbestos in the Workplace [Safe Work Australia (2011)] and Demolition Work Code of Practice [WorkCover NSW (2014)]) it is recommended that a full access (intrusive) asbestos and other hazardous materials survey is undertaken of all building structures on site and an updated Register of asbestos and other hazardous materials drawn up prior to the commencement of any demolition works.

## 5.2 Regulatory Notices Search

The EPA publishes records of contaminated sites under section 58 of the *Contaminated Land Management Act* 1997 (CLM Act) on a public database accessed via the internet. The notices relate to investigation and/or remediation of sites considered to be significantly contaminated under the definition in the CLM Act. More specifically the notices cover the following:

- Actions taken by the EPA under sections 15, 17, 19, 21, 23, 26 or 28 of the CLM Act;
- Actions taken by the EPA under sections 35 or 36 of the Environmentally Hazardous Chemicals Act 1985; and
- Site audit statements provided to the EPA under section 52 of the CLM Act on sites subject to an in-force remediation order.

A search of the public database on 1 June 2016 indicated that the site was not listed.

A search of the List of NSW Contaminated Sites notified to the EPA indicated that the site or surrounding areas were not listed,

It should be noted that the EPA record of Notices for contaminated land does not provide a record of all contaminated land in NSW.

The NSW EPA also issues environmental protection licenses under section 308 of the *Protection of the Environment Operations Act* 1997 (POEO Act). The register contains:

- Environmental protection licenses;
- Applications for new licenses and to transfer or vary existing licenses;
- Environment protection and noise control licenses;
- Convictions in prosecutions under the POEO Act;
- The result of civil proceedings;
- License review information;
- Exemptions from provisions of the POEO Act or Regulations;
- Approvals granted under Clause 9 of the POEO (Control of Burning) Regulation; and
- Approvals granted under Clause 7a of the POEO (Clean Air) Regulation.

A search of the public register on 1 June 2016 indicated that no Environmental Protection Licences were issued to the site.

A number of sites were listed in close proximity to the site as being subject to licences, all of which are listed as 'surrendered' or 'no longer in force.'

## 5.3 Lancer Barracks

Lancer Barracks is located immediately to the south of the site. The barracks were built between 1818 and 1820 to house British troops. An information leaflet on the Australian Government Department of Defence website titled Lancer Barracks, Parramatta, New South Wales, dated 1 October 2013 provides to following information in relation to potential contamination:

- *Activities carried out at the site are relatively benign in terms of environmental contamination; however the base does contain a chemical storage compound and once contained two above ground storage tanks that were used to store diesel and waste oil. The two above ground storage tanks are no longer used*; and

- Based on a limited stage 1 investigation *no known contamination exists on the site* and further action is currently proposed.

## 6. Preliminary Conceptual Site Model

A conceptual site model (CSM) is a representation of site-related information regarding contamination sources, receptors and exposure pathways between those sources and receptors. The CSM provides the framework for identifying how the site became contaminated and how potential receptors may be exposed to contamination either in the present or the future i.e. it enables an assessment of the potential source – pathway – receptor linkages (complete pathways).

### 6.1 Potential Contamination Sources

The site has been previously used as a school and possible other public activities. Areas of the site may have been filled during the construction of, and amendments to, the school. Given the age of the school it is possible that near surface soils could be impacted with hazardous building materials such as asbestos and lead paint. Pesticides may have also been used in the past as pest control beneath floors and concrete slabs (school and former dwellings) and other parts of the school grounds. Hazardous building materials have been identified in the existing buildings on site. Therefore the following potential sources of contamination and associated contaminants of potential concern (COPC) have been identified.

S1 Filling and surficial soil: Associated with levelling, demolition of former buildings and use of the site.

COPC include metals, total petroleum hydrocarbons (TPH), benzene, toluene, ethylbenzene, xylene (BTEX), polycyclic aromatic hydrocarbons (PAH), polychlorinated biphenyls (PCB), organochlorine pesticides (OCP), organophosphorus pesticides (OPP), phenols, and asbestos.

S2 Existing Buildings.

Asbestos, synthetic mineral fibres (SMF), lead (in paint) and PCB.

S3 Lancer Barracks

TPH, BTEX, PAH and perfluorinated Alkyated Substance (PFAS).

## 6.2 Potential Contamination Receptors

The main potential receptors of contamination (current and future) are considered to be:

- (R1) Site users (students, staff and visitors);
- (R2) Construction workers (for the construction of the proposed development);
- (R3) Adjacent site users;
- (R4) Surface water (Parramatta River);
- (R5) Groundwater;
- (R6) Terrestrial ecology; and
- (R7) In-ground structures.

## 6.3 Potential Contamination Pathways

The potential contamination pathways through which the identified receptors could come into contact with contamination are considered to be:

- (P1) Ingestion and dermal contact;
- (P2) Inhalation of dust and / or vapours;
- (P3) Surface water run off;
- (P4) Leaching and vertical migration into groundwater;
- (P5) Lateral migration of groundwater;
- (P6) Contact with terrestrial ecology; and
- (P7) Contact with in-ground structures.

## 6.4 Summary of Conceptual Site Model

A ‘source–pathway–receptor’ approach has been used to assess the potential risks of harm being caused to human or environmental receptors from contamination sources on or in the vicinity of the site, via exposure pathways (potential complete pathways). The possible complete pathways between the above sources (S1 to S3) and receptors (R1 to R7) are provided in Table 2.

**Table 2: Summary of Potential Complete Pathways**

| Potential Source | Transport Pathway | Receptor |
|---|---|---|
| (S1) Filling and surficial soil | (P1) Ingestion and dermal contact<br>(P2) Inhalation of dust and / or vapours | (R1) Site users<br>(R2) Construction workers |
| | (P2) Inhalation of dust and / or vapours | (R3) Adjacent site users |
| | (P3) Surface water run off<br>(P5) Lateral migration of groundwater | (R4) Surface water |
| | (P4) Leaching and vertical migration into groundwater | (R5) Groundwater |
| | (P6) Contact with terrestrial ecology | (R6) Terrestrial ecology |
| | (P7) Contact with in-ground structures | (R7) In-ground structures |
| (S2) Hazardous building materials | (P1): Ingestion and dermal contact<br>(P2): Inhalation of dust and / or vapours | (R1) Site users<br>(R2) Construction workers |
| (S3) Lancer Barracks | (P2): Inhalation of dust and Vapours | (R1) Site users<br>(R2) Construction workers |

# 7. Field Work Methods

## 7.1 Data Quality Objectives and Project Quality Procedures

The DSI has been devised broadly in accordance with the seven step data quality objective (DQO) process which is provided in Appendix B, Schedule B2 of National Environment Protection Measure 1999 revised 2013, National Environment Protection Council (NEPC, 2013). The DQO process is outlined as follows:

- Stating the Problem;
- Identifying the Decision;
- Identifying Inputs to the Decision;
- Defining the Boundary of the Assessment;
- Developing a Decision Rule;
- Specifying Acceptable Limits on Decision Errors; and
- Optimising the Design for Obtaining Data.

Referenced sections for the respective DQOs listed above are presented in Appendix C.

## 7.2 Data Quality Indicators

The performance of the assessment in achieving the DQO was assessed through the application of Data Quality Indicators (DQI), defined as follows:

**Completeness**: A measure of the amount of useable data from a data collection activity;

**Comparability**: The confidence (expressed qualitatively) that data can be considered equivalent for each sampling and analytical event;

**Representativeness**: The confidence (expressed qualitatively) that data are representative of each media present on the site;

**Precision**: A quantitative measure of the variability (or reproducibility) of data; and

**Accuracy**: A quantitative measure of the closeness of reported data to the "true" value.

Further comments on the DQIs are presented in Appendix C.

## 7.3 Sampling Locations and Rationale

The recommended minimum sampling density as stipulated in the NSW EPA Contaminated Sites: Sampling Design Guidelines, (1995) for a 9,000 $m^2$ site is 20 sampling points. The previous investigation (AG, 2015b) comprised 15 boreholes. The purpose of this investigation was to provide further insight into potential contamination on site and following review of the findings of AG (2015b) six test bores (BH6 to BH12) were deemed suitable to complete the site assessment, i.e. a total of 21 locations. The test bore locations are shown on Drawing 2, Appendix A. The locations were selected on the basis of providing adequate site coverage.

The intrusive works were conducted on the 19 April 2016. Soil samples were collected from the six test bore locations.

Groundwater assessment was conducted from three wells located over APHS-N, APHS-S and PPS, with one well located on each site. Two of the wells were constructed as part of the geotechnical investigation (DP, 2016c: Wells 102 and 103). The third well was constructed in APHS-S as close as reasonably possible to Lancer Barracks to the south. This sampling design was considered appropriate given the relatively low risk of groundwater contamination at the sites. Well locations are shown on Drawing 3, Appendix A.

Groundwater contamination is considered to be low risk based on a number of factors, namely:

- The site use has been used for schools for over 70 years, which is considered to be a very low risk activity for groundwater contamination;
- Earlier uses were generally also of low risk, with the likelihood of contaminants from this time to remain in groundwater at the site with no soil source considered to be extremely low;
- The chemical contaminants detected at the site have been present in the upper 0.5 m of the soil profile;
- The PAH and TRH exceedances appearing to be associated with asphalt in most if not all locations detected, and are therefore not expected to be leachable; and

- The identified potential up-gradient source (the Lancer Barracks) has been reported to have "no known contamination" and following preparation of a Limited Stage 1 investigation no further action is proposed, although the need for assessment around the former above ground tanks if the areas were to be redeveloped has been identified (Section 5.3). Based on this assessment the risk from the site is considered to be low to moderate, and wells have been positioned to assess potential impacts from the Barracks.

## 7.4 Drilling Methods

Hand auger drilling was undertaken using a hand auger with a 110 mm diameter head. Asphalt was encountered at each location and was removed using a 10kg hand-held rotary hammer. Auguring was conducted down to a maximum depth of 1.0 m bgl or prior refusal. Asphalt was reinstated once test bores were terminated. Test bore logs are provided in Appendix D.

Drilling for Well MW1 was drilled using a truck-mounted drilling rig and solid flight auger.

The drilling techniques and sampling techniques (see Section7.5) were considered appropriate for the DSI based on the site history and potential contamination sources; i.e. predominantly non-volatiles contaminants of concern. The potential source of volatile contamination was filling which would have been highly disturbed at the time of placement between 50 and almost 100 years ago. However, loss of volatiles during drilling and sampling was minimised by timely sampling from auger returns and appropriate storage and preservation.

## 7.5 Soil Sampling Procedures

Environmental sampling was performed in accordance with standard operating procedures outlined in the DP *Field Procedures Manual*. All sampling data was recorded on test bore logs presented in Appendix D and selected samples for laboratory analysis were recorded on DP chain-of-custody (COC) sheets provided in Appendix E. The general soil sampling procedure comprised:

- Use of disposable sampling equipment including nitrile gloves;
- Transfer of samples into laboratory prepared glass jars and capping immediately with Teflon lined lids;
- Labelling of sampling containers with individual and unique identification, including project number sample location and sample depth; and
- Placement of sample containers and bags into a cooled, insulated and sealed container for transport to the laboratory.

No new clothes, Tyvek suits, food wrappers, alfoil, light plastic containers, waterproof paper, self-sticking notes, re-usable ice packs or drilling fluids were used on site during PFAS sampling.

Envirolab Services Pty Ltd, accredited by NATA, was employed to conduct the primary sample analysis. The laboratory is required to carry out in-house QC procedures.

## 7.6 Groundwater Well Construction and Groundwater Sampling

Two of the wells were constructed as part of the geotechnical investigation (DP, 2016c). These wells were constructed in Bores 102 and 103 (Wells 102 and 103) which were drilled using a Scout truck mounted auger/rotary drilling rig, using auger, rotary and NMLC-coring methods. Well construction details are shown on the borehole logs, Appendix D.

One of the wells was constructed in Bore MW1 (Well MW1), which was drilled using a DT-100 truck mounted auger/rotary drilling rig, using auger drilling methods. Well construction details are shown on the borehole log, Appendix D.

Groundwater monitoring wells were constructed so that the screened interval intercepted the expected depth of the water table. No drilling muds/ liquids were used in the drilling.

The groundwater monitoring wells were constructed of 50 mm diameter acid washed class 18 PVC casing and machine slotted well screen intervals. Joints were screw threaded, thereby avoiding the use of glues and solvents which may contaminate the wells. All wells were capped and a Gatic cover placed flush with the ground surface.

The groundwater levels were measured using an interface meter and the wells were developed on 13 September 2016 by pumping until dry. No phase separated hydrocarbons (PSH) were noted during the development.

The general groundwater sampling procedure comprised:

- Use of disposable, non-teflon containing measuring and sampling equipment including nitrile gloves;
- Collection of sample for chemical analysis from water which has only been in contact with new, disposable silicon and LDPE tubing;
- Transfer of samples into appropriately preserved laboratory prepared glass jars and capping immediately. Sampling containers for PFAS did not have Teflon lined lids);
- Labelling of sampling containers with individual and unique identification, including project number sample location and sample depth; and
- Placement of sample jars into a cooled, insulated and sealed container for transport to the laboratory.

No new clothes, Tyvek suits, food wrappers, alfoil, light plastic containers, waterproof paper, self-sticking notes, re-usable ice packs or drilling fluids were used on site during PFAS sampling. Decon 90 and potentially treated (e.g. Gore-tex) clothing was used/ worn during sampling.

The wells were micro-purged and sampled between 16 and 19 September 2016 using a low flow pump (Geopump). No PSH was observed during micropurging or sampling. Samples from Wells 102 and MW1 were collected following stabilisation of field parameters (pH, temperature, dissolved oxygen (DO), electrical conductivity and redox). Insufficient water was present in Well 103 to allow micropurging before sampling.

Samples were placed with a minimum of aeration into laboratory prepared and preserved bottles. For analysis of metals the relevant sample fraction was filtered using an in-line disposable 0.45 µm filter that was changed between samples.

The samples were placed in an insulated cooler and maintained at a cool temperature using ice for transport to the analytical laboratory.

### 7.7 Analytical Rationale

The analytical scheme was designed to obtain an indication of the potential presence and possible distribution of contaminants that may be attributable to past and present activities, and features within the site, as discussed in Section 6.

### 7.8 Field Quality Assurance and Quality Control

The field QC procedures for sampling were undertaken in accordance with Douglas Partners' *Field Procedures Manual*. Field replicates were recovered and analysed for a limited suite of contaminants by means of intra-laboratory analysis. The results of the field QA programme are presented in Appendix C.

### 7.9 Laboratory QA/QC

The analytical laboratory, accredited by NATA, is required to conduct in-house QA/QC procedures. These are normally incorporated into every analytical run and include reagent blanks, spike recovery, surrogate recovery and duplicate samples. .

The results of the DP assessment of laboratory QA/QC are shown in Appendix C with the laboratory certificates of analysis included in Appendix E.

## 8. Site Assessment Criteria

The current site use is a secondary school, it is understood that the intended end use of the site is a redevelopment of the secondary school facilities. However, the site will be redeveloped at the same time as the adjacent Parramatta Public School (primary school). It is possible that the redevelopment may include the movement of site soils between the two schools and therefore the proposed Site Assessment Criteria (SAC) will be for more conservative residential with garden/accessible soil which also includes childcare centres, preschools and primary schools.

The SAC applied in the current investigation are informed by the CSM which identified human and ecological receptors to potential contamination on the site. Analytical results were assessed (as a Tier 1 assessment) against the SAC comprising the investigation and screening levels of Schedule B1, *National Environment Protection (Assessment of Site Contamination) Measure* 1999, as amended 2013 (NEPC, 2013). NEPC (2013) is endorsed by the NSW EPA under the CLM Act 1997. Petroleum

based health screening levels for direct contact and vapour inhalation by intrusive maintenance workers from the *Cooperative Research Centre for Contamination Assessment and Remediation of the Environment (CRC CARE) Technical Report no.10 Health screening levels for petroleum hydrocarbons in soil and groundwater* (2011) as referenced by NEPC (2013) have not been considered in this assessment as these values are significantly higher than the soil vapour HSLs adopted.

## 8.1 Soil

### 8.1.1 Health Investigation and Screening Levels

Table 3 shows the HILs that have been adopted by NEPC (2013) Schedule B1, Table 1A(1). Table 3 only includes contaminants analysed during this assessment, not the full list provided in NEPC (2013).

**Table 3: Health Investigation Levels**

| Contaminant | HIL A – Residential (mg/kg) |
|---|---|
| **Metals and Inorganics** | |
| Arsenic | 100 |
| Cadmium | 20 |
| Chromium (IV) | 100 |
| Copper | 6000 |
| Lead | 300 |
| Mercury (inorganic) | 40 |
| Nickel | 400 |
| Zinc | 7400 |
| **PAH** | |
| Carcinogenic PAH (as benzo(a)pyrene TEQ) [1] | 3 |
| Total PAH | 300 |
| **Phenols** | |
| **Pentachlorophenol (used as an initial screen)** | 100 |
| **OCP** | |
| DDT + DDD + DDE | 240 |
| Aldrin + Dieldrin | 6 |
| Chlordane | 50 |
| Endosulfan (total) | 270 |
| Endrin | 10 |
| Hepatchlor | 60 |
| HCB | 10 |
| Methoxychlor | 300 |
| **Other Pesticides** | |
| Chlorpyrifos | 160 |

| Contaminant | HIL A – Residential (mg/kg) |
|---|---|
| **Other Organics** | |
| PCB [2] | 1 |
| PFAS [3] | 4 |

Notes:

1 sum of carcinogenic PAH

2 non dioxin-like PCBs only.

3 Threshold adopted from human health residential values for PFOS from Government of Western Australia Department of Environment Regulation (DER) *Interim Guideline on the Assessment and Management of Perfluoroalkyl and Polyfluoroalkyl Substances (PFAS) Contaminated Sites Guidelines* (2016) (DER, 206) in the absence of EPA endorsed criteria

Table 4 shows petroleum hydrocarbon compounds adopted from NEPC (2013) Schedule B1, Table 1A(3). The HSLs are based on overlying soil type and depth. HSLs for sand have been used based on the sandy clay fill material encountered at the site. Given the general depth of fill encountered in the investigation during the intrusive works, and using the most conservative values, the depth range of 0 m to <1 m has been used.

**Table 4: Soil Health Screening Levels for Vapour Intrusion**

| Contaminant | Soil Type | HSL A – Residential (mg/kg) |
|---|---|---|
| | | Depth 0 m to <1m |
| Toluene | Sand | 160 |
| Ethylbenzene | | 55 |
| Xylenes | | 40 |
| Napthalene | | 3 |
| Benzene | | 0.5 |
| TRH $C_6$-$C_{10}$ less BTEX [F1] | | 45 |
| TRH >$C_{10}$-$C_{16}$ less naphthalene [F2] | | 110 |

### 8.1.2 Ecological Investigation and Screening Levels

Ecological Investigation Levels (EIL) have been derived for selected metals and organic compounds and are applicable for assessing risk to terrestrial ecosystems (NEPC, 2013). EIL depend on specific soil physiochemical properties and land use scenarios and generally apply to the top 2 m of soil, which corresponds to the root zone and habitation zone of many species. The EIL is determined for a contaminant based on the sum of the ambient background concentration (ABC) and an added contaminant limit (ACL). The ABC of a contaminant is the soil concentration in a specific locality that is the sum of naturally occurring background levels and the contaminants levels that have been introduced from diffuse or non-point sources (e.g. motor vehicle emissions). The ACL is the added concentration (above the ABC) of a contaminant above which further appropriate investigation and evaluation of the impact on ecological values is required.

The EIL is calculated using the following formula:

EIL = ABC + ACL,

The ABC is determined through direct measurement at an appropriate reference site (preferred) or through the use of methods defined by Olszowy et al *Trace element concentrations in soils from rural and urban areas of Australia*, Contaminated Sites monograph no. 4, South Australian Health Commission, Adelaide, Australia 1995 (Olszowy, 1995) or Hamon et al, *Geochemical indices allow estimation of heavy metal background concentrations in soils*, Global Biogeochemical Cycles, vol. 18, GB1014, (Hamon, 2004). ACL is based on the soil characteristics of pH, CEC and clay content.
EIL (and ACLs where appropriate) have been derived in NEPC (2013) for only a short list of contaminants comprising As, Cu, Cr (III), DDT, naphthalene, Ni, Pb and Zn. An *Interactive (Excel) Calculation Spreadsheet* may be used for calculating site-specific EIL for these contaminants, and has been provided in the ASC NEPM Toolbox available on the SCEW (Standing Council on Environment and Water) website (http://www.scew.gov.au/node/941).

The adopted EIL, derived from the *Interactive (Excel) Calculation Spreadsheet* are shown in the following Table 5. The following site specific data and assumptions have been used to determine the EILs:

- The EILs will apply to the top 2 m of the soil profile;
- Given the likely source of soil contaminants (i.e. historical site use/fill) the contamination is considered as “aged” (>2 years); and
- ABCs have been derived using the *Interactive (Excel) Calculation Spreadsheet* using input parameters of aged soil, CEC of 12.4 $cmol_c$/kg and pH of 7.5 with high traffic and clay content of 1% for the samples analysed as part of this DSI (see laboratory certificates provided in Appendix E).

**Table 5: Ecological Investigation Levels (EIL) in mg/kg**

| Analyte | | EIL Residential | Comments |
|---|---|---|---|
| **Metals** | Arsenic | 100 | Adopted pH of 7.6 and CEC of 9.4 $cmol_c$/kg]; assumed clay content 1% |
| | Chromium III | 200 | |
| | Copper | 210 | |
| | Lead | 1,100 | |
| | Nickel | 150 | |
| | Zinc | 500 | |
| **PAH** | Naphthalene | 170 | |
| **OCP** | DDT | 180 | |

Ecological Screening Levels (ESL) are used to assess the risk of selected petroleum hydrocarbon compounds, BTEX and benzo(a)pyrene to terrestrial ecosystems. ESL apply to the top 2 m of the soil profile as for EIL.

ESL have been derived in NEPC (2013) for petroleum fractions F1 to F4 as well as BTEX and Benzo(a)pyrene. Site specific data and assumptions as summarised in Table 6 have been used to

determine the ESL. The adopted ESL, from Table 1B(6), Schedule B1 of NEPC (2013) are shown in Table 7.

**Table 6: Inputs to the Derivation of ESL**

| Variable | Input | Rationale |
|---|---|---|
| Depth of ESL application | Top 2 m of the soil profile | The top 2 m depth below ground level corresponds to the root zone and habitation zone of many species. |
| Land use | Urban Residential | Primary School |
| Soil Texture | Fine | Based on findings noted in test bore logs (Appendix D) |

**Table 7: Ecological Screening Levels (ESL) in mg/kg**

| Analyte | | ESL (Residential) | Comments |
|---|---|---|---|
| **TRH** | C6 – C10 (less BTEX) [F1] | 180* | All ESLs are low reliability apart from those marked with * which are moderate reliability |
| | >C10-C16 (less Naphthalene) [F2] | 120* | |
| | >C16-C34 [F3] | 1300 | |
| | >C34-C40 [F4] | 5600 | |
| **BTEX** | Benzene | 65 | |
| | Toluene | 105 | |
| | Ethylbenzene | 125 | |
| | Xylenes | 45 | |
| **PAH** | Benzo(a)pyrene | 0.7 | |

### 8.1.3 Management Limits

NEPC (2013) Table 1B(7) provides 'management limits' for TRH fractions, which are applied after consideration of relevant HSLs. The management limits have been adopted to avoid or minimise the following potential effects of petroleum hydrocarbons:

- Formation of non-aqueous phase liquids (LNAPL);
- Fire and explosive hazards; and
- Effects on buried infrastructure e.g. penetration of, or damage to, in-ground services by hydrocarbons.

The presence of site TRH contamination at the levels of the management limits does not imply that there is no need for administrative notification or controls in accordance with jurisdictional requirements. The adopted management limits are shown in Table 8 and have been selected based on the CSM.

Management limits for fine material are presented in Table 8 based on findings noted in test bore logs (Appendix D).

**Table 8: Management Limits for TRH Fractions in Soil**

| TRH Fraction | Soil Texture | Management Limit: Residential (mg/kg) |
|---|---|---|
| $C_6$-$C_{10}$ [F1] | Fine | 800 |
| >$C_{10}$-$C_{16}$ [F2] | | 1,000 |
| >$C_{16}$-$C_{34}$ [F3] | | 3,500 |
| >$C_{34}$-$C_{40}$ [F4] | | 10,000 |

### 8.1.4 Asbestos in Soil

A detailed asbestos assessment was not undertaken as part of these works as asbestos was not an identified as a contaminant of concern for the APHS south site by AG (2015b). Therefore the presence or absence of asbestos at a limit of reporting of 0.1 g/kg has been adopted for this assessment as an initial screen. The laboratory engaged to undertake the analysis (Envirolab Services Ltd) reports any asbestos detected in a sample below the limit of reporting. Any detection of asbestos will be considered to require remediation or further investigation.

## 8.2 Groundwater

### 8.2.1 Groundwater Investigation Levels

The Groundwater Investigation Levels (GIL) adopted in NEPC (2013) are based on:

- *National water quality management strategy. Australian and New Zealand guidelines for fresh and marine water quality* 2000 (ANZECC & ARMCANZ).

The adopted GIL for the analytes included in the assessment, and the corresponding source documents, are shown in Table 9.

**Table 9: Groundwater Investigation Levels (in µg/L)**

| Analyte | | NEPC (2013) Fresh Waters [a] | Comments |
|---|---|---|---|
| Metals | Arsenic (V) | 13 | [#] Base threshold, which can be adjusted for site specific hardness measurements |
| | Arsenic (III) | 24 | |
| | Cadmium | 0.2[#] | |
| | Chromium (VI) | 1[#] | |
| | Copper | 1.4[#] | |
| | Lead | 3.4[#] | |
| | Mercury (total) | 0.06 | |
| | Nickel | 11[#] | |
| | Zinc | 8[#] | |
| PAH | Naphthalene | 16 | |
| | Benzo(a)pyrene | - | |
| BTEX | Benzene | 950 | |
| | Toluene | - | |
| | Ethylbenzene | - | |
| | Xylene (o) | 350 | |
| | Xylene (p) | 200 | |
| | Xylenes (Total) | - | |
| OCP | Chlordane | 0.03 | |
| | DDT | 0.006 | |
| | Endosulfan | 0.03 | |
| | Endrin | 0.01 | |
| | Heptachlor | 0.01 | |
| | Aldrin + Dieldrin | - | |
| | Lindane | 0.2 | |
| | Heptachlor Expoxide | - | |
| PCB | Aroclor 1242 | 0.3 | |
| | Aroclor 1254 | 0.01 | |
| Phenols | 2,4,6-trichlorophenol | 3 | Adopted as a conservative screening threshold for total phenols |
| VOC | n/a | n/a | As no VOC concentrations above the laboratory reporting limits have GIL. |
| PFAS [c] | PFOS | 0.13 | Value for PFOS adopted as conservative screen for total PFAS |
| | PFOA | 220 | |

Notes:

a Investigation levels apply to typically slightly-moderately disturbed systems

b In cases where no high reliability trigger values are provided, the low reliability trigger values provided in ANZECC &ARMCANZ (2000) were used as screening levels

c Threshold adopted from ecological freshwater value for slightly – moderately disturbed ecosystems (95% species protection) values from Government of Western Australia Department of Environment Regulation (DER) *Interim Guideline on the Assessment and Management of Perfluoroalkyl and Polyfluoroalkyl Substances (PFAS) Contaminated Sites Guidelines* (2016) (DER, 206) in the absence of EPA endorsed criteria

### 8.2.2 Health Screening Levels – Petroleum Hydrocarbons

The generic HSL are considered to be appropriate for the assessment of contamination at the site. Given the proposed land use the adopted HSL are:

- **HSL- AB** – Low – high density residential

In addition, the HSL adopted is predicated on the following inputs prescribed in Table 10.

**Table 10: Inputs to the Derivation of HSLs**

| Variable | Input | Rationale |
|---|---|---|
| Potential exposure pathway | Groundwater vapour intrusion (inhalation) | Exposure pathway via groundwater vapour intrusion affects the adopted HSL. |
| Soil Type | Sand and Clay | Given the variable texture of soils identified at the site HSL for sand and clay have been included |
| Depth to contamination | 4-8 m | Recorded depths to groundwater (prior to sampling) ranged between 4.7 m and 7.2 m (Appendix D) which is considered to be potentially conservative given site levels are proposed to be raised as part of the current development. |

The adopted groundwater HSL for vapour intrusion, from Table 1A(4), Schedule B1 of NEPC (2013) are shown in the following Table 11.

**Table 11: Groundwater Health Screening Levels (HSL) for Vapour Intrusion (µg/L)**

| Analyte | HSL A (vapour intrusion) (µg/L) | |
|---|---|---|
| | Depth 4 m to <8m | |
| Soil Texture | Clay | Sand |
| Toluene | NL [1] | NL [1] |
| Ethylbenzene | NL [1] | NL [1] |
| Xylenes | NL [1] | NL [1] |
| Naphthalene | NL [1] | NL [1] |
| Benzene | 5,000 | 800 |
| TRH $C_6$-$C_{10}$ less BTEX [F1] | NL [1] | 1,000 |
| TRH >$C_{10}$-$C_{16}$ less Naphthalene [F2] | NL [1] | 1,000 |

Note: NL -The solubility limit is defined as the groundwater concentration at which the water cannot dissolve any more of an individual chemical based on a petroleum mixture. The soil vapour which is in equilibrium with the groundwater will be at its maximum. If the derived groundwater HSL exceeds the water solubility limit, a soil-vapour source concentration for a petroleum mixture could not exceed a level that would result in the maximum allowable vapour risk for a given scenario. For these scenarios no HSL is presented for these chemicals. These are denoted as not limiting 'NL'.

### 8.3 Contaminants with No Assessment Criteria

Where no guidance is provided in NEPC (2013) for a specific analyte, the PQL was used as the initial screening criteria.

If concentrations are recorded above the PQL, reference criteria will be sourced from other national and international guidance as relevant and used to determine the significance of the detected analyte.

## 9. Field Work Results

### 9.1 Soil

Detailed descriptions of the conditions encountered in each of the test bores are provided in the logs in Appendix D. The conditions encountered are summarised below.

| | |
|---|---|
| Asphalt: | To depths of between 0.02 m and 0.05 m bgl. |
| Roadbase: | Typically light brown clayey, sandy gravel to depths of between 0.15 m and 0.30 m bgl. |
| Fill: | Typically consisted of brown / grey / orange gravelly sandy clay or clayey gravel or blue metal gravel filling to depths of between 0.40 m and 0.65 m bgl. |
| Clay: | Brown / orange mottled red sandy clay was noted to depths of between 0.5 m and 1.1 m bgl where boreholes were terminated. |

The PID readings in each sample were all below 5 ppm (refer to logs in Appendix C) suggesting that the potential for organic contaminants was low.

Some signs of potential contamination were observed, including fragments of asphalt and brick fragments recorded in the filling across the site and slight to strong solvent/ethanol odours in BH8, BH9 and BH10.

### 9.2 Groundwater

Well construction details are provided on the test bores logs, provided in Appendix D along with field records from the groundwater well development and sampling.

Groundwater was sampled from three wells, Well 102 (APHS-N), Well MW1 (Arthur Phillip High School - South) and Well 103 (Parramatta Public School). Groundwater levels recorded at the time of sampling (Appendix D) were generally consistent with a north easterly groundwater flow direction. Note, groundwater levels are transitory and subject to change over time.

No phase separated hydrocarbons, petroleum sheen or other signs of contamination concern were recorded during well development or sampling.

Water from Well 103 was noted to be silty, and some silt was observed to splash into the metals bottle during filtration.

**Table 12: Groundwater Levels**

| Well ID | Approximate Surface Level[1] | Groundwater Level | |
|---|---|---|---|
| | | 16.09.16 | |
| | m AHD | m bgl | m AHD |
| 102 | 7.15 | 4.8 | 2.4 |
| 103 | 11 | 6.6 | 4.4 |
| MW1 | 13 | 5.8 | 7.2 |

Notes:
1 draft levels interpolated from survey drawing. Final levels subject to dGPS survey not yet available

## 10. Laboratory Testing

Selected soil samples were analysed for the potential contaminants identified in the conceptual site model (CSM, refer to Section 6) comprising metals, TRH, BTEX, PAH, OCP, OPP, PCB, phenols and asbestos.

Groundwater samples were tested for metals, PAH, TRH, BTEX, total phenols, OCP, OPP, PCB, VOC, PFAS and hardness.

The results of the laboratory analysis from this PSI and AG (2015b) are presented in Tables E1 and E2, Appendix E with the SAC. The laboratory certificates and chain of custody information from this DSI are presented in Appendix E.

## 11. Discussion of Results

The key findings of the desktop and site history investigation were as follows:

- The site history review indicated that the site appeared to have been used for educational purposes from the early 1880's till present, with the exception of Lot 414 DP 820542 (the eastern section of the site) which passed through a series of owners (including a merchant and a builder) between 1914 and 1918 before being purchased as Crown land;
- The site was used as a school and possibly other public uses until the present day;
- Minor earthworks and the construction and demolition of buildings had occurred on the site over the years; and
- Asbestos has been identified in the buildings on site.

Based on the findings of the desktop assessment a number of potential contaminants were identified in the CSM comprising metals, TRH, BTEX, PAH, OCP, OPP, PCB, phenols, PFAS and asbestos.

## 11.1 Field Observations

Fragments of asphalt and brick were recorded in the filling across the site and unidentified solvent odours were detected in the filling at BH8 (0.2 m to 0.4 m), BH9 (0.3 m to 0.45 m) and BH10 (0.3 m to 0.5 m). The PID readings in each sample were all below 5 ppm suggesting that the potential for organic contaminants was low.

## 11.2 Soil Analytical Results

Selected soil samples were analysed for the potential contaminants of concern comprising metals, TRH, BTEX, PAH, OCP, OPP, PCB, phenols, PFAS and asbestos. The results of the soil analysis from this DSI and from AG (2015b), and the SAC are presented in Table E1, Appendix E.

The reported concentrations of BTEX, OCP, OPP, PCB, phenols, PFAS and asbestos were below the laboratory limits of reporting and therefore the SAC.

The reported concentrations of metals were below the SAC for all samples. Nickel and lead results indicate that leachate analysis may be required for waste classification for off-site disposal.

The reported concentrations of PAH and TRH exceeded the SAC in the following samples:

Filling

- BH7_0.35-0.45 - B(a)P TEQ (19 mg/kg) exceeded the HIL (3 mg/kg), B(a)P (12 mg/kg) exceeded the ESL (0.7 mg/kg) and TRH >$C_{16}$-$C_{34}$ (1,500 mg/kg) exceeded the ESL (1,300 mg/kg);
- BH9_0.3-0.4 - B(a)P TEQ (110 mg/kg) exceeded the HIL (3 mg/kg), B(a)P (74 mg/kg) exceeded the ESL (0.7 mg/kg), total PAH (1210 mg/kg) exceeded the HIL A (300 mg/kg), TRH F2 (530 mg/kg) exceeded the HSL (110 mg/kg) and ESL (120 mg/kg), and >$C_{16}$-$C_{34}$ (12,000 mg/kg) exceeded the ESL (1300 mg/kg) and the management limit (3,500 mg/kg);
- BH10_0.4-0.5 - B(a)P TEQ (110 mg/kg) exceeded the HIL (3 mg/kg), B(a)P (74 mg/kg) exceeded the ESL (0.7 mg/kg), total PAH (1006 mg/kg) exceeded the HIL (300 mg/kg), TRH F2 (570mg/kg) exceeded the HSL (110 mg/kg) and ESL (120 mg/kg), and >$C_{16}$-$C_{34}$ (12,000 mg/kg) exceeded the ESL (1300 mg/kg) and the management limit (3,500mg/kg);
- BH12_0.2-0.3 - B(a)P TEQ (32 mg/kg) exceeded the HIL (3 mg/kg), B(a)P (21 mg/kg) exceeded the ESL (0.7 mg/kg), total PAH (1210 mg/kg) exceeded the HIL A (300 mg/kg) and TRH >$C_{16}$-$C_{34}$ (2,200 mg/kg) exceeded the ESL (1,300 mg/kg); and
- MW1_0.4-0.5 - B(a)P TEQ (15 mg/kg) exceeded the HIL (3 mg/kg), B(a)P (10 mg/kg) exceeded the ESL (0.7 mg/kg) and TRH >$C_{16}$-$C_{34}$ (1,300 mg/kg) was equal to the ESL (1,300 mg/kg);

Natural Clay

- BH36_0.5-0.6 - B(a)P (0.8 mg/kg) exceeding the ESL (0.7 mg/kg); and
- BH37_0.5-0.6 - B(a)P (0.9 mg/kg) exceeding the ESL (0.7 mg/kg).

Due to the unexpected high concentrations of PAH and TRH in the five samples of filling DP requested additional assessment of the results from BH7, BH9, BH10 and BH12 by the laboratory to determine whether bitumen fragments were included in the samples analysed. The chromatogram and advice are included in Appendix E. The chromatogram and advice revealed that the samples contained traces of bitumen and these higher concentrations may be attributed small fragments of bitumen which have been included in the sample.

The reported TRH fractions are the heavier end less volatile fractions and are not considered to be related to the slight to strong solvent/ethanol odours in BH8, BH9 and BH10 reported during the site works. Therefore it is considered that the reported concentrations of PAH and TRH do not pose and unacceptable risk to the proposed development.

There is no obvious on-site source of the slight to strong solvent/ethanol odours in BH8, BH9 and BH10. The source may be from off-site historic activities.

Whilst no asbestos was reported in the five samples of filling submitted for analysis (current and previous investigations) DP notes that asphalt and brick fragments were recorded in the filling. Anthropogenic materials such as brick fragments can be an indicator for the presence of ACM. Therefore there is the possibility of ACM being present in the filling.

### 11.3 Groundwater Analytical Results

Groundwater results for Well MW1, located at APHS-S were within the GIL with the exception of nickel which was reported at a concentration of 65 µg/L compared to the GIL of 53 µg/L (Table E2, Appendix E). It is considered that the reported concentration represents background concentrations in the area.

It is noted that minor concentrations of TRH $C_6$-$C_{10}$, and VOC (chloroform, bromodichloromethane and 1,2,4-trimethyl benzene) were detected. The detected concentrations are considered to be low and likely to represent background concentrations in the area.

The results of the groundwater investigation are not considered to indicate a potential risk to site users.

## 12. Conclusions and Recommendations

Based on the findings of this investigation and the current use of the site as a secondary school, no immediate management action is considered necessary.

Based on the findings of this DSI it is considered that the site can be made suitable for the proposed development as a high school. However, a remediation action plan (RAP) for the redevelopment of the APHS-S, Arthur Phillip High School North site and Parramatta Public School should be prepared detailing the soil remediation and management requirements to render the site suitable for the continued high school use. The RAP should include (in relation to APHS-S):

- Delineation of the solvent/ethanol odours reported in the vicinity of BH8, BH9 and BH10;
- Assessment of the soil for a range of options including re-use on-site and disposal off-site;

- Inspection and assessment the site surface following removal of hardstand and building footprints;
- Assessment of the filling for a range of options including re-use on-site and disposal off-site (to include sampling and analysis of the potential contaminants of concern identified in Section 6); and
- An unexpected finds protocol which sets out procedures to be followed should unexpected contamination be encountered during the works.

A pre-demolition hazardous building material survey of all buildings has been undertaken and is reported in DP report *Pre-demolition Hazardous Building Materials Report, Arthur Phillip High School, Macquarie Street, Parramatta, NSW*, 85374.04.R.001, October 2016.

## 13. Limitations

This report presents the results of a detailed site investigation (DSI) undertaken for a due diligence purposes at Arthur Phillip High School South Site, Macquarie Street, Parramatta. The investigation was commissioned by Louise Browne of Grimshaw Architects LLD and was undertaken in accordance with Douglas Partners' proposal SYD160465 dated 7 April 2016. The work was carried out under DP's Conditions of Engagement. This report is provided for the exclusive use of Grimshaw Architects LLP for this project only and for the purposes as described in the report. It should not be used by or relied upon for other projects or purposes on the same or other site or by a third party. Any party so relying upon this report beyond its exclusive use and purpose as stated above, and without the express written consent of DP, does so entirely at its own risk and without recourse to DP for any loss or damage. In preparing this report DP has necessarily relied upon information provided by the client and/or their agents.

The results provided in the report are indicative of the sub-surface conditions on the site only at the specific sampling and/or testing locations, and then only to the depths investigated and at the time the work was carried out. Sub-surface conditions can change abruptly due to variable geological processes and also as a result of human influences. Such changes may occur after DP's field testing has been completed.

DP's advice is based upon the conditions encountered during this investigation. The accuracy of the advice provided by DP in this report may be affected by undetected variations in ground conditions across the site between and beyond the sampling and/or testing locations. The advice may also be limited by budget constraints imposed by others or by site accessibility.

Although the sampling plan adopted for this investigation is considered appropriate to achieve the stated project objectives, there are necessarily parts of the site that have not been sampled and analysed. This is either due to undetected variations in ground conditions or to budget constraints (as discussed above), or to parts of the site being inaccessible and not available for inspection/sampling, or to vegetation preventing visual inspection and reasonable access. It is therefore considered possible, considering the previous land uses that hazardous building materials, including asbestos, may be present in unobserved or untested parts of the site, between and beyond sampling locations, and hence no warranty can be given that asbestos is not present.

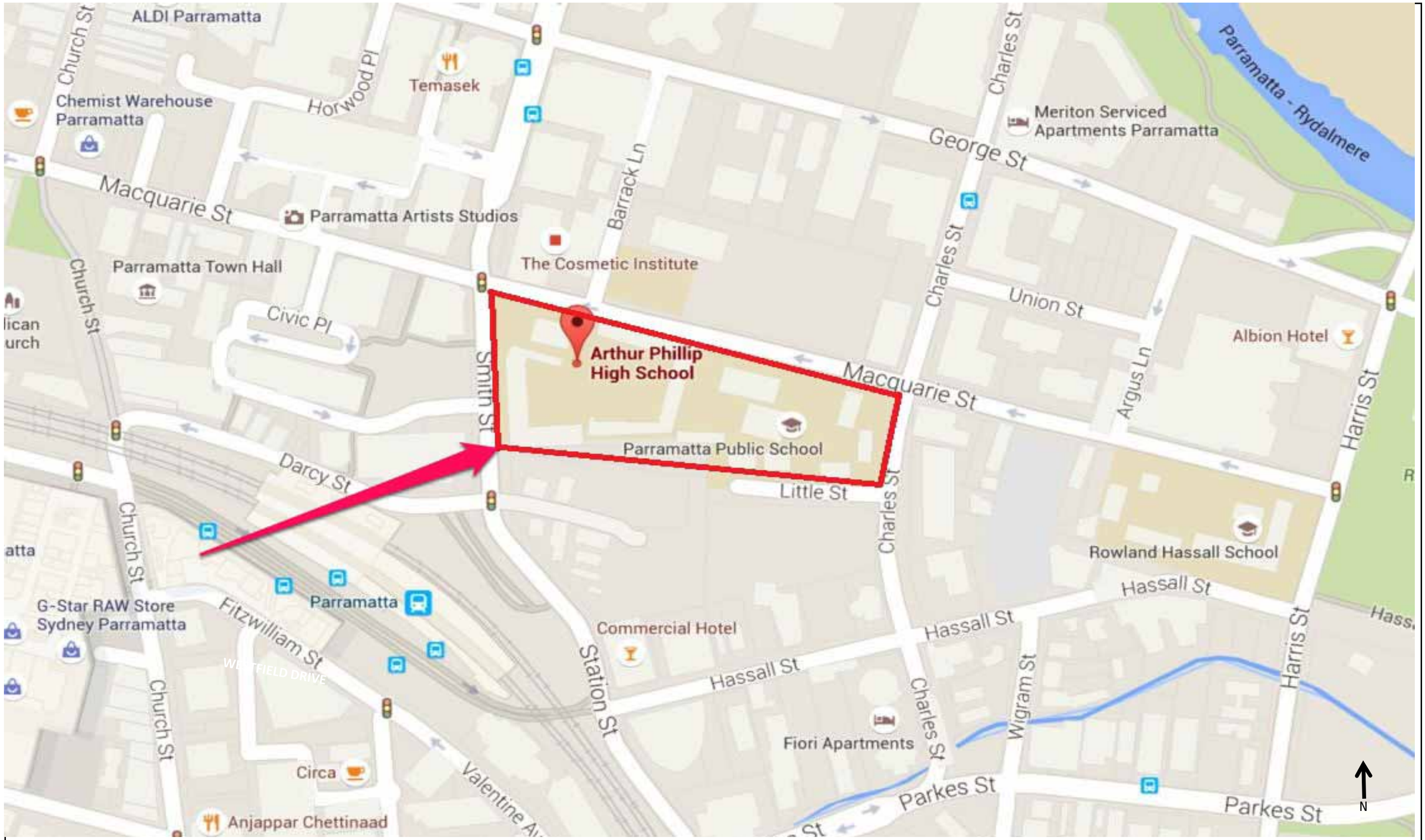
This report must be read in conjunction with all of the attached and should be kept in its entirety without separation of individual pages or sections. DP cannot be held responsible for interpretations or conclusions made by others unless they are supported by an expressed statement, interpretation, outcome or conclusion stated in this report.

This report, or sections from this report, should not be used as part of a specification for a project, without review and agreement by DP. This is because this report has been written as advice and opinion rather than instructions for construction.

**Douglas Partners Pty Ltd**

# Appendix A

Drawings

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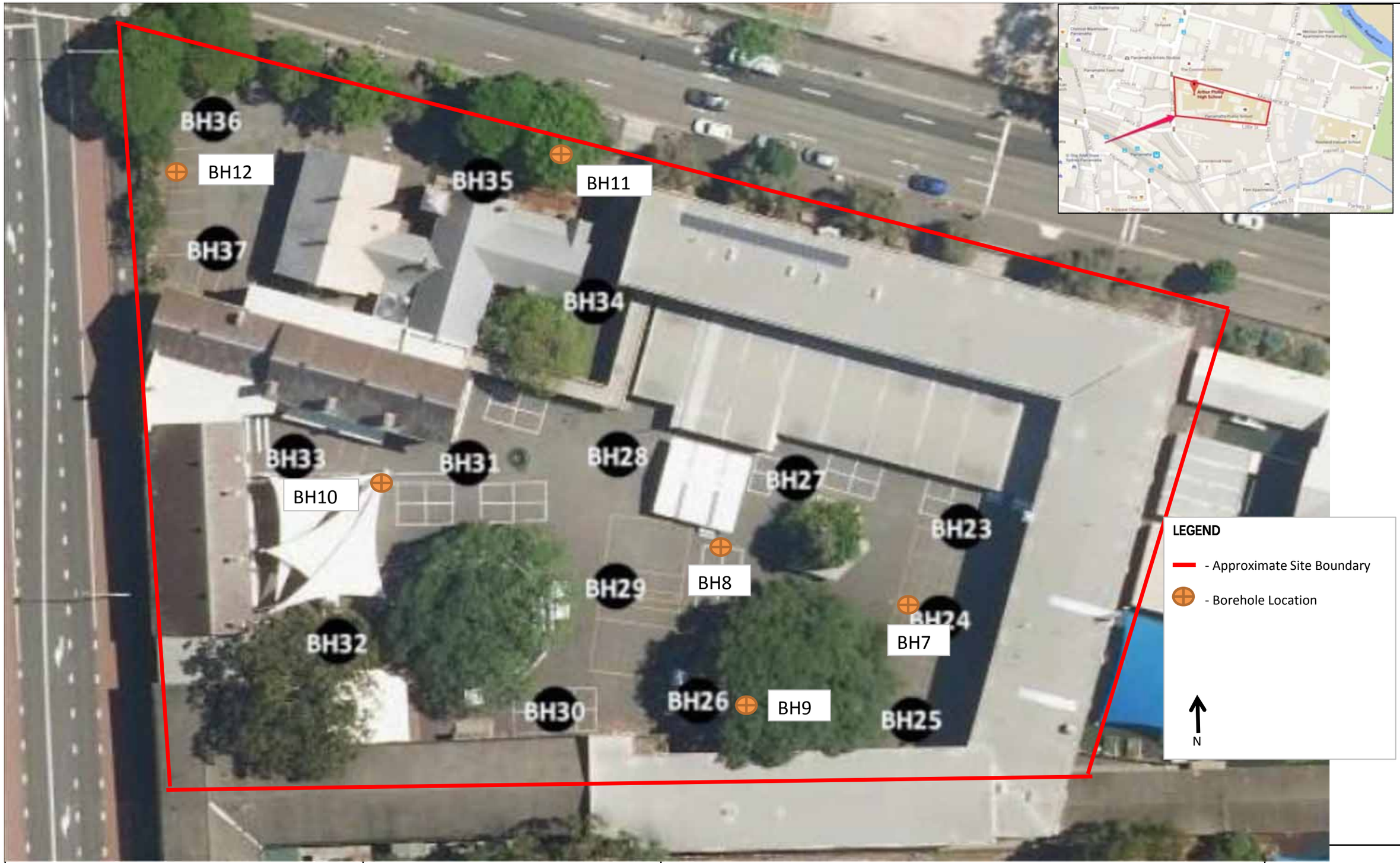
|---|---|---|---|---|---|
| **Douglas Partners** Geotechnics / Environment / Groundwater | CLIENT: Grimshaw Architects LLD | | TITLE: **Site Location of Arthur Phillip High School (South)** | PROJECT No: | 85374.02 |
| | OFFICE: Sydney | DRAWN BY: PM | **Detailed Site Investigation** | DRAWING No: | 1 |
| | SCALE: No Scale | DATE: 24 Jun 2016 | **175 Macquarie Street, Parramatta** | REVISION: | |




**LEGEND**

- Approximate Site Boundary
- Borehole Location

| | | | |
|---|---|---|---|
| Douglas Partners Geotechnics / Environment / Groundwater | CLIENT: Grimshaw Architects LLD | TITLE: **Test Locations at Arthur Phillip High School (South)** | PROJECT No: 85374.02 |
| | OFFICE: Sydney / DRAWN BY: PM | **Contamination and Asbestos Assessment** | DRAWING No: 2 |
| | SCALE: No Scale / DATE: 6/2/42016 | **Macquarie Street, Parramatta** | REVISION: |


| | | | | | |
|---|---|---|---|---|---|
| Douglas Partners<br>Geotechnics / Environment / Groundwater | CLIENT: Grimshaw Architects LLD | | TITLE: **Groundwater Sampling Locations**<br>**Detailed Site Investigation**<br>**175 Macquarie Street, Parramatta** | PROJECT No: | 85374.02 |
| | OFFICE: Sydney | DRAWN BY: NLE | | DRAWING No: | 3 |
| | SCALE: NTS | DATE: 06.10.2016 | | REVISION: | A |

# Appendix B

Site Photographs

Photograph 1 - Central courtyard, seating areas and surrounding buildings

Photograph 2 - Central courtyard, metal awnig (left), seating and surrounding buildings

| | | |
|---|---|---|
| Douglas Partners<br>Geotechnics / Environment / Groundwater | **Site Photographs** | PROJECT: 85374.02 |
| | **Arthur Phillip High School (South)** | PLATE No: B1 |
| | **Parramatta** | REV: A |
| | CLIENT: Grimshaw Architects LLD | DATE: 16-Jun-16 |

Photograph 3 - Carpark in northwest of the site

| | | |
|---|---|---|
| Douglas Partners<br>Geotechnics / Environment / Groundwater | **Site Photographs** | PROJECT: 85374.02 |
| | **Arthur Phillip High School (South)** | PLATE No: B2 |
| | **Parramatta** | REV: A |
| | CLIENT: Grimshaw Architects LLD | DATE: 16-Jun-16 |

# Appendix C

Data Quality Assessment

# DATA QUALITY ASSESSMENT

## Q1. Data Quality Objectives

The Detailed Site Investigation (DSI) was prepared with reference to the seven step data quality objective (DQO) process which is provided in Appendix B, Schedule B2 of the *National Environment Protection (Assessment of Site Contamination) Measure* 1999 as amended 2013 (NEPC, 2013). The DQO process is outlined as follows:

- Stating the Problem;
- Identifying the Decision;
- Identifying Inputs to the Decision;
- Defining the Boundary of the Assessment;
- Developing a Decision Rule;
- Specifying Acceptable Limits on Decision Errors; and
- Optimising the Design for Obtaining Data.

The DQOs have been addressed within the report as shown in Table Q1.

**Table Q1: Data Quality Objectives**

| Data Quality Objective | Report Section where Addressed |
|---|---|
| State the Problem | S1 Introduction |
| Identify the Decision | S11 Discussion of Results<br>S12 Conclusions and Recommendations |
| Identify Inputs to the Decision | S1 Introduction<br>S3 Site Identification and Description<br>S4 Regional Topography, Geology and Hydrogeology<br>S5 Site History Assessment<br>S6 Conceptual Site Model<br>S8 Site Assessment Criteria<br>S9 Field Work Results<br>S10 Laboratory Testing |
| Define the Boundary of the Assessment | S3 Site Identification and Description<br>Drawings - Appendix A |
| Develop a Decision Rule | S8 Site Assessment Criteria |
| Specify Acceptable Limits on Decision Errors | S7 Field Work Methods<br>S8 Site Assessment Criteria<br>QA/QC Procedures and Results – Sections Q2, Q3 |
| Optimise the Design for Obtaining Data | S2 Scope of Works<br>S7 Field Work Methods<br>QA/QC Procedures and Results – Sections Q2, Q3 |

## Q2. FIELD AND LABORATORY QUALITY CONTROL

The field and laboratory quality control (QC) procedures and results are summarised in Tables Q2 and Q3. Reference should be made to the fieldwork and analysis procedures in Section 7 and the laboratory certificates in Appendix E for further details.

**Table Q2: Field QC**

| Item | Evaluation / Acceptance Criteria | Achievement |
|---|---|---|
| Intra-laboratory replicates | 5% primary samples; <30% RPD (inorganics), <50% RPD (organics) | yes[1,2] |
| Trip Spikes | 1 per day, per sampling event; 60-140% recovery | Yes [3] |
| Trip Blanks | 1 per day, per sampling event; <PQL | Yes [3] |

Notes: 1 qualitative assessment of RPD results overall; refer Section Q2.1
2 applies where concentrations are >5 x LOR/PQL
3 groundwater only, soil trip spikes and blanks not analysed for soil investigation as volatiles were not considered to be primary contaminants of concern

**Table Q3: Laboratory QC**

| Item | Evaluation / Acceptance Criteria | Achievement |
|---|---|---|
| Analytical laboratories used | NATA accreditation | yes |
| Holding times | In accordance with NEPC (2013) which references various Australian and international standards | yes |
| Laboratory / Reagent Blanks | 1 per batch; <PQL | yes |
| Matrix Spikes | 1 per lab batch; 70-130% recovery (inorganics); 60-140% (organics); 10-140% (SVOC and speciated phenols) | yes |
| Surrogate Spikes | All organics analysis; 70-130% recovery (inorganics); 60-140% (organics); 10-140% (SVOC and speciated phenols) | yes |
| Control Samples | 1 per lab batch; 70-130% recovery (inorganics); 60-140% (organics); 10-140% (SVOC and speciated phenols) | yes |

The Envirolab Services Pty Ltd (ELS) laboratory certificate notes state that the practical quantitation limits (PQLs) were raised due to interference from analytes for TRH (semivol) and OC/OP/PCBs in soil.

In summary, the QC data is considered to be of sufficient quality to be acceptable for the assessment.

## Q2.1 Intra-Laboratory Replicates

Intra-laboratory replicates were analysed as an internal check of the reproducibility within the primary laboratory Envirolab Services Pty Ltd and as a measure of consistency of sampling techniques. The comparative results of analysis between original and intra-laboratory replicate samples are summarised in Tables Q4 and Q5.

Note that, where both samples are below LOR/PQL the difference and RPD has been given as zero. Where one sample is reported below LOR/PQL, but a concentration is reported for the other, the LOR/PQL value has been used for calculation of the RPD for the less than LOR/PQL sample.

**Table Q4: Relative Percentage Difference Results – Intra-laboratory Replicate (Soil)**

| Lab | Sample ID | Date Sampled | Media | Units | Metals | | | | | | | | BTEX | | | | PAH | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | As | Cd | Cr | Cu | Pb | Hg | Ni | Zn | Benzene | Toluene | Ethylbenzene | xylene | Naphthalene | Total |
| Envirolab | BH11 | 19/04/2016 | filling | mg/kg | 6 | <0.4 | 28 | 11 | 16 | <0.1 | 6 | 10 | <2 | <0.5 | <1 | <3 | <0.1 | NIL(+)VE |
| Envirolab | BD1a | 19/04/2016 | filling | mg/kg | 7 | <0.4 | 23 | 18 | 25 | <0.1 | 10 | 19 | <2 | <0.5 | <1 | <3 | <0.1 | NIL(+)VE |
| Difference | | | | mg/kg | 1 | 0 | 5 | 7 | 9 | 0 | 4 | 9 | 0 | 0 | 0 | 0 | 0 | 0 |
| RPD | | | | % | 15 | 0 | 20 | **48** | **44** | 0 | **50** | **62** | 0 | 0 | 0 | 0 | 0 | 0 |

**Table Q4: Continued - Relative Percentage Difference Results – Intra-laboratory Replicate (Soil)**

| Lab | Sample ID | Date Sampled | Media | Units | TRH | | | |
|---|---|---|---|---|---|---|---|---|
| | | | | | C6-C10 | >C10-C16 | >C16-C34 | >C34-C40 |
| Envirolab | BH11 | 19/04/2016 | filling | mg/kg | <25 | <50 | <100 | <100 |
| Envirolab | BD1a | 19/04/2016 | filling | mg/kg | <25 | <50 | <100 | <100 |
| Difference | | | | mg/kg | 0 | 0 | 0 | 0 |
| RPD | | | | % | 0 | 0 | 0 | 0 |

**Table Q5: Relative Percentage Difference Results – Intra-laboratory Replicate (Groundwater)**

| Sample ID | Date Sampled | Units | Priority Heavy Metals (total dissolved) | | | | | | | | PAH | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | As | Cd | Cr | Cu | Pb | Hg | Ni | Zn | Naphthalene | B(a)P | PAH |
| 102 | 16/09/16 | µg/L | <1 | <0.1 | <1 | <1 | <1 | <0.05 | 1 | 12 | <1 | <1 | NIL (+)VE |
| BD1 | 16/09/16 | µg/L | <1 | <0.1 | <1 | <1 | <1 | <0.05 | 1 | 11 | <1 | <1 | NIL (+)VE |
| Difference | | µg/L | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 |
| RPD | | % | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 9 | 0 | 0 | 0 |

The calculated RPD values were within the acceptable range of ± 30 for inorganic analytes and ± 50% for organics with the exception of those in bold. However, this is not considered to be significant because:

- The replicate pairs being collected from fill soils which were heterogeneous in nature;
- Soil replicates, rather than homogenised soil duplicates, were used to minimise the risk of possible volatile loss, hence greater variability can be expected;
- The low concentrations recorded resulted in high RPDs; and
- All other QA/QC parameters met the DQIs.

Overall, the intra-laboratory replicate comparisons indicate that the sampling techniques were generally consistent and repeatable.

## Q3. Data Quality Indicators

The reliability of field procedures and analytical results was assessed against the following data quality indicators (DQIs):

- Completeness – a measure of the amount of usable data from a data collection activity;
- Comparability – the confidence (qualitative) that data may be considered to be equivalent for each sampling and analytical event;
- Representativeness – the confidence (qualitative) of data representativeness of media present on-site;
- Precision – a measure of variability or reproducibility of data; and
- Accuracy – a measure of closeness of the data to the 'true' value.

The DQIs were assessed as outlined in the following Table Q6.

**Table Q6: Data Quality Indicators**

| Data Quality Indicator | Method(s) of Achievement |
|---|---|
| Completeness | Planned systematic locations sampled;<br>Preparation of field logs, sample location plan and chain of custody (COC) records;<br>Laboratory sample receipt information received confirming receipt of samples intact and appropriateness of the chain of custody;<br>Samples analysed for contaminants of potential concern (COPC) identified in the Conceptual Site Model (CSM);<br>Completion of COC documentation;<br>NATA endorsed laboratory certificates provided by the laboratory;<br>Satisfactory frequency and results for field and laboratory QC samples as discussed in Section Q2. |
| Comparability | Using appropriate techniques for sample recovery, storage and transportation, which were the same for the duration of the project;<br>Works undertaken by appropriately experienced and trained DP environmental scientist / engineer;<br>Use of NATA registered laboratory;<br>Satisfactory results for field and laboratory QC samples. |

| Data Quality Indicator | Method(s) of Achievement |
|---|---|
| Representativeness | Target media sampled;<br>Spatial and temporal distribution of sample locations;<br>Sample numbers recovered and analysed are considered to be representative of the target media and complying with DQOs;<br>Samples were extracted and analysed within holding times;<br>Samples were analysed in accordance with the analysis request. |
| Precision | Acceptable RPD overall between original samples and replicates;<br>Satisfactory results for all other field and laboratory QC samples. |
| Accuracy | Satisfactory results for all field and laboratory QC samples. |

Based on the above, it is considered that the DQIs have been complied with. As such, it is concluded that the field and laboratory test data obtained are reliable and useable for this assessment.

# Appendix D

Test Bore Logs

and Notes About this Report

# About this Report

Douglas Partners

## Introduction

These notes have been provided to amplify DP's report in regard to classification methods, field procedures and the comments section. Not all are necessarily relevant to all reports.

DP's reports are based on information gained from limited subsurface excavations and sampling, supplemented by knowledge of local geology and experience. For this reason, they must be regarded as interpretive rather than factual documents, limited to some extent by the scope of information on which they rely.

## Copyright



## Borehole and Test Pit Logs

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

Interpretation of the information and its application to design and construction should therefore take into account the spacing of boreholes or pits, the frequency of sampling, and the possibility of other than 'straight line' variations between the test locations.

## Groundwater

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

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

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

## Reports

The report has been prepared by qualified personnel, is based on the information obtained from field and laboratory testing, and has been undertaken to current engineering standards of interpretation and analysis. Where the report has been prepared for a specific design proposal, the information and interpretation may not be relevant if the design proposal is changed. If this happens, DP will be pleased to review the report and the sufficiency of the investigation work.

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

- Unexpected variations in ground conditions. The potential for this will depend partly on borehole or pit spacing and sampling frequency;
- Changes in policy or interpretations of policy by statutory authorities; or
- The actions of contractors responding to commercial pressures.

If these occur, DP will be pleased to assist with investigations or advice to resolve the matter.

# *About this Report*

## Site Anomalies

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

## Information for Contractual Purposes

Where information obtained from this report is provided for tendering purposes, it is recommended that all information, including the written report and discussion, be made available. In circumstances where the discussion or comments section is not relevant to the contractual situation, it may be appropriate to prepare a specially edited document. DP would be pleased to assist in this regard and/or to make additional report copies available for contract purposes at a nominal charge.

## Site Inspection

The company will always be pleased to provide engineering inspection services for geotechnical and environmental aspects of work to which this report is related. This could range from a site visit to confirm that conditions exposed are as expected, to full time engineering presence on site.

## Sampling

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

Disturbed samples taken during drilling provide information on colour, type, inclusions and, depending upon the degree of disturbance, some information on strength and structure.

Undisturbed samples are taken by pushing a thin-walled sample tube into the soil and withdrawing it to obtain a sample of the soil in a relatively undisturbed state. Such samples yield information on structure and strength, and are necessary for laboratory determination of shear strength and compressibility. Undisturbed sampling is generally effective only in cohesive soils.

## Test Pits

Test pits are usually excavated with a backhoe or an excavator, allowing close examination of the in-situ soil if it is safe to enter into the pit. The depth of excavation is limited to about 3 m for a backhoe and up to 6 m for a large excavator. A potential disadvantage of this investigation method is the larger area of disturbance to the site.

## Large Diameter Augers

Boreholes can be drilled using a rotating plate or short spiral auger, generally 300 mm or larger in diameter commonly mounted on a standard piling rig. The cuttings are returned to the surface at intervals (generally not more than 0.5 m) and are disturbed but usually unchanged in moisture content. Identification of soil strata is generally much more reliable than with continuous spiral flight augers, and is usually supplemented by occasional undisturbed tube samples.

## Continuous Spiral Flight Augers

The borehole is advanced using 90-115 mm diameter continuous spiral flight augers which are withdrawn at intervals to allow sampling or in-situ testing. This is a relatively economical means of drilling in clays and sands above the water table. Samples are returned to the surface, or may be collected after withdrawal of the auger flights, but they are disturbed and may be mixed with soils from the sides of the hole. Information from the drilling (as distinct from specific sampling by SPTs or undisturbed samples) is of relatively low reliability, due to the remoulding, possible mixing or softening of samples by groundwater.

## Non-core Rotary Drilling

The borehole is advanced using a rotary bit, with water or drilling mud being pumped down the drill rods and returned up the annulus, carrying the drill cuttings. Only major changes in stratification can be determined from the cuttings, together with some information from the rate of penetration. Where drilling mud is used this can mask the cuttings and reliable identification is only possible from separate sampling such as SPTs.

## Continuous Core Drilling

A continuous core sample can be obtained using a diamond tipped core barrel, usually with a 50 mm internal diameter. Provided full core recovery is achieved (which is not always possible in weak rocks and granular soils), this technique provides a very reliable method of investigation.

## Standard Penetration Tests

Standard penetration tests (SPT) are used as a means of estimating the density or strength of soils and also of obtaining a relatively undisturbed sample. The test procedure is described in Australian Standard 1289, Methods of Testing Soils for Engineering Purposes - Test 6.3.1.

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

The test results are reported in the following form.

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

  4,6,7
  N=13

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

  15, 30/40 mm

The results of the SPT tests can be related empirically to the engineering properties of the soils.

### Dynamic Cone Penetrometer Tests / Perth Sand Penetrometer Tests

Dynamic penetrometer tests (DCP or PSP) are carried out by driving a steel rod into the ground using a standard weight of hammer falling a specified distance. As the rod penetrates the soil the number of blows required to penetrate each successive 150 mm depth are recorded. Normally there is a depth limitation of 1.2 m, but this may be extended in certain conditions by the use of extension rods. Two types of penetrometer are commonly used.

- Perth sand penetrometer - a 16 mm diameter flat ended rod is driven using a 9 kg hammer dropping 600 mm (AS 1289, Test 6.3.3). This test was developed for testing the density of sands and is mainly used in granular soils and filling.
- Cone penetrometer - a 16 mm diameter rod with a 20 mm diameter cone end is driven using a 9 kg hammer dropping 510 mm (AS 1289, Test 6.3.2). This test was developed initially for pavement subgrade investigations, and correlations of the test results with California Bearing Ratio have been published by various road authorities.

# Soil Descriptions

Douglas Partners

## Description and Classification Methods

The methods of description and classification of soils and rocks used in this report are based on Australian Standard AS 1726, Geotechnical Site Investigations Code. In general, the descriptions include strength or density, colour, structure, soil or rock type and inclusions.

## Soil Types

Soil types are described according to the predominant particle size, qualified by the grading of other particles present:

| Type | Particle size (mm) |
|---|---|
| Boulder | >200 |
| Cobble | 63 - 200 |
| Gravel | 2.36 - 63 |
| Sand | 0.075 - 2.36 |
| Silt | 0.002 - 0.075 |
| Clay | <0.002 |

The sand and gravel sizes can be further subdivided as follows:

| Type | Particle size (mm) |
|---|---|
| Coarse gravel | 20 - 63 |
| Medium gravel | 6 - 20 |
| Fine gravel | 2.36 - 6 |
| Coarse sand | 0.6 - 2.36 |
| Medium sand | 0.2 - 0.6 |
| Fine sand | 0.075 - 0.2 |

The proportions of secondary constituents of soils are described as:

| Term | Proportion | Example |
|---|---|---|
| And | Specify | Clay (60%) and Sand (40%) |
| Adjective | 20 - 35% | Sandy Clay |
| Slightly | 12 - 20% | Slightly Sandy Clay |
| With some | 5 - 12% | Clay with some sand |
| With a trace of | 0 - 5% | Clay with a trace of sand |

Definitions of grading terms used are:

- Well graded - a good representation of all particle sizes
- Poorly graded - an excess or deficiency of particular sizes within the specified range
- Uniformly graded - an excess of a particular particle size
- Gap graded - a deficiency of a particular particle size with the range

## Cohesive Soils

Cohesive soils, such as clays, are classified on the basis of undrained shear strength. The strength may be measured by laboratory testing, or estimated by field tests or engineering examination. The strength terms are defined as follows:

| Description | Abbreviation | Undrained shear strength (kPa) |
|---|---|---|
| Very soft | vs | <12 |
| Soft | s | 12 - 25 |
| Firm | f | 25 - 50 |
| Stiff | st | 50 - 100 |
| Very stiff | vst | 100 - 200 |
| Hard | h | >200 |

## Cohesionless Soils

Cohesionless soils, such as clean sands, are classified on the basis of relative density, generally from the results of standard penetration tests (SPT), cone penetration tests (CPT) or dynamic penetrometers (PSP). The relative density terms are given below:

| Relative Density | Abbreviation | SPT N value | CPT qc value (MPa) |
|---|---|---|---|
| Very loose | vl | <4 | <2 |
| Loose | l | 4 - 10 | 2 -5 |
| Medium dense | md | 10 - 30 | 5 - 15 |
| Dense | d | 30 - 50 | 15 - 25 |
| Very dense | vd | >50 | >25 |

# *Soil Descriptions*

## Soil Origin

It is often difficult to accurately determine the origin of a soil. Soils can generally be classified as:

- Residual soil - derived from in-situ weathering of the underlying rock;
- Transported soils - formed somewhere else and transported by nature to the site; or
- Filling - moved by man.

Transported soils may be further subdivided into:

- Alluvium - river deposits
- Lacustrine - lake deposits
- Aeolian - wind deposits
- Littoral - beach deposits
- Estuarine - tidal river deposits
- Talus - scree or coarse colluvium
- Slopewash or Colluvium - transported downslope by gravity assisted by water. Often includes angular rock fragments and boulders.

## Rock Strength

Rock strength is defined by the Point Load Strength Index ($Is_{(50)}$) and refers to the strength of the rock substance and not the strength of the overall rock mass, which may be considerably weaker due to defects. The test procedure is described by Australian Standard 4133.4.1 - 1993. The terms used to describe rock strength are as follows:

| Term | Abbreviation | Point Load Index $Is_{(50)}$ MPa | Approx Unconfined Compressive Strength MPa* |
|---|---|---|---|
| Extremely low | EL | <0.03 | <0.6 |
| Very low | VL | 0.03 - 0.1 | 0.6 - 2 |
| Low | L | 0.1 - 0.3 | 2 - 6 |
| Medium | M | 0.3 - 1.0 | 6 - 20 |
| High | H | 1 - 3 | 20 - 60 |
| Very high | VH | 3 - 10 | 60 - 200 |
| Extremely high | EH | >10 | >200 |

* Assumes a ratio of 20:1 for UCS to $Is_{(50)}$

## Degree of Weathering

The degree of weathering of rock is classified as follows:

| Term | Abbreviation | Description |
|---|---|---|
| Extremely weathered | EW | Rock substance has soil properties, i.e. it can be remoulded and classified as a soil but the texture of the original rock is still evident. |
| Highly weathered | HW | Limonite staining or bleaching affects whole of rock substance and other signs of decomposition are evident. Porosity and strength may be altered as a result of iron leaching or deposition. Colour and strength of original fresh rock is not recognisable |
| Moderately weathered | MW | Staining and discolouration of rock substance has taken place |
| Slightly weathered | SW | Rock substance is slightly discoloured but shows little or no change of strength from fresh rock |
| Fresh stained | Fs | Rock substance unaffected by weathering but staining visible along defects |
| Fresh | Fr | No signs of decomposition or staining |

## Degree of Fracturing

The following classification applies to the spacing of natural fractures in diamond drill cores. It includes bedding plane partings, joints and other defects, but excludes drilling breaks.

| Term | Description |
|---|---|
| Fragmented | Fragments of <20 mm |
| Highly Fractured | Core lengths of 20-40 mm with some fragments |
| Fractured | Core lengths of 40-200 mm with some shorter and longer sections |
| Slightly Fractured | Core lengths of 200-1000 mm with some shorter and loner sections |
| Unbroken | Core lengths mostly > 1000 mm |

# *Rock Descriptions*

## Rock Quality Designation

The quality of the cored rock can be measured using the Rock Quality Designation (RQD) index, defined as:

$$\text{RQD \%} = \frac{\text{cumulative length of 'sound' core sections} \geq \text{100 mm long}}{\text{total drilled length of section being assessed}}$$

where 'sound' rock is assessed to be rock of low strength or better. The RQD applies only to natural fractures. If the core is broken by drilling or handling (i.e. drilling breaks) then the broken pieces are fitted back together and are not included in the calculation of RQD.

## Stratification Spacing

For sedimentary rocks the following terms may be used to describe the spacing of bedding partings:

| Term | Separation of Stratification Planes |
|---|---|
| Thinly laminated | < 6 mm |
| Laminated | 6 mm to 20 mm |
| Very thinly bedded | 20 mm to 60 mm |
| Thinly bedded | 60 mm to 0.2 m |
| Medium bedded | 0.2 m to 0.6 m |
| Thickly bedded | 0.6 m to 2 m |
| Very thickly bedded | > 2 m |

# Symbols & Abbreviations

Douglas Partners

## Introduction

These notes summarise abbreviations commonly used on borehole logs and test pit reports.

## Drilling or Excavation Methods

| | |
|---|---|
| C | Core Drilling |
| R | Rotary drilling |
| SFA | Spiral flight augers |
| NMLC | Diamond core - 52 mm dia |
| NQ | Diamond core - 47 mm dia |
| HQ | Diamond core - 63 mm dia |
| PQ | Diamond core - 81 mm dia |

## Water

| | |
|---|---|
| ▷ | Water seep |
| ▽ | Water level |

## Sampling and Testing

| | |
|---|---|
| A | Auger sample |
| B | Bulk sample |
| D | Disturbed sample |
| E | Environmental sample |
| $U_{50}$ | Undisturbed tube sample (50mm) |
| W | Water sample |
| pp | pocket penetrometer (kPa) |
| PID | Photo ionisation detector |
| PL | Point load strength Is(50) MPa |
| S | Standard Penetration Test |
| V | Shear vane (kPa) |

## Description of Defects in Rock

The abbreviated descriptions of the defects should be in the following order: Depth, Type, Orientation, Coating, Shape, Roughness and Other. Drilling and handling breaks are not usually included on the logs.

### Defect Type

| | |
|---|---|
| B | Bedding plane |
| Cs | Clay seam |
| Cv | Cleavage |
| Cz | Crushed zone |
| Ds | Decomposed seam |
| F | Fault |
| J | Joint |
| Lam | lamination |
| Pt | Parting |
| Sz | Sheared Zone |
| V | Vein |

### Orientation

The inclination of defects is always measured from the perpendicular to the core axis.

| | |
|---|---|
| h | horizontal |
| v | vertical |
| sh | sub-horizontal |
| sv | sub-vertical |

### Coating or Infilling Term

| | |
|---|---|
| cln | clean |
| co | coating |
| he | healed |
| inf | infilled |
| stn | stained |
| ti | tight |
| vn | veneer |

### Coating Descriptor

| | |
|---|---|
| ca | calcite |
| cbs | carbonaceous |
| cly | clay |
| fe | iron oxide |
| mn | manganese |
| slt | silty |

### Shape

| | |
|---|---|
| cu | curved |
| ir | irregular |
| pl | planar |
| st | stepped |
| un | undulating |

### Roughness

| | |
|---|---|
| po | polished |
| ro | rough |
| sl | slickensided |
| sm | smooth |
| vr | very rough |

### Other

| | |
|---|---|
| fg | fragmented |
| bnd | band |
| qtz | quartz |

# Symbols & Abbreviations

## Graphic Symbols for Soil and Rock

### General


Asphalt


Road base


Concrete


Filling

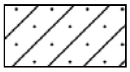
### Soils


Topsoil

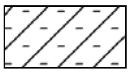

Peat


Clay

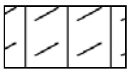

Silty clay

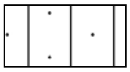

Sandy clay

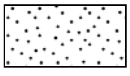

Gravelly clay

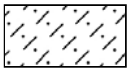

Shaly clay

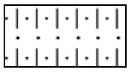

Silt


Clayey silt


Sandy silt

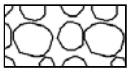

Sand

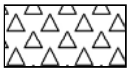

Clayey sand


Silty sand


Gravel


Sandy gravel


Cobbles, boulders

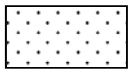

Talus

### Sedimentary Rocks

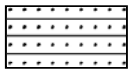

Boulder conglomerate

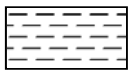

Conglomerate


Conglomeratic sandstone

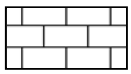

Sandstone


Siltstone


Laminite

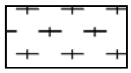

Mudstone, claystone, shale

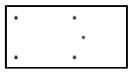

Coal


Limestone

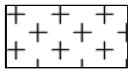
### Metamorphic Rocks

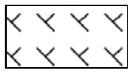

Slate, phyllite, schist

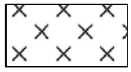

Gneiss

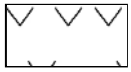

Quartzite

### Igneous Rocks


Granite


Dolerite, basalt, andesite


Dacite, epidote


Tuff, breccia


Porphyry

# BOREHOLE LOG

**CLIENT:** Grimshaw Architects LLD
**PROJECT:** Arthur Phillip High School
**LOCATION:** Macquarie Street, Parramatta

**SURFACE LEVEL:** --
**EASTING:**
**NORTHING:**
**DIP/AZIMUTH:** 90°/--

**BORE No:** BH7
**PROJECT No:** 85374.02
**DATE:** 19/4/2016
**SHEET** 1 OF 1

| RL | Depth (m) | Description of Strata | Graphic Log | Sampling & In Situ Testing: Type | Depth | Sample | Results & Comments | Water | Well Construction Details |
|---|---|---|---|---|---|---|---|---|---|
| | 0.04 | ASPHALT | | | | | | | |
| | | ROADBASE - apparently poorly compacted, brown-grey, clayey sandy gravel roadbase | | A | 0.05<br>0.1 | | PID<5 | | |
| | 0.15 | FILLING - fine to medium blue metal gravel with some asphalt fragments | | A | 0.2 | | PID<5 | | |
| | 0.3 | FILLING - brown, gravelly clay filling with some asphalt fragments | | A | 0.3 | | PID<5 | | |
| | 0.35 | FILLING - grey, sandy clay filling with some fine gravel and a trace of ironstone gravel | | A | 0.35 | | PID<5 | | |
| | 0.45 | FILLING - brown, sandy clay filling with some fine gravel | | A | 0.45<br>0.5<br>0.6 | | PID<5 | | |
| | 0.65 | CLAY - brown-orange, sandy clay | | A | 0.9<br>1.0 | | PID<5 | | 1 |
| | 1.1 | Bore discontinued at 1.1m<br>- target depth reached | | | | | | | |

**RIG:** Hand tools **DRILLER:** MW **LOGGED:** CB **CASING:** Uncased
**TYPE OF BORING:** Hand auger
**WATER OBSERVATIONS:** No free groundwater observed
**REMARKS:**

**SAMPLING & IN SITU TESTING LEGEND**

| | | | | | |
|---|---|---|---|---|---|
| A | Auger sample | G | Gas sample | PID | Photo ionisation detector (ppm) |
| B | Bulk sample | P | Piston sample | PL(A) | Point load axial test Is(50) (MPa) |
| BLK | Block sample | $U_x$ | Tube sample (x mm dia.) | PL(D) | Point load diametral test Is(50) (MPa) |
| C | Core drilling | W | Water sample | pp | Pocket penetrometer (kPa) |
| D | Disturbed sample | ▷ | Water seep | S | Standard penetration test |
| E | Environmental sample | ▼ | Water level | V | Shear vane (kPa) |

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# BOREHOLE LOG

**CLIENT:** Grimshaw Architects LLD
**PROJECT:** Arthur Phillip High School
**LOCATION:** Macquarie Street, Parramatta

**SURFACE LEVEL:** --
**EASTING:**
**NORTHING:**
**DIP/AZIMUTH:** 90°/--

**BORE No:** BH8
**PROJECT No:** 85374.02
**DATE:** 19/4/2016
**SHEET** 1 OF 1

| RL | Depth (m) | Description of Strata | Graphic Log | Sampling & In Situ Testing: Type | Depth | Sample | Results & Comments | Water | Well Construction Details |
|---|---|---|---|---|---|---|---|---|---|
| | 0.02 | ASPHALT | | | | | | | |
| | | ROADBASE - apparently poorly compacted, brown, clayey sandy gravel roadbase | | A | 0.05 | | PID<5 | | |
| | 0.1 | ROADBASE - apparently well compacted, grey, clayey sandy coarse gravel roadbase | | A | 0.1 | | PID<5 | | |
| | 0.2 | FILLING - red-brown, sandy clay filling with some fine gravel, slight odour (ethanol?) | | | 0.2 | | | | |
| | | | | A* | 0.3 | | PID<5 | | |
| | 0.4 | CLAY - stiff, red-brown clay | | | 0.4 | | | | |
| | 0.5 | Bore discontinued at 0.5m - refusal on stiff clay | | | | | | | |
| | 1 | | | | | | | | 1 |

**RIG:** Hand tools **DRILLER:** MW **LOGGED:** CB **CASING:** Uncased

**TYPE OF BORING:** Hand auger

**WATER OBSERVATIONS:** No free groundwater observed

**REMARKS:** *BD1-190416 taken at depth 0.3m to 0.4m

**SAMPLING & IN SITU TESTING LEGEND**

| | | | | | |
|---|---|---|---|---|---|
| A | Auger sample | G | Gas sample | PID | Photo ionisation detector (ppm) |
| B | Bulk sample | P | Piston sample | PL(A) | Point load axial test Is(50) (MPa) |
| BLK | Block sample | $U_x$ | Tube sample (x mm dia.) | PL(D) | Point load diametral test Is(50) (MPa) |
| C | Core drilling | W | Water sample | pp | Pocket penetrometer (kPa) |
| D | Disturbed sample | ▷ | Water seep | S | Standard penetration test |
| E | Environmental sample | ▼ | Water level | V | Shear vane (kPa) |

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# BOREHOLE LOG

**CLIENT:** Grimshaw Architects LLD
**PROJECT:** Arthur Phillip High School
**LOCATION:** Macquarie Street, Parramatta

**SURFACE LEVEL:** --
**EASTING:**
**NORTHING:**
**DIP/AZIMUTH:** 90°/--

**BORE No:** BH9
**PROJECT No:** 85374.02
**DATE:** 19/4/2016
**SHEET** 1 OF 1

| RL | Depth (m) | Description of Strata | Graphic Log | Sampling & In Situ Testing: Type | Depth | Sample | Results & Comments | Water | Well Construction Details |
|---|---|---|---|---|---|---|---|---|---|
| | 0.04 | ASPHALT | | | | | | | |
| | | ROADBASE - apparently poorly compacted, brown, clayey sandy gravel roadbase | | A | 0.1<br>0.2 | | PID<5 | | |
| | 0.3 | FILLING - fine to medium blue metal gravel with some asphalt fragments, strong odour (ethanol?) | | A | 0.3<br>0.4 | | PID<5 | | |
| | 0.45 | CLAY - stiff, brown-orange clay | | A | 0.6<br>0.7 | | PID<5 | | |
| | 0.8 | Bore discontinued at 0.8m<br>- refusal on stiff clay | | | | | | | |
| 1 | | | | | | | | | 1 |

**RIG:** Hand tools **DRILLER:** MW **LOGGED:** CB **CASING:** Uncased
**TYPE OF BORING:** Hand auger
**WATER OBSERVATIONS:** No free groundwater observed
**REMARKS:**

**SAMPLING & IN SITU TESTING LEGEND**

| | | | | | |
|---|---|---|---|---|---|
| A | Auger sample | G | Gas sample | PID | Photo ionisation detector (ppm) |
| B | Bulk sample | P | Piston sample | PL(A) | Point load axial test Is(50) (MPa) |
| BLK | Block sample | $U_x$ | Tube sample (x mm dia.) | PL(D) | Point load diametral test Is(50) (MPa) |
| C | Core drilling | W | Water sample | pp | Pocket penetrometer (kPa) |
| D | Disturbed sample | ▷ | Water seep | S | Standard penetration test |
| E | Environmental sample | ▼ | Water level | V | Shear vane (kPa) |

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# BOREHOLE LOG

**CLIENT:** Grimshaw Architects LLD
**PROJECT:** Arthur Phillip High School
**LOCATION:** Macquarie Street, Parramatta

**SURFACE LEVEL:** --
**EASTING:**
**NORTHING:**
**DIP/AZIMUTH:** 90°/--

**BORE No:** BH10
**PROJECT No:** 85374.02
**DATE:** 19/4/2016
**SHEET** 1 OF 1

| RL | Depth (m) | Description of Strata | Graphic Log | Sampling & In Situ Testing: Type | Depth | Sample | Results & Comments | Water | Well Construction Details |
|---|---|---|---|---|---|---|---|---|---|
| | 0.05 | ASPHALT | | | 0.05 | | | | |
| | | ROADBASE - apparently poorly compacted, light grey, clayey sandy coarse gravel roadbase | | A | 0.1 | | PID<5 | | |
| | | - becoming grey at 0.2m with some brick fragments | | A | 0.2 | | PID<5 | | |
| | 0.3 | FILLING - fine to medium bluemetal gravel with some asphalt gravel, strong odour (solvent?) | | A | 0.3 | | PID<5 | | |
| | 0.5 | Bore discontinued at 0.5m<br>- refusal on gravel/stiff clay | | | 0.4 | | | | |
| | 1 | | | | 0.5 | | | | 1 |

**RIG:** Hand tools **DRILLER:** MW **LOGGED:** MW **CASING:** Uncased
**TYPE OF BORING:** Hand auger
**WATER OBSERVATIONS:** No free groundwater observed
**REMARKS:**

**SAMPLING & IN SITU TESTING LEGEND**

| | | | | | |
|---|---|---|---|---|---|
| A | Auger sample | G | Gas sample | PID | Photo ionisation detector (ppm) |
| B | Bulk sample | P | Piston sample | PL(A) | Point load axial test Is(50) (MPa) |
| BLK | Block sample | $U_x$ | Tube sample (x mm dia.) | PL(D) | Point load diametral test Is(50) (MPa) |
| C | Core drilling | W | Water sample | pp | Pocket penetrometer (kPa) |
| D | Disturbed sample | ▷ | Water seep | S | Standard penetration test |
| E | Environmental sample | ▼ | Water level | V | Shear vane (kPa) |

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# BOREHOLE LOG

**CLIENT:** Grimshaw Architects LLD
**PROJECT:** Arthur Phillip High School
**LOCATION:** Macquarie Street, Parramatta

**SURFACE LEVEL:** --
**EASTING:**
**NORTHING:**
**DIP/AZIMUTH:** 90°/--

**BORE No:** BH11
**PROJECT No:** 85374.02
**DATE:** 19/4/2016
**SHEET** 1 OF 1

| RL | Depth (m) | Description of Strata | Graphic Log | Sampling & In Situ Testing: Type | Depth | Sample | Results & Comments | Water | Well Construction Details |
|---|---|---|---|---|---|---|---|---|---|
| | 0.03 | ASPHALT | | | | | | | |
| | | ROADBASE - apparently poorly compacted, light brown, sandy clayey gravel roadbase with some asphalt gravel | | A | 0.05<br>0.1 | | PID<5 | | |
| | 0.2 | FILLING - brown, sandy clay filling with some rootlets and gravel fragments | | A | 0.2<br>0.3 | | PID<5 | | |
| | 0.45 | CLAY - brown, sandy clay with some rootlets and traces of charcoal | | A | 0.45 | | PID<5 | | |
| | 0.55 | Bore discontinued at 0.55m<br>- due to refusal on stiff clay | | | 0.55 | | | | |
| | 1 | | | | | | | | 1 |

**RIG:** Hand tools **DRILLER:** MW **LOGGED:** CB **CASING:** Uncased
**TYPE OF BORING:** Hand auger
**WATER OBSERVATIONS:** No free groundwater observed
**REMARKS:**

**SAMPLING & IN SITU TESTING LEGEND**

| | | | | | |
|---|---|---|---|---|---|
| A | Auger sample | G | Gas sample | PID | Photo ionisation detector (ppm) |
| B | Bulk sample | P | Piston sample | PL(A) | Point load axial test Is(50) (MPa) |
| BLK | Block sample | $U_x$ | Tube sample (x mm dia.) | PL(D) | Point load diametral test Is(50) (MPa) |
| C | Core drilling | W | Water sample | pp | Pocket penetrometer (kPa) |
| D | Disturbed sample | ▷ | Water seep | S | Standard penetration test |
| E | Environmental sample | ▼ | Water level | V | Shear vane (kPa) |

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# BOREHOLE LOG

**CLIENT:** Grimshaw Architects LLD
**PROJECT:** Arthur Phillip High School
**LOCATION:** Macquarie Street, Parramatta

**SURFACE LEVEL:** --
**EASTING:**
**NORTHING:**
**DIP/AZIMUTH:** 90°/--

**BORE No:** BH12
**PROJECT No:** 85374.02
**DATE:** 19/4/2016
**SHEET** 1 OF 1

| RL | Depth (m) | Description of Strata | Graphic Log | Sampling & In Situ Testing: Type | Depth | Sample | Results & Comments | Water | Well Construction Details |
|---|---|---|---|---|---|---|---|---|---|
| | 0.05 | ASPHALT | | | 0.05 | | | | |
| | | ROADBASE - apparently poorly compacted, light brown, sandy clayey roadbase with some asphalt gravel | | A | 0.1 | | PID<5 | | |
| | 0.2 | FILLING - dark brown, sandy clay filling with some rootlets and asphalt gravel | | A | 0.2 | | PID<5 | | |
| | | | | | 0.3 | | | | |
| | | - becoming brown at 0.35m with traces of brick fragments | | A | 0.35 | | PID<5 | | |
| | 0.45 | CLAY - brown, sandy clay | | A | 0.45 | | PID<5 | | |
| | 0.55 | Bore discontinued at 0.55m<br>- refusal on stiff clay | | | 0.55 | | | | |
| | 1 | | | | | | | | 1 |

**RIG:** Hand tools **DRILLER:** MW **LOGGED:** MW **CASING:** Uncased
**TYPE OF BORING:** Hand auger
**WATER OBSERVATIONS:** No free groundwater observed
**REMARKS:**

**SAMPLING & IN SITU TESTING LEGEND**

| | | | | | |
|---|---|---|---|---|---|
| A | Auger sample | G | Gas sample | PID | Photo ionisation detector (ppm) |
| B | Bulk sample | P | Piston sample | PL(A) | Point load axial test Is(50) (MPa) |
| BLK | Block sample | $U_x$ | Tube sample (x mm dia.) | PL(D) | Point load diametral test Is(50) (MPa) |
| C | Core drilling | W | Water sample | pp | Pocket penetrometer (kPa) |
| D | Disturbed sample | ▷ | Water seep | S | Standard penetration test |
| E | Environmental sample | ▼ | Water level | V | Shear vane (kPa) |

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# BOREHOLE LOG

**CLIENT:** Grimshaw Architects LLD
**PROJECT:** Arthur Phillip High School (South)
**LOCATION:** Macquarie Street, Parramatta

**SURFACE LEVEL:** --
**EASTING:**
**NORTHING:**
**DIP/AZIMUTH:** 90°/--

**BORE No:** MW1
**PROJECT No:** 85374.02
**DATE:** 10/9/2016
**SHEET** 1 OF 1

| RL | Depth (m) | Description of Strata | Graphic Log | Sampling & In Situ Testing: Type | Depth | Sample | Results & Comments | Water | Well Construction Details |
|---|---|---|---|---|---|---|---|---|---|
| | 0.1 | ASPHALT | | A | 0.1 | | | | Gatic cover |
| | 0.4 | FILLING - dark grey, clayey, coarse sand and basalt filling with trace asphalt gravel (roadbase) | | A | 0.2 | | | | |
| | 0.6 | - some crushed sandstone gravel at 0.2m to 0.3m | | A | 0.3 | | | | |
| | | FILLING - dark brown mottled red, clay filling with traces of sand, basalt and asphalt gravel | | A | 0.4 | | | | |
| | | CLAY - brown mottled red clay | | | 0.5 | | | | |
| | | - becoming mottled grey at 1.4m | | A | 0.9 | | | | Backfill 0.2-2.5m |
| | 2.3 | SHALE | | | 1.0 | | | | |
| | | | | A | 1.4 | | | | Bentonite 2.5-3.0m |
| | | | | | 1.5 | | | | |
| | | | | | | | | | Gravel 3.0-10.0m |
| | | | | | | | | | Machine slotted PVC screen 4.0-10.0m |
| | 10.15 | Bore discontinued at 10.15m - target depth reached | | | | | | | End cap |

**RIG:** DT-100 **DRILLER:** LC **LOGGED:** MW **CASING:** Uncased

**TYPE OF BORING:** Auger

**WATER OBSERVATIONS:** No free groundwater observed during drilling

**REMARKS:**

**SAMPLING & IN SITU TESTING LEGEND**

| | | | | | |
|---|---|---|---|---|---|
| A | Auger sample | G | Gas sample | PID | Photo ionisation detector (ppm) |
| B | Bulk sample | P | Piston sample | PL(A) | Point load axial test Is(50) (MPa) |
| BLK | Block sample | $U_x$ | Tube sample (x mm dia.) | PL(D) | Point load diametral test Is(50) (MPa) |
| C | Core drilling | W | Water sample | pp | Pocket penetrometer (kPa) |
| D | Disturbed sample | ▷ | Water seep | S | Standard penetration test |
| E | Environmental sample | ▼ | Water level | V | Shear vane (kPa) |

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# BOREHOLE LOG

**CLIENT:** Grimshaw Architects
**PROJECT:** Arthur Philip High School
**LOCATION:** Macquarie Street, Parramatta

**SURFACE LEVEL:** 7.15 AHD
**EASTING:**
**NORTHING:**
**DIP/AZIMUTH:** 90°/--

**BORE No:** 102
**PROJECT No:** 85374.00
**DATE:** 12/7/2016
**SHEET** 1 OF 2

| RL | Depth (m) | Description of Strata | Degree of Weathering (EW HW MW SW FS FR) | Graphic Log | Rock Strength (Ex Low, Very Low, Low, Medium, High, Very High, Ex High) | Water | Fracture Spacing (m) (0.01, 0.05, 0.10, 0.50, 1.00) | Discontinuities (B - Bedding J - Joint S - Shear F - Fault) | Sampling & In Situ Testing: Type | Core Rec. % | RQD % | Test Results & Comments |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 7 | | FILLING - grey silty sandy clay filling with a trace of roadbase gravel and brick fragments, moist | | | | | | | A | | | |
| 6 | | | | | | | | | A | | | |
| 1 | 1.0 | | | | | | | | A | | | |
| | 1.2 | FILLING - poorly compacted, dark grey to black, slag filling with some charcoal and sand, moist | | | | | | | S | | | 1,0,2<br>N = 2 |
| 5 | | SILTY CLAY - stiff to very stiff, light brown silty clay with some fine sand, moist | | | | | | | $U_{50}$ | | | pp = 300 |
| 2 | | | | | | | | | | | | |
| | | | | | | | | | S | | | 3,5,5<br>N = 10 |
| 4 | | | | | | | | | | | | |
| 3 | 3.3 | SAND - medium dense, light brown, fine to medium grained sand with some silt and clay, wet | | | | | | | | | | |
| 3 | | | | | | | | Note: Unless otherwise stated, rock is fractured along rough planar bedding dipping 0°- 10° | S | | | 7,7,10<br>N = 17 |
| | 4.8 | LAMINITE - extremely low strength, grey laminite | | | | | | | | | | |
| 5 | 5.1 | | | | | | | | | | | |
| 2 | | LAMINITE - medium then high strength, fresh stained then fresh, slightly fractured then unbroken, grey-brown to grey laminite with approximately 20% fine sandstone laminations | | | | | | 5.31m: B0°, fe<br>5.35m: J60°, un, ro, fe | | | | PL(A) = 0.53 |
| | | | | | | | | | | | | PL(A) = 1.37 |
| 6 | | | | | | | | 5.84m: J60°, ti, fe | | | | |
| 1 | | | | | | | | | C | 100 | 96 | |
| | | | | | | | | 6.32m: B0°, fe | | | | PL(A) = 2.1 |
| 7 | | | | | | | | | | | | |
| 0 | | | | | | | | 7.2, 7.25 & 7.35m: J (x3) 30°- 45°, pl, sm, cln<br>7.53m: J45°, pl, ro, cln | | | | PL(A) = 2.16 |
| 8 | | | | | | | | 7.94m: J30°, pl, sm, cln | | | | |
| -1 | | | | | | | | 8.27m: J45°, pl, sm, ti | | | | |
| | | | | | | | | | C | 100 | 100 | PL(A) = 2.24 |
| 9 | | | | | | | | 8.72m: B0°, fg, 5mm | | | | |
| -2 | | | | | | | | | | | | PL(A) = 2.4 |

**RIG:** Scout **DRILLER:** LC **LOGGED:** SI **CASING:** HW to 2.7m

**TYPE OF BORING:** Solid flight auger to 2.5m; Rotary to 5.1m; NMLC-Coring to 15.1m

**WATER OBSERVATIONS:** No free groundwater observed whilst augering

**REMARKS:** Standpipe installed to 7.0m (screen 4.0-7.0m; gravel 3.0-7.0m; bentonite 2.5-3.0m; backfill to 0.2m with gatic cover to GL)

**SAMPLING & IN SITU TESTING LEGEND**

| | | | | | |
|---|---|---|---|---|---|
| A | Auger sample | G | Gas sample | PID | Photo ionisation detector (ppm) |
| B | Bulk sample | P | Piston sample | PL(A) | Point load axial test Is(50) (MPa) |
| BLK | Block sample | $U_x$ | Tube sample (x mm dia.) | PL(D) | Point load diametral test Is(50) (MPa) |
| C | Core drilling | W | Water sample | pp | Pocket penetrometer (kPa) |
| D | Disturbed sample | ▷ | Water seep | S | Standard penetration test |
| E | Environmental sample | ▼ | Water level | V | Shear vane (kPa) |

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# BOREHOLE LOG

**CLIENT:** Grimshaw Architects
**PROJECT:** Arthur Philip High School
**LOCATION:** Macquarie Street, Parramatta

**SURFACE LEVEL:** 7.15 AHD
**EASTING:**
**NORTHING:**
**DIP/AZIMUTH:** 90°/--

**BORE No:** 102
**PROJECT No:** 85374.00
**DATE:** 12/7/2016
**SHEET** 2 OF 2

| RL | Depth (m) | Description of Strata | Degree of Weathering (EW HW MW SW FS FR) | Graphic Log | Rock Strength (Ex Low, Very Low, Low, Medium, High, Very High, Ex High) | Water | Fracture Spacing (m) (0.01, 0.05, 0.10, 0.50, 1.00) | Discontinuities (B - Bedding J - Joint S - Shear F - Fault) | Sampling & In Situ Testing: Type | Core Rec. % | RQD % | Test Results & Comments |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| -3 | | LAMINITE - medium then high strength, fresh stained then fresh, slightly fractured then unbroken, grey-brown to grey laminite with approximately 20% fine sandstone laminations *(continued)* | | | | | | >> | C | 100 | 100 | PL(A) = 2.37 |
| -4 | 11 | | | | | | | | | | | |
| -5 | 12 | | | | | | | | C | 100 | 100 | PL(A) = 1.71 |
| | 12.3 | SHALE - high then medium to high strength, fresh, slightly fractured and unbroken, grey shale | | | | | | | | | | PL(A) = 1.4 |
| -6 | 13 | | | | | | | 13.03 & 13.75m: J20°, pl, sm, cln | | | | |
| -7 | 14 | | | | | | | | C | 100 | 100 | PL(A) = 1.08 |
| | | | | | | | | | | | | PL(A) = 0.91 |
| -8 | 15 | | | | | | | 14.52-14.89m: J (x3) 30°- 45°, pl, sm, cln | | | | |
| | 15.1 | Bore discontinued at 15.1m | | | | | | | | | | PL(A) = 1.18 |
| -9 | 16 | | | | | | | | | | | |
| -10 | 17 | | | | | | | | | | | |
| -11 | 18 | | | | | | | | | | | |
| -12 | 19 | | | | | | | | | | | |

**RIG:** Scout **DRILLER:** LC **LOGGED:** SI **CASING:** HW to 2.7m

**TYPE OF BORING:** Solid flight auger to 2.5m; Rotary to 5.1m; NMLC-Coring to 15.1m

**WATER OBSERVATIONS:** No free groundwater observed whilst augering

**REMARKS:** Standpipe installed to 7.0m (screen 4.0-7.0m; gravel 3.0-7.0m; bentonite 2.5-3.0m; backfill to 0.2m with gatic cover to GL)

**SAMPLING & IN SITU TESTING LEGEND**

| | | | | | |
|---|---|---|---|---|---|
| A | Auger sample | G | Gas sample | PID | Photo ionisation detector (ppm) |
| B | Bulk sample | P | Piston sample | PL(A) | Point load axial test Is(50) (MPa) |
| BLK | Block sample | $U_x$ | Tube sample (x mm dia.) | PL(D) | Point load diametral test Is(50) (MPa) |
| C | Core drilling | W | Water sample | pp | Pocket penetrometer (kPa) |
| D | Disturbed sample | ▷ | Water seep | S | Standard penetration test |
| E | Environmental sample | ▼ | Water level | V | Shear vane (kPa) |

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# BOREHOLE LOG

**CLIENT:** Grimshaw Architects
**PROJECT:** Arthur Philip High School
**LOCATION:** Macquarie Street, Parramatta

**SURFACE LEVEL:** 11.00 AHD
**EASTING:**
**NORTHING:**
**DIP/AZIMUTH:** 90°/--

**BORE No:** 103
**PROJECT No:** 85374.00
**DATE:** 8/7/2016
**SHEET** 1 OF 2

| RL | Depth (m) | Description of Strata | Degree of Weathering (EW HW MW SW FS FR) | Graphic Log | Rock Strength (Ex Low, Very Low, Low, Medium, High, Very High, Ex High) | Water | Fracture Spacing (m) (0.01, 0.05, 0.10, 0.50, 1.00) | Discontinuities (B - Bedding J - Joint S - Shear F - Fault) | Sampling & In Situ Testing: Type | Core Rec. % | RQD % | Test Results & Comments |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 11 | 0.04 | CARPET & ASPHALTIC CONCRETE | | | | | | | A | | | |
| | 0.2 | ROADBASE GRAVEL | | | | | | | A | | | |
| | 0.45 | FILLING - grey to grey-brown, sandy clay filling, moist | | | | | | | $U_{50}$ | | | pp = 400 |
| 10 | 1 | CLAY - stiff to very stiff, red-brown clay, slightly silty, moist | | | | | | | S | | | 3,7,10 N = 17 |
| | 1.5 | CLAY - very stiff, light grey clay, moist | | | | | | Note: Unless otherwise stated, rock is fractured along rough planar bedding dipping 0°- 10° | | | | |
| 9 | 2 | | | | | | | | | | | |
| | 2.2 | SHALY CLAY - very stiff, light grey mottled brown shaly clay, damp | | | | | | | | | | |
| | 2.5 | | | | | | | | | | | |
| | 2.53 | SHALE - extremely low strength, extremely weathered, slightly fractured, light grey shale | | | | | | 2.5m: CORE LOSS: 30mm<br>2.62-3.62m: relict joints (x5) 70°, pl, ro, cly | | | | pp >600 |
| 8 | 3 | | | | | | | | | | | pp = 450 |
| | 3.45 | SHALE - extremely low to very low strength, extremely to highly weathered, slightly fractured, light grey-brown shale with some ironcemented bands | | | | | | 3.8-4.38m: B (x5) 0°, fe, cly | C | 92 | 0 | |
| 7 | 4 | | | | | | | | | | | pp = 400 |
| | 4.5 | SHALE - very low strength, highly weathered, slightly fractured, grey-brown shale | | | | | | 4.52-4.64m: fg, fe | | | | |
| 6 | 5 | | | | | | | 4.92m: J60°- 70°, st, ro, cln | | | | |
| | 5.4 | | | | | | | 5.18m: CORE LOSS: 220mm<br>5.46m: B0°, fe | | | | |
| 5 | 6 | | | | | | | 6.06-6.26m: B0°, fe, cly, 10-20mm<br>6.25-6.7m: B (x7) 0°, cly co, 1-3mm<br>6.3m: J45°, fe, cly, he | | | | PL(A) = 0.25 |
| | 6.35 | SHALE - low then medium strength, slightly weathered then fresh, fractured then slightly fractured, grey shale | | | | | | | C | 100 | 53 | |
| 4 | 7 | | | | | | | 7.2m: J70°, pl, ro, cln | | | | PL(A) = 0.5 |
| | | | | | | | | 7.42m: J30° & 60°, st, ro, cln<br>7.52m: J60°, pl, ro, cly<br>7.84m: J70°, pl, ro, cln | | | | |
| 3 | 8 | | | | | | | | | | | |
| | | 8.35-8.5m: very high strength siderite band | | | | | | | | | | PL(A) = 5.13 |
| 2 | 9 | | | | | | | | C | 100 | 97 | PL(A) = 0.38 |
| | 9.6 | LAMINITE - description next page | | | | | | 9.52m: J45°, pl, sm, cly<br>9.6m: J45°, pl, sm, cly<br>9.88m: J60°, un, ro, cln | | | | |

**RIG:** Scout 1 **DRILLER:** LC **LOGGED:** SI **CASING:** HW to 2.6m

**TYPE OF BORING:** Solid flight auger to 2.5m; NMLC-Coring to 15.0m

**WATER OBSERVATIONS:** No free groundwater observed whilst augering

**REMARKS:** Standpipe installed to 7.5m (screen 1.5-7.5m; gravel 1.0-7.5m; bentonite 0.2-10.0m; backfill to GL with gatic cover)

**SAMPLING & IN SITU TESTING LEGEND**

| | | | | | |
|---|---|---|---|---|---|
| A | Auger sample | G | Gas sample | PID | Photo ionisation detector (ppm) |
| B | Bulk sample | P | Piston sample | PL(A) | Point load axial test Is(50) (MPa) |
| BLK | Block sample | $U_x$ | Tube sample (x mm dia.) | PL(D) | Point load diametral test Is(50) (MPa) |
| C | Core drilling | W | Water sample | pp | Pocket penetrometer (kPa) |
| D | Disturbed sample | ▷ | Water seep | S | Standard penetration test |
| E | Environmental sample | ▼ | Water level | V | Shear vane (kPa) |

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# BOREHOLE LOG

**CLIENT:** Grimshaw Architects
**PROJECT:** Arthur Philip High School
**LOCATION:** Macquarie Street, Parramatta

**SURFACE LEVEL:** 11.00 AHD
**EASTING:**
**NORTHING:**
**DIP/AZIMUTH:** 90°/--

**BORE No:** 103
**PROJECT No:** 85374.00
**DATE:** 8/7/2016
**SHEET** 2 OF 2

| RL | Depth (m) | Description of Strata | Degree of Weathering (EW HW MW SW FS FR) | Graphic Log | Rock Strength (Ex Low, Very Low, Low, Medium, High, Very High, Ex High) | Water | Fracture Spacing (m) (0.01, 0.05, 0.10, 0.50, 1.00) | Discontinuities (B - Bedding J - Joint S - Shear F - Fault) | Sampling & In Situ Testing: Type | Core Rec. % | RQD % | Test Results & Comments |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 11 | LAMINITE - high strength, fresh, slightly fractured then unbroken, light grey to grey laminite with approximately 30% fine sandstone laminations *(continued)* | | | | | | 10.6m: B0°, cly co, 1mm | C | 100 | 97 | PL(A) = 1.22 |
| | | | | | | | | | | | | PL(A) = 1.55 |
| -1 | 12 | | | | | | | 12.32m: J30°, pl, ro, cly | | | | PL(A) = 1.64 |
| -2 | 13 | | | | | | | | C | 100 | 100 | |
| | | | | | | | | | | | | PL(A) = 2.2 |
| -3 | 14 | | | | | | | | | | | |
| | | | | | | | | | | | | PL(A) = 2.17 |
| -4 | 15 15.0 | Bore discontinued at 15.0m | | | | | | | C | | | |
| -5 | 16 | | | | | | | | | | | |
| -6 | 17 | | | | | | | | | | | |
| -7 | 18 | | | | | | | | | | | |
| -8 | 19 | | | | | | | | | | | |

**RIG:** Scout 1 **DRILLER:** LC **LOGGED:** SI **CASING:** HW to 2.6m

**TYPE OF BORING:** Solid flight auger to 2.5m; NMLC-Coring to 15.0m

**WATER OBSERVATIONS:** No free groundwater observed whilst augering

**REMARKS:** Standpipe installed to 7.5m (screen 1.5-7.5m; gravel 1.0-7.5m; bentonite 0.2-10.0m; backfill to GL with gatic cover)

**SAMPLING & IN SITU TESTING LEGEND**

| | | | | | |
|---|---|---|---|---|---|
| A | Auger sample | G | Gas sample | PID | Photo ionisation detector (ppm) |
| B | Bulk sample | P | Piston sample | PL(A) | Point load axial test Is(50) (MPa) |
| BLK | Block sample | $U_x$ | Tube sample (x mm dia.) | PL(D) | Point load diametral test Is(50) (MPa) |
| C | Core drilling | W | Water sample | pp | Pocket penetrometer (kPa) |
| D | Disturbed sample | ▷ | Water seep | S | Standard penetration test |
| E | Environmental sample | ▼ | Water level | V | Shear vane (kPa) |

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# Groundwater Field Sheet

| | | | |
|---|---|---|---|
| **Project and Bore Installation Details** | | | |
| Bore / Standpipe ID: | **102** | | |
| Project Name: | Detailed Site Investigation | | |
| Project Number: | 85374.02 | | |
| Site Location: | APHS-N | | |
| Bore Easting: | | Northing: | |
| Installation Date: | 12.07.16 | Ground RL: | 7.15 m AHD |
| GW Level (during drilling): | - m bgl | -0.4 m AHD | |
| Well Depth: | 7.5 m bgl | -0.4 m AHD | |
| Screened Interval: | 4-7.5 m bgl | | |
| Contaminants/Comments: | | | |
| **Bore Development Details** | | | |
| Date/Time: | 13.09.2016, 7am | | |
| Purged By: | CB | | |
| GW Level (pre-purge): | 3.70 m bgl | 3.5 m AHD | |
| GW Level (post-purge): | 5.65 m bgl | | |
| PSH observed: | No (interface/visual) | | |
| Observed Well Depth: | 7.21 m bgl | | |
| Estimated Bore Volume: | 25 L | | |
| Total Volume Purged: | 17 L | purged dry | |
| Equipment, decontamination: | twister' 12 volt pump and hand bailer | | |
| Appearance/Comments: | water was silty, brown | | |
| **Micropurge and Sampling Details** | | | |
| Date/Time: | 16.09.2016 | | |
| Sampled By: | MW | | |
| Weather Conditions: | fine | | |
| GW Level (pre-purge): | 4.75 m bgl | 2.4 m AHD | |
| GW Level (post sample): | 4.80 m bgl | | |
| PSH observed: | No (interface/visual) | | |
| Observed Well Depth: | 7.17 m bgl | | |
| Estimated Bore Volume: | 17 L | | |
| Total Volume Purged: | 10 L | (prior to sampling) | |
| Equipment, decontamination: | geopump, peristaltic pump | | |

**Water Quality Parameters**

| Time | Volume (L) | Temp ($^{o}$C) | DO (ppm) | EC (µS/cm) | pH | Redox (mV) |
|---|---|---|---|---|---|---|
| **Stabilisation Criteria (3 readings)** | | **-** | **+/- 0.3 mg/L** | **+/- 3%** | **+/- 0.1** | **+/- 10 mV** |
| 7.02 | | 17 | 4.41 | 0.2 | 5.17 | 225 |
| 7.03 | | 17.8 | 2.33 | 261 | 5.7 | 194 |
| 7.04 | | 18 | 2.09 | 284 | 5.76 | 187 |
| 7.05 | | 18.2 | 1.87 | 282 | 5.81 | 185 |
| 7.06 | | 18.3 | 1.78 | 284 | 5.84 | 188 |
| 7.07 | | 18.3 | 1.78 | 284 | 5.86 | 179 |
| | | | | | | |
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| Additional Readings Following stabilisation: | | | | | | |
| | | | | | | |

| | |
|---|---|
| **Sample Details** | |
| Sampling Depth (rationale): | m bgl, |
| Sample Appearance: | no odour, clear |
| Sample ID: | 102 |
| Replicate Samples: | BD1/160916 |
| Sampling containers, preservatives, filtration: | 1L glass, 2x 40mL glass vials (HCl) , 1x500ml plastic, 1x200ml plastic ($H_2SO_4$), 1x 100mL plastic ($HNO_3$ (filtered)), 1L glass (no Teflon lined lid) |
| Comments / Observations: | |

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# Groundwater Field Sheet

| **Project and Bore Installation Details** | | | |
|---|---|---|---|
| Bore / Standpipe ID: | **103** | | |
| Project Name: | Detailed Site Investigation | | |
| Project Number: | 85374.02 | | |
| Site Location: | PPS | | |
| Bore Easting: | | Northing: | |
| Installation Date: | 8.07.16 | Ground RL: | 11 m AHD |
| GW Level (during drilling): | - m bgl | 3.5 m AHD | |
| Well Depth: | 7.5 m bgl | 3.5 m AHD | |
| Screened Interval: | 1.5-7.5 m bgl | | |
| Contaminants/Comments: | | | |
| **Bore Development Details** | | | |
| Date/Time: | 13.09.2016, 6am | | |
| Purged By: | CB | | |
| GW Level (pre-purge): | 3.88 m bgl | 7.1 m AHD | |
| GW Level (post-purge): | 6.70 m bgl | | |
| PSH observed: | No (interface/visual) | | |
| Observed Well Depth: | 7.4 m bgl | | |
| Estimated Bore Volume: | 25 L | | |
| Total Volume Purged: | 11 L | purged dry | |
| Equipment, decontamination: | twister' 12 volt pump and hand bailer | | |
| Appearance/Comments: | water was silty, brown | | |
| **Micropurge and Sampling Details** | | | |
| Date/Time: | 19.09.2016 | | |
| Sampled By: | MW | | |
| Weather Conditions: | raining | | |
| GW Level (pre-purge): | 6.62 m bgl | 4.4 m AHD | |
| GW Level (post sample): | 4.80 m bgl | | |
| PSH observed: | No (interface/visual) | | |
| Observed Well Depth: | 7.22 m bgl | | |
| Estimated Bore Volume: | 4 L | | |
| Total Volume Purged: | 5 L | (prior to sampling) | |
| Equipment, decontamination: | geopump, peristaltic pump | | |

**Water Quality Parameters**

| Time | Volume (L) | Temp ($^{o}$C) | DO (mg/L) | EC (µS or mS/cm) | pH | Redox (mV) |
|---|---|---|---|---|---|---|
| **Stabilisation Criteria (3 readings)** | | **-** | **+/- 0.3 mg/L** | **+/- 3%** | **+/- 0.1** | **+/- 10 mV** |
| | | | | | | |
| Insufficient water | | | | | | |
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| | | | | | | |
| Additional Readings Following stabilisation: | | | | | | |
| | | | | | | |

| **Sample Details** | |
|---|---|
| Sampling Depth (rationale): | 6.9 m bgl, |
| Sample Appearance: | initially very silty, becoming clear then silty again |
| Sample ID: | 103 |
| Replicate Samples: | |
| Sampling containers, preservatives, filtration: | 1L glass, 2x 40mL glass vials (HCl) , 1x500ml plastic, 1x200ml plastic ($H_2SO_4$), 1x 100mL plastic ($HNO_3$ (filtered)), 1L glass (no Teflon lined lid) |
| Comments / Observations: | some silt in metals bottle |

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# Groundwater Field Sheet

| | | | |
|---|---|---|---|
| **Project and Bore Installation Details** | | | |
| Bore / Standpipe ID: | **MW1** | | |
| Project Name: | Detailed Site Investigation | | |
| Project Number: | 85374.02 | | |
| Site Location: | APHS-S | | |
| Bore Easting: | | Northing: | |
| Installation Date: | 10.09.2016 | Ground RL (approx): | 13 m AHD |
| GW Level (during drilling): | - m bgl | 2.9 m AHD | |
| Well Depth: | 10.15 m bgl | 2.9 m AHD | |
| Screened Interval: | 4-10.15 m bgl | | |
| Contaminants/Comments: | | | |
| **Bore Development Details** | | | |
| Date/Time: | 13.09.2016, 6.37am | | |
| Purged By: | CB | | |
| GW Level (pre-purge): | 5.57 m bgl | 7.4 m AHD | |
| GW Level (post-purge): | 9.56 m bgl | | |
| PSH observed: | No (interface/visual) | | |
| Observed Well Depth: | 10.1 m bgl | | |
| Estimated Bore Volume: | 33 L | | |
| Total Volume Purged: | 18 L | purged dry | |
| Equipment, decontamination: | twister' 12 volt pump and hand bailer | | |
| Appearance/Comments: | water was silty, brown | | |
| **Micropurge and Sampling Details** | | | |
| Date/Time: | 16.09.2016 | | |
| Sampled By: | MW | | |
| Weather Conditions: | raining | | |
| GW Level (pre-purge): | 7.24 m bgl | 5.8 m AHD | |
| GW Level (post sample): | m bgl | | |
| PSH observed: | No (interface/visual) | | |
| Observed Well Depth: | 10.1 m bgl | | |
| Estimated Bore Volume: | 21 L | | |
| Total Volume Purged: | L | (prior to sampling) | |
| Equipment, decontamination: | geopump, peristaltic pump | | |

**Water Quality Parameters**

| Time | Volume (L) | Temp (°C) | DO (ppm) | EC (µS/cm) | pH | Redox (mV) |
|---|---|---|---|---|---|---|
| **Stabilisation Criteria (3 readings)** | | **-** | **+/- 0.3 mg/L** | **+/- 3%** | **+/- 0.1** | **+/- 10 mV** |
| 7.45 | | 18.9 | 5.04 | 10.6 | 5.37 | 181 |
| 7.46 | | 19.1 | 4.86 | 8.6 | 5.43 | 163 |
| 7.47 | | 19.5 | 4.5 | 2.5 | 5.54 | 126 |
| 7.52 | | 20.6 | 3.27 | 2.9 | 5.53 | 132 |
| 7.53 | | 21 | 2.96 | 2.89 | 5.52 | 126 |
| 7.54 | | 21.3 | 3.03 | 2.87 | 5.51 | 130 |
| 7.55 | | 21.4 | 2.95 | 2.86 | 5.51 | 132 |
| 7.56 | | 21.4 | 2.92 | 2.86 | 5.5 | 134 |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| Additional Readings Following stabilisation: | | | | | | |
| | | | | | | |

| | |
|---|---|
| **Sample Details** | |
| Sampling Depth (rationale): | m bgl, |
| Sample Appearance: | clear, becoming slightly silty |
| Sample ID: | MW1 |
| Replicate Samples: | |
| Sampling containers, preservatives, filtration: | 1L glass, 2x 40mL glass vials (HCl) , 1x500ml plastic, 1x200ml plastic ($H_2SO_4$), 1x 100mL plastic ($HNO_3$ (filtered)), 1L glass (no Teflon lined lid) |
| Comments / Observations: | some silt in metals bottle |

# Appendix E

Summary of Laboratory Results for Soil

Laboratory Certificates and Advice (Chromatograms)

Chain of Custody Documentation

Douglas Partners
Geotechnics | Environment | Groundwater

**Table E1 – Summary of Laboratory Results for Soils**

| Sample | Depth | Filling/ Natural | Date | Heavy Metals | | | | | | | | PAH | | | | TRH (NEPM 2013) | | | | | | BTEX | | | | PCB [b] | asbestos | Phenols | OCPb | | OPPb | PFAS | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | As | Cd | Cr | Cu | Pb | Hg | Ni | Zn | total [b] | BaP TEQ upper | BaP | Naphthalene | C6-C10 | >C10-C16 | F1 - C6 – C10 less BTEX | F2 - >C10-C16 less naphthalene | >C16-C34 | >C34-C40 | Benzene | Toluene | Ethylbenzene | xylene | | | | DDT+DDD+DDE | DDT | | PFOS | PFOA | Other |
| | | | | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | 0.1g/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg |
| EQL | | | | 2 | 0.4 | 1 | 1 | 1 | 0.05 | 1 | 1 | | | 0.05 | 0.1 | 20 | 50 | 20 | 50 | 100 | 100 | 0.1 | 0.1 | 0.1 | 0.3 | | | | | | | | | |
| **Soil Assessment Criteria (SAC) - NEPM (as amended 2013) (refer to report body)** | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Health Investigation Level for Residential A | | | | 100 | 20 | 100 | 6000 | 300 | 40 | 400 | 7400 | 300 | 3 | | | | | | | | | | | | | 1 | 0.01% | 100 | 240 | | | 4 | | |
| Health Screening Level for Vapour Intrusion (0-1m) SAND HSLA Residential | | | | | | | | | | | | | | | 3 | | | | 45 | 110 | | 0.5 | 160 | 55 | 40 | | | | | | | | | |
| **Management Limit Residential** | | | | | | | | | | | | | | | | **800** | **1000** | | | **3500** | **10000** | | | | | | | | | | | | | |
| Ecological Investigation Levels Residential | | | | 100 | | 200 | 210 | 1100 | | 150 | 500 | | | | 170 | | | | | | | | | | | | | | | 180 | | | | |
| Ecological Screening Levels Residential | | | | | | | | | | | | | | 0.7 | | | | 180 | 120 | 1300 | 5600 | 65 | 105 | 125 | 45 | | | | | | | | | |
| **Current Investigation** | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| BH07 | 0.35-0.45 | F | 19/4/16 | 7 | <0.4 | 22 | 13 | 21 | <0.1 | 7 | 9 | 164.3 | 19 | 12 | 0.2 | <25 | <50 | <25 | <50 | 1500 | 320 | <0.2 | <0.5 | <1 | <3 | <0.1 | NAD | <5 | <0.3 | <0.1 | <0.1 | | | |
| BH08 | 0.3-0.4 | F | 19/4/16 | 7 | <0.4 | 19 | 20 | 23 | <0.1 | 9 | 21 | 1.1 | <0.5 | 0.1 | <0.1 | <25 | <50 | <25 | <50 | <100 | <100 | <0.2 | <0.5 | <1 | <3 | <0.1 | NAD | <5 | <0.3 | <0.1 | <0.1 | | | |
| BH09 | 0.3-0.4 | F | 19/4/16 | <4 | <0.4 | 8 | 50 | 20 | <0.1 | 45 | 40 | 1210 | 110 | 74 | 1.2 | <25 | 530 | <25 | 530 | **12000** | 2200 | <0.2 | <0.5 | <1 | <3 | <1 | NAD | <5 | <3 | <1 | <1 | | | |
| BH10 | 0.4-0.5 | F | 19/4/16 | <4 | <0.4 | 15 | 56 | 57 | 0.1 | 30 | 70 | 1006 | 110 | 74 | 1.5 | <25 | 570 | <25 | 570 | **12000** | 2500 | <0.2 | <0.5 | <1 | <3 | <0.1 | NAD | <5 | <3 | <0.1 | <0.1 | | | |
| BH11 | 0.45-0.55 | N clay | 19/4/16 | 6 | <0.4 | 28 | 11 | 16 | <0.1 | 6 | 10 | 1.02 | <0.5 | 0.07 | <0.1 | <25 | <50 | <25 | <50 | <100 | <100 | <0.2 | <0.5 | <1 | <3 | <0.1 | NAD | <5 | <0.3 | <0.1 | <0.1 | | | |
| BD1a | 0.3-0.4 | F | 19/4/16 | 7 | <0.4 | 23 | 18 | 25 | <0.1 | 10 | 19 | 0.38 | <0.5 | 0.06 | <0.1 | <25 | <50 | <25 | <50 | <100 | <100 | <0.2 | <0.5 | <1 | <3 | <0.1 | NAD | <5 | <0.3 | <0.1 | <0.1 | | | |
| BH12 | 0.2-0.3 | F | 19/4/16 | <4 | <0.4 | 19 | 49 | 110 | 0.3 | 29 | 59 | 175.1 | 32 | 21 | 0.9 | <25 | 56 | <25 | 56 | 2200 | 660 | <0.2 | <0.5 | <1 | <3 | <3 | NAD | <5 | <3 | <3 | <3 | | | |
| MW1 | 0.4-0.5 | F | 10/9/16 | 7 | <0.4 | 22 | 15 | 63 | <0.1 | 10 | 120 | 120 | 15 | 10 | 0.1 | <25 | <50 | <25 | <50 | 1300 | 350 | <0.2 | <0.5 | <1 | <3 | | NAD | | | | | 0.0001 | <0.0001 | 0.0002 |
| MW1 | 0.9-1.0 | N clay | 10/9/16 | 9 | <0.4 | 23 | 18 | 36 | <0.1 | 7 | 52 | 16 | 1.9 | 1.2 | <0.1 | <25 | <50 | <25 | <50 | <100 | <100 | <0.2 | <0.5 | <1 | <3 | | NAD | | | | | | | |
| **Previous Investigation** | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| BH23 | 0.5-0.6 | N clay | | 10 | <0.4 | 32 | 11 | 20 | <0.05 | <5 | 42 | | | | | | | | | | | | | | | | NAD | | | | | | | |
| BH24 | 0.5-0.6 | N clay | | 13 | <0.4 | 34 | 18 | 21 | <0.05 | <5 | 9.1 | | | | | | | | | | | | | | | | | | | | | | | |
| BH25 | 0.5-0.6 | N clay | | 8 | <0.4 | 22 | 29 | 20 | <0.05 | 16 | 36 | | | | | | | | | | | | | | | | NAD | | | | | | | |
| BH26 | 0.5-0.6 | N clay | | 12 | <0.4 | 37 | 11 | 21 | <0.05 | 8.2 | 13 | | | | | | | | | | | | | | | | | | | | | | | |
| BH27 | 0.5-0.6 | N clay | | 14 | <0.4 | 35 | 15 | 32 | <0.05 | <5 | 41 | | | | | | | | | | | | | | | | NAD | | | | | | | |
| BH28 | 0.5-0.6 | N clay | | 12 | <0.4 | 38 | 14 | 23 | <0.05 | <5 | 22 | | | | | | | | | | | | | | | | | | | | | | | |
| BH29 | 0.5-0.6 | N clay | | 10 | <0.4 | 29 | 11 | 19 | <0.05 | <5 | 7.6 | | | | | | | | | | | | | | | | NAD | | | | | | | |
| BH30 | 0.5-0.6 | N clay | | 3.5 | <0.4 | 15 | 15 | 28 | <0.05 | 6.3 | 9.4 | | | | | | | | | | | | | | | | | | | | | | | |
| BH31 | 0.5-0.6 | N clay | | 9.7 | <0.4 | 26 | 17 | 29 | <0.05 | 5.5 | 17 | | | | | | | | | | | | | | | | NAD | | | | | | | |
| BH32 | 0.5-0.6 | N clay | | 10 | <0.4 | 33 | 15 | 17 | 0.06 | 7 | 7.2 | | | | | | | | | | | | | | | | | | | | | | | |
| BH33 | 0.5-0.6 | N clay | | 9.5 | <0.4 | 29 | 9.1 | 19 | <0.05 | <5 | 7.5 | | | | | | | | | | | | | | | | | | | | | | | |
| BH34 | 0.3-0.4 | F | | 2.3 | <0.4 | 40 | 32 | 11 | <0.05 | 53 | 55 | | | | | | | | | | | | | | | | | | | | | | | |
| BH35 | 0.5-0.6 | N | | 15 | <0.4 | 36 | 13 | 23 | <0.05 | <5 | 10 | <0.5 | 1.2 | <0.5 | <0.5 | <20 | <50 | <50 | <50 | <100 | <100 | <0.1 | <0.1 | <0.1 | <0.3 | | | | | | | | | |
| BH36 | 0.5-0.6 | N clay | | 7.2 | <0.4 | 29 | 13 | 27 | <0.05 | 11 | 21 | 5.2 | 1.6 | 0.8 | <0.5 | <20 | <50 | <50 | <50 | <100 | <100 | <0.1 | <0.1 | <0.1 | <0.3 | | | | | | | | | |
| BH37 | 0.5-0.6 | N clay | | 8.2 | <0.4 | 27 | 9.1 | 20 | <0.05 | <5 | 9.7 | 11 | 1.7 | 0.9 | <0.5 | <20 | <50 | <50 | <50 | <100 | <100 | <0.1 | <0.1 | <0.1 | <0.3 | | | | | | | | | |

**Notes**

| | |
|---|---|
| a | QA/QC replicate/triplicate of sample listed directly above |
| b | where results of one or more component compound are above practical quantitation limit (PQL) sum of all results above PQL given, when all results are below PQL results quoted as <PQL of majority of individual analytes |
| c | guideline concentrations are for Cr (III) |
| - | not analysed/ not defined/ not applicable |
| Highlight orange | exceedance of HILA residential based on NEPM (2013) guideline |
| Highlight yellow | exceedance of Residential soil vapour |
| Highlight green | exceedance of Residential EIL/ESL (prior to statistical analysis) |
| **Bold** | exceedance of Management Limits |
| Highlight red | asbestos detected |

**Acronyms**

| | |
|---|---|
| AD | asbestos detected |
| As | arsenic |
| BaP | benzo(a)pyrene |
| BaP TEQ | benzo(a)pyrene toxic equivalencies |
| BTEX | benzene, toluene, ethyl benzene, total xylenes |
| Cd | cadmium |
| Cr | chromium (total) |
| Cu | copper |
| EIL | Ecological Investigation Levels |
| ESL | Ecological Screening Level |
| Hg | mercury |
| HIL | health investigation level |
| HSL | Health Screening Levels |
| NAD | No asbestos detected |
| NL | The soil saturation concentration (Csat) is defined as the soil concentration at which the porewater phase cannot dissolve any more of an individual chemical based on a petroleum mixture. The soil vapour that is in equilibrium with the porewater will be at its maximum. If the derived HSL exceeds the Csat, a soil-vapour source concentration for a petroleum mixture could not exceed a level that would result in the maximum allowable vapour risk for a given scenario. For these scenarios no HSL is presented for these chemicals. These are denoted as not limiting 'NL' |
| OCP | organochlorine pesticides |
| OPP | organophosphorus pesticides |
| PAH | polycyclic aromatic hydrcarbons |
| Pb | lead |
| PCB | polychlorinated biphenyls |
| Ni | nickel |
| TPH | total petroleum hydrocarbons |
| TRH | total recoverable hydrocarbons (including total petroleum hydrocarbons) |
| VOC | volatile organic compounds |
| Zn | zinc |

**Table E2: Summary of Laboratory Results for Groundwater Analysis**

| Sample ID | Depth[e] | Date Sampled | Hardness | Applicable Soil Type[f] | Priority Heavy Metals (total dissolved) | | | | | | | | TRH | | | | | | BTEX | | | | | PAH | | | Total Phenols | OCP | OPP | PCB | VOC | | | | PFAS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | As | Cd | Cr | Cu | Pb | Hg | Ni | Zn | TRH $C_6$ - $C_{10}$ | TRH $>C_{10}$ - $C_{16}$ | C6-C10 less BTEX (F1) | >C10-C16 less Naphthalene (F2) | >C16-C34 | >C34-40 | Benzene | Toluene | Ethylbenzene | m+p-xylene | o-xylene | Naphthalene | B(a)P | PAH | | | | | Chloroform | Bromodichloromethane | 1,2,4-trimethyl benzene | Other VOC | |
| | m bgl | | mgCaCO3/L | | (µg/L) | (µg/L) | (µg/L) | (µg/L) | (µg/L) | (µg/L) | (µg/L) | (µg/L) | (µg/L) | (µg/L) | (µg/L) | (µg/L) | (µg/L) | (µg/L) | (µg/L) | (µg/L) | (µg/L) | (µg/L) | (µg/L) | (µg/L) | (µg/L) | (µg/L) | (mg/L) | (µg/L) | (µg/L) | (µg/L) | (µg/L) | (µg/L) | (µg/L) | (µg/L) | (µg/L) |
| **Groundwater Assessment Criteria** | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| GIL (freshwater) | | | - | - | 24/ 13[c] | 0.2 | 1[d] | 1.4 | 3.4 | 0.06 | 11 | 8 | - | - | - | - | - | - | 950 | - | - | 200[h] | 350 | 16 | - | - | 0.003[g] | - | - | - | - | - | - | - | - |
| GIL (freshwater, hardness adjusted)[b] | | | 277 | - | - | 1.4 | - | 9 | 57 | - | 73 | 53 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| HSLs (Residential) | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| HSL-A&B | 4-<8m | | - | Sand | - | - | - | - | - | - | - | - | - | - | 1,000 | 1,000 | - | - | 800 | NL | NL | NL | - | NL | - | - | - | - | - | - | - | - | - | - | - |
| HSL-A&B | 4-<8m | | - | Clay | - | - | - | - | - | - | - | - | - | - | NL | NL | - | - | 5,000 | NL | NL | NL | - | NL | - | - | - | - | - | - | - | - | - | - | - |
| ADWG | (health-based) | | - | - | 10 | 2 | 50[d] | 2,000 | 10 | 1 | 20 | - | - | - | - | - | - | - | 1 | 800 | 300 | 600 | | - | 0.01 | - | 0.01[l] | - | - | - | - | - | - | - | - |
| ADWG | (aesthetic-based) | | - | - | - | - | - | 1,000 | - | - | - | 3,000 | - | - | - | - | - | - | - | 25 | 3 | 20 | | - | - | - | - | - | - | - | - | - | - | - | - |
| Reference Level | | | - | - | - | - | - | - | - | - | - | - | - | - | 150[j] | 600[j] | - | - | - | 180[k] | 80[k] | 75[k,i] | - | - | 0.1[k] | - | - | - | - | - | - | - | - | - | 0.13[m] |
| **Laboratory Results** | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| MW1 | 7.2 | 16/09/16 | 100 | | 2 | <0.1 | <1 | 2 | <1 | <0.05 | 12 | **65** | 15 | <50 | 15 | <50 | <100 | <100 | <1 | <1 | <1 | <2 | <1 | <1 | <1 | NIL (+)VE | <0.05 | <0.2 | <0.2 | <2 | 16 | 4 | <1 | <1/<10 | <0.01 |
| 102 | 4.7 | 16/09/16 | 190 | | <1 | <0.1 | <1 | <1 | <1 | <0.05 | 1 | 12 | <10 | <50 | <10 | <50 | <100 | <100 | <1 | <1 | <1 | <2 | <1 | <1 | <1 | NIL (+)VE | <0.05 | <0.2 | <0.2 | <2 | <1 | <1 | <1 | <1/<10 | <0.01 |
| BD1[a] | 6.6 | 16/09/16 | | | <1 | <0.1 | <1 | <1 | <1 | <0.05 | 1 | 11 | | | | | | | | | | | | <1 | <1 | NIL (+)VE | | | | | | | | | |
| 103 | 6.6 | 16/09/16 | 540 | | <1 | 0.2 | <1 | **23** | 2 | <0.05 | 53 | **340** | 24 | <50 | 24 | <50 | <100 | <100 | <1 | <1 | <1 | <2 | <1 | <1 | <1 | NIL (+)VE | <0.05 | <0.2 | <0.2 | <2 | <1 | <1 | 1 | <1/<10 | <0.01 |

Notes:

a Replicate sample of sample listed directly above

b Adjusted in accordance with ANZECC (2000) for a hardness of 277mg/L ,which is the average of the hardness values recorded in the primary samples

c 24µg/L as As(III) 13µg/L as As(V)

d Threshold value for Cr (VI)

e Depth to groundwater as measured immediately prior to sampling

f Overlying material applying for HSL.

g threshold for 2,4,6-trichlorophenol as a conservative screen

h As p-xylene

i As m-xylene

j Airport (Environment Protection) Regulations (1997), Schedule 2 Water Pollution Accepted Limits: Table 1.03 – Accepted limits of contamination

k ANZECC Australian and New Zealand Guidelines for Fresh and Marine Water Quality (2000), Low reliability values

l threshold for pentachlorophenol as a conservative screen

m DER (2016) value for PFOS for slightly - moderately disturbed freshwater ecosystems

- Not defined/ not analysed/ not applicable

**BOLD** Concentration Detected at or above the PQL

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

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

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

# CERTIFICATE OF ANALYSIS 145323

**Client:**

**Douglas Partners Pty Ltd**
96 Hermitage Rd
West Ryde
NSW 2114

**Attention:** Michael Whittaker, Tim Wright

**Sample log in details:**

| | |
|---|---|
| Your Reference: | **85374.02, Parramatta** |
| No. of samples: | 14 Soils 1 Material |
| Date samples received / completed instructions received | 21/04/2016 / 21/04/2016 |

**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: | 29/04/16 / 28/04/16 |
| Date of Preliminary Report: | Not Issued |

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**Results Approved By:**

Jacinta Hurst
Laboratory Manager



ACCREDITED FOR TECHNICAL COMPETENCE

| vTRH(C6-C10)/BTEXN in Soil | | | | | | |
|---|---|---|---|---|---|---|
| Our Reference: | UNITS | 145323-1 | 145323-2 | 145323-3 | 145323-4 | 145323-5 |
| Your Reference | ---------- - | BH01 | BH02 | BH03 | BH04 | BH05 |
| Depth | ---------- | 0.3-0.4 | 0.25-0.35 | 0.5-0.6 | 0.3-0.4 | 0.3-0.4 |
| Date Sampled | | 14/04/2016 | 14/04/2016 | 14/04/2016 | 15/04/2016 | 15/04/2016 |
| Type of sample | | Soil | Soil | Soil | Soil | Soil |
| Date extracted | - | 22/04/2016 | 22/04/2016 | 22/04/2016 | 22/04/2016 | 22/04/2016 |
| Date analysed | - | 23/04/2016 | 23/04/2016 | 23/04/2016 | 23/04/2016 | 23/04/2016 |
| TRH $C_6$ - $C_9$ | mg/kg | <25 | <25 | <25 | <25 | <25 |
| TRH $C_6$ - $C_{10}$ | mg/kg | <25 | <25 | <25 | <25 | <25 |
| vTPH $C_6$ - $C_{10}$ less BTEX (F1) | mg/kg | <25 | <25 | <25 | <25 | <25 |
| Benzene | mg/kg | <0.2 | <0.2 | <0.2 | <0.2 | <0.2 |
| Toluene | mg/kg | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| Ethylbenzene | mg/kg | <1 | <1 | <1 | <1 | <1 |
| m+p-xylene | mg/kg | <2 | <2 | <2 | <2 | <2 |
| o-Xylene | mg/kg | <1 | <1 | <1 | <1 | <1 |
| naphthalene | mg/kg | <1 | <1 | <1 | <1 | <1 |
| *Surrogate* aaa-Trifluorotoluene | % | 78 | 89 | 86 | 90 | 88 |

| vTRH(C6-C10)/BTEXN in Soil | | | | | | |
|---|---|---|---|---|---|---|
| Our Reference: | UNITS | 145323-6 | 145323-7 | 145323-8 | 145323-9 | 145323-10 |
| Your Reference | ---------- - | BH06 | BH07 | BH08 | BH09 | BH10 |
| Depth | ---------- | 0.5-0.6 | 0.35-0.45 | 0.3-0.4 | 0.3-0.4 | 0.4-0.5 |
| Date Sampled | | 15/04/2016 | 19/04/2016 | 19/04/2016 | 19/04/2016 | 19/04/2016 |
| Type of sample | | Soil | Soil | Soil | Soil | Soil |
| Date extracted | - | 22/04/2016 | 22/04/2016 | 22/04/2016 | 22/04/2016 | 22/04/2016 |
| Date analysed | - | 23/04/2016 | 23/04/2016 | 23/04/2016 | 23/04/2016 | 23/04/2016 |
| TRH $C_6$ - $C_9$ | mg/kg | <25 | <25 | <25 | <25 | <25 |
| TRH $C_6$ - $C_{10}$ | mg/kg | <25 | <25 | <25 | <25 | <25 |
| vTPH $C_6$ - $C_{10}$ less BTEX (F1) | mg/kg | <25 | <25 | <25 | <25 | <25 |
| Benzene | mg/kg | <0.2 | <0.2 | <0.2 | <0.2 | <0.2 |
| Toluene | mg/kg | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| Ethylbenzene | mg/kg | <1 | <1 | <1 | <1 | <1 |
| m+p-xylene | mg/kg | <2 | <2 | <2 | <2 | <2 |
| o-Xylene | mg/kg | <1 | <1 | <1 | <1 | <1 |
| naphthalene | mg/kg | <1 | <1 | <1 | <1 | <1 |
| *Surrogate* aaa-Trifluorotoluene | % | 85 | 82 | 87 | 87 | 88 |

| vTRH(C6-C10)/BTEXN in Soil | | | | | |
|---|---|---|---|---|---|
| Our Reference: | UNITS | 145323-11 | 145323-12 | 145323-13 | 145323-14 |
| Your Reference | ---------- - | BH11 | BH12 | BD1 | BD1 |
| Depth | ---------- | 0.45-0.55 | 0.2-0.3 | - | - |
| Date Sampled | | 19/04/2016 | 19/04/2016 | 15/04/2016 | 19/04/2016 |
| Type of sample | | Soil | Soil | Soil | Soil |
| Date extracted | - | 22/04/2016 | 22/04/2016 | 22/04/2016 | 22/04/2016 |
| Date analysed | - | 23/04/2016 | 23/04/2016 | 23/04/2016 | 23/04/2016 |
| TRHC$_6$ - C$_9$ | mg/kg | <25 | <25 | <25 | <25 |
| TRHC$_6$ - C$_{10}$ | mg/kg | <25 | <25 | <25 | <25 |
| vTPHC$_6$ - C$_{10}$ less BTEX (F1) | mg/kg | <25 | <25 | <25 | <25 |
| Benzene | mg/kg | <0.2 | <0.2 | <0.2 | <0.2 |
| Toluene | mg/kg | <0.5 | <0.5 | <0.5 | <0.5 |
| Ethylbenzene | mg/kg | <1 | <1 | <1 | <1 |
| m+p-xylene | mg/kg | <2 | <2 | <2 | <2 |
| o-Xylene | mg/kg | <1 | <1 | <1 | <1 |
| naphthalene | mg/kg | <1 | <1 | <1 | <1 |
| *Surrogate* aaa-Trifluorotoluene | % | 94 | 90 | 92 | 97 |

| svTRH (C10-C40) in Soil | | | | | | |
|---|---|---|---|---|---|---|
| Our Reference: | UNITS | 145323-1 | 145323-2 | 145323-3 | 145323-4 | 145323-5 |
| Your Reference | ---------- - | BH01 | BH02 | BH03 | BH04 | BH05 |
| Depth | ---------- | 0.3-0.4 | 0.25-0.35 | 0.5-0.6 | 0.3-0.4 | 0.3-0.4 |
| Date Sampled | | 14/04/2016 | 14/04/2016 | 14/04/2016 | 15/04/2016 | 15/04/2016 |
| Type of sample | | Soil | Soil | Soil | Soil | Soil |
| Date extracted | - | 22/04/2016 | 22/04/2016 | 22/04/2016 | 22/04/2016 | 22/04/2016 |
| Date analysed | - | 23/04/2016 | 23/04/2016 | 23/04/2016 | 23/04/2016 | 23/04/2016 |
| TRHC$_{10}$ - C$_{14}$ | mg/kg | <50 | <50 | <50 | <50 | <50 |
| TRHC$_{15}$ - C$_{28}$ | mg/kg | <100 | 110 | <100 | <100 | <100 |
| TRHC$_{29}$ - C$_{36}$ | mg/kg | <100 | 170 | <100 | <100 | <100 |
| TRH>C$_{10}$-C$_{16}$ | mg/kg | <50 | <50 | <50 | <50 | <50 |
| TRH>C$_{10}$ - C$_{16}$ less Naphthalene (F2) | mg/kg | <50 | <50 | <50 | <50 | <50 |
| TRH>C$_{16}$-C$_{34}$ | mg/kg | <100 | 240 | <100 | <100 | <100 |
| TRH>C$_{34}$-C$_{40}$ | mg/kg | <100 | 110 | <100 | <100 | <100 |
| *Surrogate* o-Terphenyl | % | 82 | 86 | 84 | 84 | 82 |

| svTRH (C10-C40) in Soil | | | | | | |
|---|---|---|---|---|---|---|
| Our Reference: | UNITS | 145323-6 | 145323-7 | 145323-8 | 145323-9 | 145323-10 |
| Your Reference | ---------- - | BH06 | BH07 | BH08 | BH09 | BH10 |
| Depth | ---------- | 0.5-0.6 | 0.35-0.45 | 0.3-0.4 | 0.3-0.4 | 0.4-0.5 |
| Date Sampled | | 15/04/2016 | 19/04/2016 | 19/04/2016 | 19/04/2016 | 19/04/2016 |
| Type of sample | | Soil | Soil | Soil | Soil | Soil |
| Date extracted | - | 22/04/2016 | 22/04/2016 | 22/04/2016 | 22/04/2016 | 22/04/2016 |
| Date analysed | - | 23/04/2016 | 23/04/2016 | 23/04/2016 | 23/04/2016 | 23/04/2016 |
| TRHC$_{10}$ - C$_{14}$ | mg/kg | <50 | <50 | <50 | 160 | 150 |
| TRHC$_{15}$ - C$_{28}$ | mg/kg | <100 | 980 | <100 | 8,200 | 8,200 |
| TRHC$_{29}$ - C$_{36}$ | mg/kg | <100 | 630 | <100 | 4,400 | 4,800 |
| TRH>C$_{10}$-C$_{16}$ | mg/kg | <50 | <50 | <50 | 530 | 570 |
| TRH>C$_{10}$ - C$_{16}$ less Naphthalene (F2) | mg/kg | <50 | <50 | <50 | 530 | 570 |
| TRH>C$_{16}$-C$_{34}$ | mg/kg | <100 | 1,500 | <100 | 12,000 | 12,000 |
| TRH>C$_{34}$-C$_{40}$ | mg/kg | <100 | 320 | <100 | 2,200 | 2,500 |
| *Surrogate* o-Terphenyl | % | 86 | 124 | 81 | # | # |

| svTRH (C10-C40) in Soil | | | | | |
|---|---|---|---|---|---|
| Our Reference: | UNITS | 145323-11 | 145323-12 | 145323-13 | 145323-14 |
| Your Reference | ---------- - | BH11 | BH12 | BD1 | BD1 |
| Depth | ---------- | 0.45-0.55 | 0.2-0.3 | - | - |
| Date Sampled | | 19/04/2016 | 19/04/2016 | 15/04/2016 | 19/04/2016 |
| Type of sample | | Soil | Soil | Soil | Soil |
| Date extracted | - | 22/04/2016 | 22/04/2016 | 22/04/2016 | 22/04/2016 |
| Date analysed | - | 23/04/2016 | 23/04/2016 | 23/04/2016 | 23/04/2016 |
| TRHC$_{10}$ - C$_{14}$ | mg/kg | <50 | <50 | <50 | <50 |
| TRHC$_{15}$ - C$_{28}$ | mg/kg | <100 | 1,300 | <100 | <100 |
| TRHC$_{29}$ - C$_{36}$ | mg/kg | <100 | 1,100 | <100 | <100 |
| TRH>C$_{10}$-C$_{16}$ | mg/kg | <50 | 56 | <50 | <50 |
| TRH>C$_{10}$ - C$_{16}$ less Naphthalene (F2) | mg/kg | <50 | 56 | <50 | <50 |
| TRH>C$_{16}$-C$_{34}$ | mg/kg | <100 | 2,200 | <100 | <100 |
| TRH>C$_{34}$-C$_{40}$ | mg/kg | <100 | 660 | <100 | <100 |
| *Surrogate* o-Terphenyl | % | 82 | 136 | 81 | 84 |

| PAHs in Soil | | | | | | |
|---|---|---|---|---|---|---|
| Our Reference: | UNITS | 145323-1 | 145323-2 | 145323-3 | 145323-4 | 145323-5 |
| Your Reference | ---------- | BH01 | BH02 | BH03 | BH04 | BH05 |
| Depth | - ---------- | 0.3-0.4 | 0.25-0.35 | 0.5-0.6 | 0.3-0.4 | 0.3-0.4 |
| Date Sampled | | 14/04/2016 | 14/04/2016 | 14/04/2016 | 15/04/2016 | 15/04/2016 |
| Type of sample | | Soil | Soil | Soil | Soil | Soil |
| Date extracted | - | 22/04/2016 | 22/04/2016 | 22/04/2016 | 22/04/2016 | 22/04/2016 |
| Date analysed | - | 22/04/2016 | 22/04/2016 | 22/04/2016 | 22/04/2016 | 22/04/2016 |
| Naphthalene | mg/kg | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 |
| Acenaphthylene | mg/kg | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 |
| Acenaphthene | mg/kg | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 |
| Fluorene | mg/kg | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 |
| Phenanthrene | mg/kg | 0.1 | 0.1 | <0.1 | 0.1 | 0.2 |
| Anthracene | mg/kg | <0.1 | 0.2 | <0.1 | <0.1 | 0.1 |
| Fluoranthene | mg/kg | 0.6 | 2.3 | <0.1 | 0.5 | 0.9 |
| Pyrene | mg/kg | 0.7 | 3.5 | <0.1 | 0.6 | 1.0 |
| Benzo(a)anthracene | mg/kg | 0.4 | 1.9 | <0.1 | 0.3 | 0.6 |
| Chrysene | mg/kg | 0.4 | 1.9 | <0.1 | 0.4 | 0.7 |
| Benzo(b,j+k)fluoranthene | mg/kg | 0.9 | 4.4 | <0.2 | 0.8 | 2 |
| Benzo(a)pyrene | mg/kg | 0.4 | 2.5 | <0.05 | 0.4 | 0.74 |
| Indeno(1,2,3-c,d)pyrene | mg/kg | 0.3 | 1.6 | <0.1 | 0.3 | 0.6 |
| Dibenzo(a,h)anthracene | mg/kg | <0.1 | 0.3 | <0.1 | <0.1 | 0.1 |
| Benzo(g,h,i)perylene | mg/kg | 0.3 | 1.5 | <0.1 | 0.3 | 0.5 |
| Benzo(a)pyrene TEQ calc (zero) | mg/kg | 0.6 | 3.7 | <0.5 | 0.5 | 1.2 |
| Benzo(a)pyrene TEQ calc(half) | mg/kg | 0.7 | 3.7 | <0.5 | 0.6 | 1.2 |
| Benzo(a)pyrene TEQ calc(PQL) | mg/kg | 0.7 | 3.7 | <0.5 | 0.6 | 1.2 |
| Total Positive PAHs | mg/kg | 4.3 | 20 | NIL (+)VE | 3.6 | 7.1 |
| *Surrogate p*-Terphenyl-d14 | % | 89 | 96 | 93 | 92 | 93 |

| PAHs in Soil<br>Our Reference:<br>Your Reference | UNITS<br>---------- | 145323-6<br>BH06 | 145323-7<br>BH07 | 145323-8<br>BH08 | 145323-9<br>BH09 | 145323-10<br>BH10 |
|---|---|---|---|---|---|---|
| Depth | ---------- | 0.5-0.6 | 0.35-0.45 | 0.3-0.4 | 0.3-0.4 | 0.4-0.5 |
| Date Sampled | | 15/04/2016 | 19/04/2016 | 19/04/2016 | 19/04/2016 | 19/04/2016 |
| Type of sample | | Soil | Soil | Soil | Soil | Soil |
| Date extracted | - | 22/04/2016 | 22/04/2016 | 22/04/2016 | 22/04/2016 | 22/04/2016 |
| Date analysed | - | 22/04/2016 | 22/04/2016 | 22/04/2016 | 22/04/2016 | 22/04/2016 |
| Naphthalene | mg/kg | <0.1 | 0.2 | <0.1 | 1.2 | 1.5 |
| Acenaphthylene | mg/kg | <0.1 | 1.2 | <0.1 | 2.4 | 2.3 |
| Acenaphthene | mg/kg | <0.1 | 0.1 | <0.1 | 13 | 21 |
| Fluorene | mg/kg | <0.1 | 1.4 | <0.1 | 8.1 | 11 |
| Phenanthrene | mg/kg | <0.1 | 25 | <0.1 | 290 | 140 |
| Anthracene | mg/kg | <0.1 | 5.9 | <0.1 | 64 | 44 |
| Fluoranthene | mg/kg | <0.1 | 36 | 0.2 | 250 | 230 |
| Pyrene | mg/kg | <0.1 | 33 | 0.2 | 220 | 210 |
| Benzo(a)anthracene | mg/kg | <0.1 | 18 | <0.1 | 91 | 91 |
| Chrysene | mg/kg | <0.1 | 16 | 0.1 | 88 | 80 |
| Benzo(b,j+k)fluoranthene | mg/kg | <0.2 | 20 | <0.2 | 130 | 120 |
| Benzo(a)pyrene | mg/kg | <0.05 | 12 | 0.1 | 74 | 74 |
| Indeno(1,2,3-c,d)pyrene | mg/kg | <0.1 | 7.5 | <0.1 | 50 | 48 |
| Dibenzo(a,h)anthracene | mg/kg | <0.1 | 1.6 | <0.1 | 11 | 9.4 |
| Benzo(g,h,i)perylene | mg/kg | <0.1 | 6.4 | <0.1 | 47 | 44 |
| Benzo(a)pyrene TEQ calc (zero) | mg/kg | <0.5 | 19 | <0.5 | 110 | 110 |
| Benzo(a)pyrene TEQ calc(half) | mg/kg | <0.5 | 19 | <0.5 | 110 | 110 |
| Benzo(a)pyrene TEQ calc(PQL) | mg/kg | <0.5 | 19 | <0.5 | 110 | 110 |
| Total Positive PAHs | mg/kg | NIL (+)VE | 180 | 0.58 | 1,300 | 1,100 |
| *Surrogate p*-Terphenyl-d14 | % | 94 | 89 | 94 | 91 | 91 |

| PAHs in Soil | | | | | |
|---|---|---|---|---|---|
| Our Reference: | UNITS | 145323-11 | 145323-12 | 145323-13 | 145323-14 |
| Your Reference | ---------- | BH11 | BH12 | BD1 | BD1 |
| Depth | ---------- | 0.45-0.55 | 0.2-0.3 | - | - |
| Date Sampled | | 19/04/2016 | 19/04/2016 | 15/04/2016 | 19/04/2016 |
| Type of sample | | Soil | Soil | Soil | Soil |
| Date extracted | - | 22/04/2016 | 22/04/2016 | 22/04/2016 | 22/04/2016 |
| Date analysed | - | 22/04/2016 | 22/04/2016 | 22/04/2016 | 22/04/2016 |
| Naphthalene | mg/kg | <0.1 | 0.9 | <0.1 | <0.1 |
| Acenaphthylene | mg/kg | <0.1 | 1.1 | <0.1 | <0.1 |
| Acenaphthene | mg/kg | <0.1 | 0.1 | <0.1 | <0.1 |
| Fluorene | mg/kg | <0.1 | 0.4 | <0.1 | <0.1 |
| Phenanthrene | mg/kg | <0.1 | 13 | <0.1 | <0.1 |
| Anthracene | mg/kg | <0.1 | 5.3 | <0.1 | <0.1 |
| Fluoranthene | mg/kg | 0.2 | 29 | <0.1 | 0.2 |
| Pyrene | mg/kg | 0.2 | 30 | <0.1 | 0.2 |
| Benzo(a)anthracene | mg/kg | <0.1 | 20 | <0.1 | <0.1 |
| Chrysene | mg/kg | <0.1 | 20 | <0.1 | <0.1 |
| Benzo(b,j+k)fluoranthene | mg/kg | <0.2 | 36 | <0.2 | <0.2 |
| Benzo(a)pyrene | mg/kg | 0.07 | 21 | <0.05 | 0.06 |
| Indeno(1,2,3-c,d)pyrene | mg/kg | <0.1 | 17 | <0.1 | <0.1 |
| Dibenzo(a,h)anthracene | mg/kg | <0.1 | 3.3 | <0.1 | <0.1 |
| Benzo(g,h,i)perylene | mg/kg | <0.1 | 14 | <0.1 | <0.1 |
| Benzo(a)pyrene TEQ calc (zero) | mg/kg | <0.5 | 32 | <0.5 | <0.5 |
| Benzo(a)pyrene TEQ calc(half) | mg/kg | <0.5 | 32 | <0.5 | <0.5 |
| Benzo(a)pyrene TEQ calc(PQL) | mg/kg | <0.5 | 32 | <0.5 | <0.5 |
| Total Positive PAHs | mg/kg | 0.41 | 210 | NIL (+)VE | 0.38 |
| *Surrogate p*-Terphenyl-d14 | % | 94 | 88 | 98 | 96 |

| Organochlorine Pesticides in soil | | | | | | |
|---|---|---|---|---|---|---|
| Our Reference: | UNITS | 145323-1 | 145323-2 | 145323-3 | 145323-4 | 145323-5 |
| Your Reference | ---------- | BH01 | BH02 | BH03 | BH04 | BH05 |
| Depth | - ---------- | 0.3-0.4 | 0.25-0.35 | 0.5-0.6 | 0.3-0.4 | 0.3-0.4 |
| Date Sampled | | 14/04/2016 | 14/04/2016 | 14/04/2016 | 15/04/2016 | 15/04/2016 |
| Type of sample | | Soil | Soil | Soil | Soil | Soil |
| Date extracted | - | 22/04/2016 | 22/04/2016 | 22/04/2016 | 22/04/2016 | 22/04/2016 |
| Date analysed | - | 23/04/2016 | 23/04/2016 | 23/04/2016 | 23/04/2016 | 23/04/2016 |
| HCB | mg/kg | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 |
| alpha-BHC | mg/kg | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 |
| gamma-BHC | mg/kg | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 |
| beta-BHC | mg/kg | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 |
| Heptachlor | mg/kg | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 |
| delta-BHC | mg/kg | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 |
| Aldrin | mg/kg | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 |
| Heptachlor Epoxide | mg/kg | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 |
| gamma-Chlordane | mg/kg | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 |
| alpha-chlordane | mg/kg | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 |
| Endosulfan I | mg/kg | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 |
| pp-DDE | mg/kg | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 |
| Dieldrin | mg/kg | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 |
| Endrin | mg/kg | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 |
| pp-DDD | mg/kg | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 |
| Endosulfan II | mg/kg | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 |
| pp-DDT | mg/kg | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 |
| Endrin Aldehyde | mg/kg | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 |
| Endosulfan Sulphate | mg/kg | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 |
| Methoxychlor | mg/kg | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 |
| *Surrogate* TCMX | % | 88 | 97 | 89 | 88 | 83 |

| Organochlorine Pesticides in soil | | | | | | |
|---|---|---|---|---|---|---|
| Our Reference: | UNITS | 145323-6 | 145323-7 | 145323-8 | 145323-9 | 145323-10 |
| Your Reference | ---------- | BH06 | BH07 | BH08 | BH09 | BH10 |
| Depth | - ---------- | 0.5-0.6 | 0.35-0.45 | 0.3-0.4 | 0.3-0.4 | 0.4-0.5 |
| Date Sampled | | 15/04/2016 | 19/04/2016 | 19/04/2016 | 19/04/2016 | 19/04/2016 |
| Type of sample | | Soil | Soil | Soil | Soil | Soil |
| Date extracted | - | 22/04/2016 | 22/04/2016 | 22/04/2016 | 22/04/2016 | 22/04/2016 |
| Date analysed | - | 23/04/2016 | 23/04/2016 | 23/04/2016 | 23/04/2016 | 23/04/2016 |
| HCB | mg/kg | <0.1 | <0.1 | <0.1 | <1 | <1 |
| alpha-BHC | mg/kg | <0.1 | <0.1 | <0.1 | <1 | <1 |
| gamma-BHC | mg/kg | <0.1 | <0.1 | <0.1 | <1 | <1 |
| beta-BHC | mg/kg | <0.1 | <0.1 | <0.1 | <1 | <1 |
| Heptachlor | mg/kg | <0.1 | <0.1 | <0.1 | <1 | <1 |
| delta-BHC | mg/kg | <0.1 | <0.1 | <0.1 | <1 | <1 |
| Aldrin | mg/kg | <0.1 | <0.1 | <0.1 | <1 | <1 |
| Heptachlor Epoxide | mg/kg | <0.1 | <0.1 | <0.1 | <1 | <1 |
| gamma-Chlordane | mg/kg | <0.1 | <0.1 | <0.1 | <1 | <1 |
| alpha-chlordane | mg/kg | <0.1 | <0.1 | <0.1 | <1 | <1 |
| Endosulfan I | mg/kg | <0.1 | <0.1 | <0.1 | <1 | <1 |
| pp-DDE | mg/kg | <0.1 | <0.1 | <0.1 | <1 | <1 |
| Dieldrin | mg/kg | <0.1 | <0.1 | <0.1 | <1 | <1 |
| Endrin | mg/kg | <0.1 | <0.5 | <0.1 | <2 | <2 |
| pp-DDD | mg/kg | <0.1 | <0.1 | <0.1 | <1 | <1 |
| Endosulfan II | mg/kg | <0.1 | <0.1 | <0.1 | <1 | <1 |
| pp-DDT | mg/kg | <0.1 | <0.1 | <0.1 | <1 | <1 |
| Endrin Aldehyde | mg/kg | <0.1 | <0.1 | <0.1 | <1 | <1 |
| Endosulfan Sulphate | mg/kg | <0.1 | <0.1 | <0.1 | <1 | <1 |
| Methoxychlor | mg/kg | <0.1 | <0.5 | <0.1 | <2 | <2 |
| *Surrogate* TCMX | % | 87 | 80 | 89 | 88 | 93 |

| Organochlorine Pesticides in soil | | | | | |
|---|---|---|---|---|---|
| Our Reference: | UNITS | 145323-11 | 145323-12 | 145323-13 | 145323-14 |
| Your Reference | ---------- | BH11 | BH12 | BD1 | BD1 |
| Depth | - ---------- | 0.45-0.55 | 0.2-0.3 | - | - |
| Date Sampled | | 19/04/2016 | 19/04/2016 | 15/04/2016 | 19/04/2016 |
| Type of sample | | Soil | Soil | Soil | Soil |
| Date extracted | - | 22/04/2016 | 22/04/2016 | 22/04/2016 | 22/04/2016 |
| Date analysed | - | 23/04/2016 | 23/04/2016 | 23/04/2016 | 23/04/2016 |
| HCB | mg/kg | <0.1 | <1 | <0.1 | <0.1 |
| alpha-BHC | mg/kg | <0.1 | <1 | <0.1 | <0.1 |
| gamma-BHC | mg/kg | <0.1 | <1 | <0.1 | <0.1 |
| beta-BHC | mg/kg | <0.1 | <1 | <0.1 | <0.1 |
| Heptachlor | mg/kg | <0.1 | <1 | <0.1 | <0.1 |
| delta-BHC | mg/kg | <0.1 | <1 | <0.1 | <0.1 |
| Aldrin | mg/kg | <0.1 | <1 | <0.1 | <0.1 |
| Heptachlor Epoxide | mg/kg | <0.1 | <1 | <0.1 | <0.1 |
| gamma-Chlordane | mg/kg | <0.1 | <1 | <0.1 | <0.1 |
| alpha-chlordane | mg/kg | <0.1 | <1 | <0.1 | <0.1 |
| Endosulfan I | mg/kg | <0.1 | <1 | <0.1 | <0.1 |
| pp-DDE | mg/kg | <0.1 | <1 | <0.1 | <0.1 |
| Dieldrin | mg/kg | <0.1 | <1 | <0.1 | <0.1 |
| Endrin | mg/kg | <0.1 | <1 | <0.1 | <0.1 |
| pp-DDD | mg/kg | <0.1 | <1 | <0.1 | <0.1 |
| Endosulfan II | mg/kg | <0.1 | <1 | <0.1 | <0.1 |
| pp-DDT | mg/kg | <0.1 | <1 | <0.1 | <0.1 |
| Endrin Aldehyde | mg/kg | <0.1 | <1 | <0.1 | <0.1 |
| Endosulfan Sulphate | mg/kg | <0.1 | <1 | <0.1 | <0.1 |
| Methoxychlor | mg/kg | <0.1 | <1 | <0.1 | <0.1 |
| *Surrogate* TCMX | % | 93 | 93 | 87 | 87 |

| Organophosphorus Pesticides | | | | | | |
|---|---|---|---|---|---|---|
| Our Reference: | UNITS | 145323-1 | 145323-2 | 145323-3 | 145323-4 | 145323-5 |
| Your Reference | ---------- - | BH01 | BH02 | BH03 | BH04 | BH05 |
| Depth | ---------- | 0.3-0.4 | 0.25-0.35 | 0.5-0.6 | 0.3-0.4 | 0.3-0.4 |
| Date Sampled | | 14/04/2016 | 14/04/2016 | 14/04/2016 | 15/04/2016 | 15/04/2016 |
| Type of sample | | Soil | Soil | Soil | Soil | Soil |
| Date extracted | - | 22/04/2016 | 22/04/2016 | 22/04/2016 | 22/04/2016 | 22/04/2016 |
| Date analysed | - | 23/04/2016 | 23/04/2016 | 23/04/2016 | 23/04/2016 | 23/04/2016 |
| Azinphos-methyl (Guthion) | mg/kg | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 |
| Bromophos-ethyl | mg/kg | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 |
| Chlorpyriphos | mg/kg | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 |
| Chlorpyriphos-methyl | mg/kg | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 |
| Diazinon | mg/kg | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 |
| Dichlorvos | mg/kg | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 |
| Dimethoate | mg/kg | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 |
| Ethion | mg/kg | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 |
| Fenitrothion | mg/kg | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 |
| Malathion | mg/kg | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 |
| Parathion | mg/kg | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 |
| Ronnel | mg/kg | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 |
| *Surrogate* TCMX | % | 88 | 97 | 89 | 88 | 83 |

| Organophosphorus Pesticides | | | | | | |
|---|---|---|---|---|---|---|
| Our Reference: | UNITS | 145323-6 | 145323-7 | 145323-8 | 145323-9 | 145323-10 |
| Your Reference | ---------- - | BH06 | BH07 | BH08 | BH09 | BH10 |
| Depth | ---------- | 0.5-0.6 | 0.35-0.45 | 0.3-0.4 | 0.3-0.4 | 0.4-0.5 |
| Date Sampled | | 15/04/2016 | 19/04/2016 | 19/04/2016 | 19/04/2016 | 19/04/2016 |
| Type of sample | | Soil | Soil | Soil | Soil | Soil |
| Date extracted | - | 22/04/2016 | 22/04/2016 | 22/04/2016 | 22/04/2016 | 22/04/2016 |
| Date analysed | - | 23/04/2016 | 23/04/2016 | 23/04/2016 | 23/04/2016 | 23/04/2016 |
| Azinphos-methyl (Guthion) | mg/kg | <0.1 | <0.1 | <0.1 | <1 | <1 |
| Bromophos-ethyl | mg/kg | <0.1 | <0.1 | <0.1 | <1 | <1 |
| Chlorpyriphos | mg/kg | <0.1 | <0.1 | <0.1 | <1 | <1 |
| Chlorpyriphos-methyl | mg/kg | <0.1 | <0.1 | <0.1 | <1 | <1 |
| Diazinon | mg/kg | <0.1 | <0.1 | <0.1 | <1 | <1 |
| Dichlorvos | mg/kg | <0.1 | <0.1 | <0.1 | <1 | <1 |
| Dimethoate | mg/kg | <0.1 | <0.1 | <0.1 | <1 | <1 |
| Ethion | mg/kg | <0.1 | <0.1 | <0.1 | <1 | <1 |
| Fenitrothion | mg/kg | <0.1 | <0.1 | <0.1 | <1 | <1 |
| Malathion | mg/kg | <0.1 | <0.1 | <0.1 | <1 | <1 |
| Parathion | mg/kg | <0.1 | <0.1 | <0.1 | <1 | <1 |
| Ronnel | mg/kg | <0.1 | <0.1 | <0.1 | <1 | <1 |
| *Surrogate* TCMX | % | 87 | 80 | 89 | 88 | 93 |

| Organophosphorus Pesticides | | | | | |
|---|---|---|---|---|---|
| Our Reference: | UNITS | 145323-11 | 145323-12 | 145323-13 | 145323-14 |
| Your Reference | ---------- | BH11 | BH12 | BD1 | BD1 |
| Depth | - ---------- | 0.45-0.55 | 0.2-0.3 | - | - |
| Date Sampled | | 19/04/2016 | 19/04/2016 | 15/04/2016 | 19/04/2016 |
| Type of sample | | Soil | Soil | Soil | Soil |
| Date extracted | - | 22/04/2016 | 22/04/2016 | 22/04/2016 | 22/04/2016 |
| Date analysed | - | 23/04/2016 | 23/04/2016 | 23/04/2016 | 23/04/2016 |
| Azinphos-methyl (Guthion) | mg/kg | <0.1 | <1 | <0.1 | <0.1 |
| Bromophos-ethyl | mg/kg | <0.1 | <1 | <0.1 | <0.1 |
| Chlorpyriphos | mg/kg | <0.1 | <1 | <0.1 | <0.1 |
| Chlorpyriphos-methyl | mg/kg | <0.1 | <1 | <0.1 | <0.1 |
| Diazinon | mg/kg | <0.1 | <1 | <0.1 | <0.1 |
| Dichlorvos | mg/kg | <0.1 | <1 | <0.1 | <0.1 |
| Dimethoate | mg/kg | <0.1 | <1 | <0.1 | <0.1 |
| Ethion | mg/kg | <0.1 | <1 | <0.1 | <0.1 |
| Fenitrothion | mg/kg | <0.1 | <1 | <0.1 | <0.1 |
| Malathion | mg/kg | <0.1 | <1 | <0.1 | <0.1 |
| Parathion | mg/kg | <0.1 | <1 | <0.1 | <0.1 |
| Ronnel | mg/kg | <0.1 | <1 | <0.1 | <0.1 |
| *Surrogate* TCMX | % | 93 | 93 | 87 | 87 |

| PCBs in Soil | | | | | | |
|---|---|---|---|---|---|---|
| Our Reference: | UNITS | 145323-1 | 145323-2 | 145323-3 | 145323-4 | 145323-5 |
| Your Reference | ---------- | BH01 | BH02 | BH03 | BH04 | BH05 |
| Depth | - ---------- | 0.3-0.4 | 0.25-0.35 | 0.5-0.6 | 0.3-0.4 | 0.3-0.4 |
| Date Sampled | | 14/04/2016 | 14/04/2016 | 14/04/2016 | 15/04/2016 | 15/04/2016 |
| Type of sample | | Soil | Soil | Soil | Soil | Soil |
| Date extracted | - | 22/04/2016 | 22/04/2016 | 22/04/2016 | 22/04/2016 | 22/04/2016 |
| Date analysed | - | 23/04/2016 | 23/04/2016 | 23/04/2016 | 23/04/2016 | 23/04/2016 |
| Aroclor 1016 | mg/kg | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 |
| Aroclor 1221 | mg/kg | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 |
| Aroclor 1232 | mg/kg | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 |
| Aroclor 1242 | mg/kg | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 |
| Aroclor 1248 | mg/kg | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 |
| Aroclor 1254 | mg/kg | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 |
| Aroclor 1260 | mg/kg | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 |
| *Surrogate* TCLMX | % | 88 | 97 | 89 | 88 | 83 |

| PCBs in Soil | | | | | | |
|---|---|---|---|---|---|---|
| Our Reference: | UNITS | 145323-6 | 145323-7 | 145323-8 | 145323-9 | 145323-10 |
| Your Reference | ---------- | BH06 | BH07 | BH08 | BH09 | BH10 |
| Depth | - ---------- | 0.5-0.6 | 0.35-0.45 | 0.3-0.4 | 0.3-0.4 | 0.4-0.5 |
| Date Sampled | | 15/04/2016 | 19/04/2016 | 19/04/2016 | 19/04/2016 | 19/04/2016 |
| Type of sample | | Soil | Soil | Soil | Soil | Soil |
| Date extracted | - | 22/04/2016 | 22/04/2016 | 22/04/2016 | 22/04/2016 | 22/04/2016 |
| Date analysed | - | 23/04/2016 | 23/04/2016 | 23/04/2016 | 23/04/2016 | 23/04/2016 |
| Aroclor 1016 | mg/kg | <0.1 | <1 | <0.1 | <5 | <5 |
| Aroclor 1221 | mg/kg | <0.1 | <1 | <0.1 | <5 | <5 |
| Aroclor 1232 | mg/kg | <0.1 | <1 | <0.1 | <5 | <5 |
| Aroclor 1242 | mg/kg | <0.1 | <1 | <0.1 | <5 | <5 |
| Aroclor 1248 | mg/kg | <0.1 | <1 | <0.1 | <5 | <5 |
| Aroclor 1254 | mg/kg | <0.1 | <1 | <0.1 | <5 | <5 |
| Aroclor 1260 | mg/kg | <0.1 | <1 | <0.1 | <5 | <5 |
| *Surrogate* TCLMX | % | 87 | 80 | 89 | 88 | 93 |

| PCBs in Soil | | | | | |
|---|---|---|---|---|---|
| Our Reference: | UNITS | 145323-11 | 145323-12 | 145323-13 | 145323-14 |
| Your Reference | ---------- | BH11 | BH12 | BD1 | BD1 |
| Depth | ---------- | 0.45-0.55 | 0.2-0.3 | - | - |
| Date Sampled | | 19/04/2016 | 19/04/2016 | 15/04/2016 | 19/04/2016 |
| Type of sample | | Soil | Soil | Soil | Soil |
| Date extracted | - | 22/04/2016 | 22/04/2016 | 22/04/2016 | 22/04/2016 |
| Date analysed | - | 23/04/2016 | 23/04/2016 | 23/04/2016 | 23/04/2016 |
| Aroclor 1016 | mg/kg | <0.1 | <1 | <0.1 | <0.1 |
| Aroclor 1221 | mg/kg | <0.1 | <1 | <0.1 | <0.1 |
| Aroclor 1232 | mg/kg | <0.1 | <1 | <0.1 | <0.1 |
| Aroclor 1242 | mg/kg | <0.1 | <1 | <0.1 | <0.1 |
| Aroclor 1248 | mg/kg | <0.1 | <1 | <0.1 | <0.1 |
| Aroclor 1254 | mg/kg | <0.1 | <1 | <0.1 | <0.1 |
| Aroclor 1260 | mg/kg | <0.1 | <1 | <0.1 | <0.1 |
| *Surrogate* TCLMX | % | 93 | 93 | 87 | 87 |

| Acid Extractable metals in soil | | | | | | |
|---|---|---|---|---|---|---|
| Our Reference: | UNITS | 145323-1 | 145323-2 | 145323-3 | 145323-4 | 145323-5 |
| Your Reference | ---------- - | BH01 | BH02 | BH03 | BH04 | BH05 |
| Depth | ---------- | 0.3-0.4 | 0.25-0.35 | 0.5-0.6 | 0.3-0.4 | 0.3-0.4 |
| Date Sampled | | 14/04/2016 | 14/04/2016 | 14/04/2016 | 15/04/2016 | 15/04/2016 |
| Type of sample | | Soil | Soil | Soil | Soil | Soil |
| Date prepared | - | 22/04/2016 | 22/04/2016 | 22/04/2016 | 22/04/2016 | 22/04/2016 |
| Date analysed | - | 22/04/2016 | 22/04/2016 | 22/04/2016 | 22/04/2016 | 22/04/2016 |
| Arsenic | mg/kg | 5 | 7 | 9 | 10 | <4 |
| Cadmium | mg/kg | 0.4 | <0.4 | <0.4 | 0.4 | <0.4 |
| Chromium | mg/kg | 14 | 16 | 16 | 16 | 6 |
| Copper | mg/kg | 48 | 57 | 14 | 28 | 36 |
| Lead | mg/kg | 56 | 54 | 63 | 47 | 22 |
| Mercury | mg/kg | 0.5 | 0.2 | <0.1 | <0.1 | <0.1 |
| Nickel | mg/kg | 27 | 28 | 5 | 10 | 18 |
| Zinc | mg/kg | 70 | 84 | 33 | 49 | 220 |

| Acid Extractable metals in soil | | | | | | |
|---|---|---|---|---|---|---|
| Our Reference: | UNITS | 145323-6 | 145323-7 | 145323-8 | 145323-9 | 145323-10 |
| Your Reference | ---------- - | BH06 | BH07 | BH08 | BH09 | BH10 |
| Depth | ---------- | 0.5-0.6 | 0.35-0.45 | 0.3-0.4 | 0.3-0.4 | 0.4-0.5 |
| Date Sampled | | 15/04/2016 | 19/04/2016 | 19/04/2016 | 19/04/2016 | 19/04/2016 |
| Type of sample | | Soil | Soil | Soil | Soil | Soil |
| Date prepared | - | 22/04/2016 | 22/04/2016 | 22/04/2016 | 22/04/2016 | 22/04/2016 |
| Date analysed | - | 22/04/2016 | 22/04/2016 | 22/04/2016 | 22/04/2016 | 22/04/2016 |
| Arsenic | mg/kg | 7 | 7 | 7 | <4 | <4 |
| Cadmium | mg/kg | <0.4 | <0.4 | <0.4 | <0.4 | <0.4 |
| Chromium | mg/kg | 24 | 22 | 19 | 8 | 15 |
| Copper | mg/kg | 18 | 13 | 20 | 50 | 56 |
| Lead | mg/kg | 16 | 21 | 23 | 20 | 57 |
| Mercury | mg/kg | <0.1 | <0.1 | <0.1 | <0.1 | 0.1 |
| Nickel | mg/kg | 11 | 7 | 9 | 45 | 30 |
| Zinc | mg/kg | 27 | 9 | 21 | 40 | 70 |

| Acid Extractable metals in soil | | | | | |
|---|---|---|---|---|---|
| Our Reference: | UNITS | 145323-11 | 145323-12 | 145323-13 | 145323-14 |
| Your Reference | ---------- | BH11 | BH12 | BD1 | BD1 |
| Depth | - ---------- | 0.45-0.55 | 0.2-0.3 | - | - |
| Date Sampled | | 19/04/2016 | 19/04/2016 | 15/04/2016 | 19/04/2016 |
| Type of sample | | Soil | Soil | Soil | Soil |
| Date prepared | - | 22/04/2016 | 22/04/2016 | 22/04/2016 | 22/04/2016 |
| Date analysed | - | 22/04/2016 | 22/04/2016 | 22/04/2016 | 22/04/2016 |
| Arsenic | mg/kg | 6 | <4 | 7 | 7 |
| Cadmium | mg/kg | <0.4 | <0.4 | <0.4 | <0.4 |
| Chromium | mg/kg | 28 | 19 | 31 | 23 |
| Copper | mg/kg | 11 | 49 | 20 | 18 |
| Lead | mg/kg | 16 | 110 | 18 | 25 |
| Mercury | mg/kg | <0.1 | 0.3 | <0.1 | <0.1 |
| Nickel | mg/kg | 6 | 29 | 19 | 10 |
| Zinc | mg/kg | 10 | 59 | 28 | 19 |

| Misc Soil - Inorg | | | | | | |
|---|---|---|---|---|---|---|
| Our Reference: | UNITS | 145323-1 | 145323-2 | 145323-3 | 145323-4 | 145323-5 |
| Your Reference | ---------- | BH01 | BH02 | BH03 | BH04 | BH05 |
| | - | | | | | |
| Depth | ---------- | 0.3-0.4 | 0.25-0.35 | 0.5-0.6 | 0.3-0.4 | 0.3-0.4 |
| Date Sampled | | 14/04/2016 | 14/04/2016 | 14/04/2016 | 15/04/2016 | 15/04/2016 |
| Type of sample | | Soil | Soil | Soil | Soil | Soil |
| Date prepared | - | 22/04/2016 | 22/04/2016 | 22/04/2016 | 22/04/2016 | 22/04/2016 |
| Date analysed | - | 26/04/2016 | 26/04/2016 | 26/04/2016 | 26/04/2016 | 26/04/2016 |
| Total Phenolics (as Phenol) | mg/kg | <5 | <5 | <5 | <5 | <5 |

| Misc Soil - Inorg | | | | | | |
|---|---|---|---|---|---|---|
| Our Reference: | UNITS | 145323-6 | 145323-7 | 145323-8 | 145323-9 | 145323-10 |
| Your Reference | ---------- | BH06 | BH07 | BH08 | BH09 | BH10 |
| | - | | | | | |
| Depth | ---------- | 0.5-0.6 | 0.35-0.45 | 0.3-0.4 | 0.3-0.4 | 0.4-0.5 |
| Date Sampled | | 15/04/2016 | 19/04/2016 | 19/04/2016 | 19/04/2016 | 19/04/2016 |
| Type of sample | | Soil | Soil | Soil | Soil | Soil |
| Date prepared | - | 22/04/2016 | 22/04/2016 | 22/04/2016 | 22/04/2016 | 22/04/2016 |
| Date analysed | - | 26/04/2016 | 26/04/2016 | 26/04/2016 | 26/04/2016 | 26/04/2016 |
| Total Phenolics (as Phenol) | mg/kg | <5 | <5 | <5 | <5 | <5 |

| Misc Soil - Inorg | | | | | |
|---|---|---|---|---|---|
| Our Reference: | UNITS | 145323-11 | 145323-12 | 145323-13 | 145323-14 |
| Your Reference | ---------- | BH11 | BH12 | BD1 | BD1 |
| | - | | | | |
| Depth | ---------- | 0.45-0.55 | 0.2-0.3 | - | - |
| Date Sampled | | 19/04/2016 | 19/04/2016 | 15/04/2016 | 19/04/2016 |
| Type of sample | | Soil | Soil | Soil | Soil |
| Date prepared | - | 22/04/2016 | 22/04/2016 | 22/04/2016 | 22/04/2016 |
| Date analysed | - | 26/04/2016 | 26/04/2016 | 26/04/2016 | 26/04/2016 |
| Total Phenolics (as Phenol) | mg/kg | <5 | <5 | <5 | <5 |

| Misc Inorg - Soil | | | | | |
|---|---|---|---|---|---|
| Our Reference: | UNITS | 145323-2 | 145323-6 | 145323-7 | 145323-12 |
| Your Reference | ---------- - | BH02 | BH06 | BH07 | BH12 |
| Depth | ---------- | 0.25-0.35 | 0.5-0.6 | 0.35-0.45 | 0.2-0.3 |
| Date Sampled | | 14/04/2016 | 15/04/2016 | 19/04/2016 | 19/04/2016 |
| Type of sample | | Soil | Soil | Soil | Soil |
| Date prepared | - | 26/04/2016 | 26/04/2016 | 26/04/2016 | 26/04/2016 |
| Date analysed | - | 26/04/2016 | 26/04/2016 | 26/04/2016 | 26/04/2016 |
| pH 1:5 soil:water | pH Units | 7.3 | 7.3 | 6.4 | 8.7 |

| Moisture | | | | | | |
|---|---|---|---|---|---|---|
| Our Reference: | UNITS | 145323-1 | 145323-2 | 145323-3 | 145323-4 | 145323-5 |
| Your Reference | ---------- - | BH01 | BH02 | BH03 | BH04 | BH05 |
| Depth | ---------- | 0.3-0.4 | 0.25-0.35 | 0.5-0.6 | 0.3-0.4 | 0.3-0.4 |
| Date Sampled | | 14/04/2016 | 14/04/2016 | 14/04/2016 | 15/04/2016 | 15/04/2016 |
| Type of sample | | Soil | Soil | Soil | Soil | Soil |
| Date prepared | - | 22/04/2016 | 22/04/2016 | 22/04/2016 | 22/04/2016 | 22/04/2016 |
| Date analysed | - | 26/04/2016 | 26/04/2016 | 26/04/2016 | 26/04/2016 | 26/04/2016 |
| Moisture | % | 8.0 | 17 | 22 | 17 | 8.1 |

| Moisture | | | | | | |
|---|---|---|---|---|---|---|
| Our Reference: | UNITS | 145323-6 | 145323-7 | 145323-8 | 145323-9 | 145323-10 |
| Your Reference | ---------- - | BH06 | BH07 | BH08 | BH09 | BH10 |
| Depth | ---------- | 0.5-0.6 | 0.35-0.45 | 0.3-0.4 | 0.3-0.4 | 0.4-0.5 |
| Date Sampled | | 15/04/2016 | 19/04/2016 | 19/04/2016 | 19/04/2016 | 19/04/2016 |
| Type of sample | | Soil | Soil | Soil | Soil | Soil |
| Date prepared | - | 22/04/2016 | 22/04/2016 | 22/04/2016 | 22/04/2016 | 22/04/2016 |
| Date analysed | - | 26/04/2016 | 26/04/2016 | 26/04/2016 | 26/04/2016 | 26/04/2016 |
| Moisture | % | 22 | 16 | 14 | 3.4 | 4.6 |

| Moisture | | | | | |
|---|---|---|---|---|---|
| Our Reference: | UNITS | 145323-11 | 145323-12 | 145323-13 | 145323-14 |
| Your Reference | ---------- - | BH11 | BH12 | BD1 | BD1 |
| Depth | ---------- | 0.45-0.55 | 0.2-0.3 | - | - |
| Date Sampled | | 19/04/2016 | 19/04/2016 | 15/04/2016 | 19/04/2016 |
| Type of sample | | Soil | Soil | Soil | Soil |
| Date prepared | - | 22/04/2016 | 22/04/2016 | 22/04/2016 | 22/04/2016 |
| Date analysed | - | 26/04/2016 | 26/04/2016 | 26/04/2016 | 26/04/2016 |
| Moisture | % | 17 | 4.6 | 21 | 15 |

| CEC<br>Our Reference:<br>Your Reference | UNITS<br>----------<br>- | 145323-2<br>BH02 | 145323-6<br>BH06 | 145323-7<br>BH07 | 145323-12<br>BH12 |
|---|---|---|---|---|---|
| Depth | ---------- | 0.25-0.35 | 0.5-0.6 | 0.35-0.45 | 0.2-0.3 |
| Date Sampled | | 14/04/2016 | 15/04/2016 | 19/04/2016 | 19/04/2016 |
| Type of sample | | Soil | Soil | Soil | Soil |
| Date prepared | - | 27/04/2016 | 27/04/2016 | 27/04/2016 | 27/04/2016 |
| Date analysed | - | 27/04/2016 | 27/04/2016 | 27/04/2016 | 27/04/2016 |
| Exchangeable Ca | meq/100g | 12 | 8.4 | 2.3 | 11 |
| Exchangeable K | meq/100g | 0.3 | 0.2 | 0.1 | 0.1 |
| Exchangeable Mg | meq/100g | 4.4 | 5.1 | 1.8 | 3.1 |
| Exchangeable Na | meq/100g | 0.37 | 0.61 | 0.36 | 0.56 |
| Cation Exchange Capacity | meq/100g | 17 | 14 | 4.7 | 14 |

| Asbestos ID - soils | | | | | | |
|---|---|---|---|---|---|---|
| Our Reference: | UNITS | 145323-1 | 145323-2 | 145323-3 | 145323-4 | 145323-5 |
| Your Reference | ---------- - | BH01 | BH02 | BH03 | BH04 | BH05 |
| Depth | ---------- | 0.3-0.4 | 0.25-0.35 | 0.5-0.6 | 0.3-0.4 | 0.3-0.4 |
| Date Sampled | | 14/04/2016 | 14/04/2016 | 14/04/2016 | 15/04/2016 | 15/04/2016 |
| Type of sample | | Soil | Soil | Soil | Soil | Soil |
| Date analysed | - | 28/04/2016 | 28/04/2016 | 28/04/2016 | 28/04/2016 | 28/04/2016 |
| Sample mass tested | g | Approx 35g | Approx 55g | Approx 30g | Approx 30g | Approx 55g |
| Sample Description | - | Brown coarse-grained soil & rocks | Brown coarse-grained soil & rocks | Brown coarse-grained soil & rocks | Brown coarse-grained soil & rocks | Brown coarse-grained soil & rocks |
| Asbestos ID in soil | - | No asbestos detected at reporting limit of 0.1g/kg Organic fibres detected | No asbestos detected at reporting limit of 0.1g/kg Organic fibres detected | No asbestos detected at reporting limit of 0.1g/kg Organic fibres detected | No asbestos detected at reporting limit of 0.1g/kg Organic fibres detected | No asbestos detected at reporting limit of 0.1g/kg Organic fibres detected |
| Trace Analysis | - | No asbestos detected | No asbestos detected | No asbestos detected | No asbestos detected | No asbestos detected |

| Asbestos ID - soils | | | | | | |
|---|---|---|---|---|---|---|
| Our Reference: | UNITS | 145323-6 | 145323-7 | 145323-8 | 145323-9 | 145323-10 |
| Your Reference | ---------- - | BH06 | BH07 | BH08 | BH09 | BH10 |
| Depth | ---------- | 0.5-0.6 | 0.35-0.45 | 0.3-0.4 | 0.3-0.4 | 0.4-0.5 |
| Date Sampled | | 15/04/2016 | 19/04/2016 | 19/04/2016 | 19/04/2016 | 19/04/2016 |
| Type of sample | | Soil | Soil | Soil | Soil | Soil |
| Date analysed | - | 28/04/2016 | 28/04/2016 | 28/04/2016 | 28/04/2016 | 28/04/2016 |
| Sample mass tested | g | Approx 30g | Approx 35g | Approx 30g | Approx 45g | Approx 30g |
| Sample Description | - | Brown coarse-grained soil & rocks | Brown coarse-grained soil & rocks | Brown coarse-grained soil & rocks | Black coarse-grained soil & rocks | Black bitumen soil & rocks |
| Asbestos ID in soil | - | No asbestos detected at reporting limit of 0.1g/kg Organic fibres detected | No asbestos detected at reporting limit of 0.1g/kg Organic fibres detected | No asbestos detected at reporting limit of 0.1g/kg Organic fibres detected | No asbestos detected at reporting limit of 0.1g/kg Organic fibres detected | No asbestos detected at reporting limit of 0.1g/kg Organic fibres detected |
| Trace Analysis | - | No asbestos detected | No asbestos detected | No asbestos detected | No asbestos detected | No asbestos detected |

| Asbestos ID - soils | | | | | |
|---|---|---|---|---|---|
| Our Reference: | UNITS | 145323-11 | 145323-12 | 145323-13 | 145323-14 |
| Your Reference | ---------- - | BH11 | BH12 | BD1 | BD1 |
| Depth | ---------- | 0.45-0.55 | 0.2-0.3 | - | - |
| Date Sampled | | 19/04/2016 | 19/04/2016 | 15/04/2016 | 19/04/2016 |
| Type of sample | | Soil | Soil | Soil | Soil |
| Date analysed | - | 28/04/2016 | 28/04/2016 | 28/04/2016 | 28/04/2016 |
| Sample mass tested | g | Approx 30g | Approx 35g | Approx 30g | Approx 40g |
| Sample Description | - | Brown coarse-grained soil & rocks | Brown coarse-grained soil & rocks | Brown coarse-grained soil & rocks | Brown coarse-grained soil & rocks |
| Asbestos ID in soil | - | No asbestos detected at reporting limit of 0.1g/kg Organic fibres detected | No asbestos detected at reporting limit of 0.1g/kg Organic fibres detected | No asbestos detected at reporting limit of 0.1g/kg Organic fibres detected | No asbestos detected at reporting limit of 0.1g/kg Organic fibres detected |
| Trace Analysis | - | No asbestos detected | No asbestos detected | No asbestos detected | No asbestos detected |

| Asbestos ID - materials | | |
|---|---|---|
| Our Reference: | UNITS | 145323-15 |
| Your Reference | ---------- | T3 A01 |
| | - | |
| Depth | ---------- | - |
| Date Sampled | | 14/04/2016 |
| Type of sample | | Material |
| Date analysed | - | 28/04/2016 |
| Mass / Dimension of Sample | - | 70x30x5mm |
| Sample Description | - | Green compressed fibre cement material |
| Asbestos ID in materials | - | Chrysotile asbestos detected<br>Amosite asbestos detected<br>Crocidolite asbestos detected |

| Method ID | Methodology Summary |
|---|---|
| Org-016 | Soil samples are extracted with methanol and spiked into water prior to analysing by purge and trap GC-MS. Water samples are analysed directly by purge and trap GC-MS. F1 = (C6-C10)-BTEX as per NEPM B1 Guideline on Investigation Levels for Soil and Groundwater. |
| Org-014 | Soil samples are extracted with methanol and spiked into water prior to analysing by purge and trap GC-MS. |
| Org-003 | Soil samples are extracted with Dichloromethane/Acetone and waters with Dichloromethane and analysed by GC-FID.<br>F2 = (>C10-C16)-Naphthalene as per NEPM B1 Guideline on Investigation Levels for Soil and Groundwater (HSLs Tables 1A (3, 4)). Note Naphthalene is determined from the VOC analysis. |
| Org-012 | Soil samples are extracted with Dichloromethane/Acetone and waters with Dichloromethane and analysed by GC-MS. Benzo(a)pyrene TEQ as per NEPM B1 Guideline on Investigation Levels for Soil and Groundwater - 2013.<br>For soil results:-<br>1. 'TEQ PQL' values are assuming all contributing PAHs reported as <PQL are actually at the PQL. This is the most conservative approach and can give false positive TEQs given that PAHs that contribute to the TEQ calculation may not be present.<br>2. 'TEQ zero' values are assuming all contributing PAHs reported as <PQL are zero. This is the least conservative approach and is more susceptible to false negative TEQs when PAHs that contribute to the TEQ calculation are present but below PQL.<br>3. 'TEQ half PQL' values are assuming all contributing PAHs reported as <PQL are half the stipulated PQL. Hence a mid-point between the most and least conservative approaches above.<br>Note, the Total +ve PAHs PQL is reflective of the lowest individual PQL and is therefore" Total +ve PAHs" is simply a sum of the positive individual PAHs. |
| Org-005 | Soil samples are extracted with dichloromethane/acetone and waters with dichloromethane and analysed by GC with dual ECD's. |
| Org-008 | Soil samples are extracted with dichloromethane/acetone and waters with dichloromethane and analysed by GC with dual ECD's. |
| Org-006 | Soil samples are extracted with dichloromethane/acetone and waters with dichloromethane and analysed by GC-ECD. |
| Metals-020 ICP-AES | Determination of various metals by ICP-AES. |
| Metals-021 CV-AAS | Determination of Mercury by Cold Vapour AAS. |
| Inorg-031 | Total Phenolics by segmented flow analyser (in line distillation with colourimetric finish).<br>Solids are extracted in a caustic media prior to analysis. |
| Inorg-001 | pH - Measured using pH meter and electrode in accordance with APHA latest edition, 4500-H+. Please note that the results for water analyses are indicative only, as analysis outside of the APHA storage times. |
| Inorg-008 | Moisture content determined by heating at 105+/-5 deg C for a minimum of 12 hours. |
| Metals-009 | Determination of exchangeable cations and cation exchange capacity in soils using 1M Ammonium Chloride exchange and ICP-AES analytical finish. |
| ASB-001 | Asbestos ID - Qualitative identification of asbestos in bulk samples using Polarised Light Microscopy and Dispersion Staining Techniques including Synthetic Mineral Fibre and Organic Fibre as per Australian Standard 4964-2004. |

| QUALITY CONTROL<br>vTRH(C6-C10)/BTEXN in Soil | UNITS | PQL | METHOD | Blank | Duplicate Sm# | Duplicate results<br>Base ll Duplicate ll %RPD | Spike Sm# | Spike % Recovery |
|---|---|---|---|---|---|---|---|---|
| Date extracted | - | | | 22/04/2016 | 145323-1 | 22/04/2016 \|\| 22/04/2016 | LCS-8 | 22/04/2016 |
| Date analysed | - | | | 23/04/2016 | 145323-1 | 23/04/2016 \|\| 23/04/2016 | LCS-8 | 23/04/2016 |
| TRHC$_6$ - C$_9$ | mg/kg | 25 | Org-016 | <25 | 145323-1 | <25 \|\| <25 | LCS-8 | 112% |
| TRHC$_6$ - C$_{10}$ | mg/kg | 25 | Org-016 | <25 | 145323-1 | <25 \|\| <25 | LCS-8 | 112% |
| Benzene | mg/kg | 0.2 | Org-016 | <0.2 | 145323-1 | <0.2 \|\| <0.2 | LCS-8 | 106% |
| Toluene | mg/kg | 0.5 | Org-016 | <0.5 | 145323-1 | <0.5 \|\| <0.5 | LCS-8 | 111% |
| Ethylbenzene | mg/kg | 1 | Org-016 | <1 | 145323-1 | <1 \|\| <1 | LCS-8 | 111% |
| m+p-xylene | mg/kg | 2 | Org-016 | <2 | 145323-1 | <2 \|\| <2 | LCS-8 | 115% |
| o-Xylene | mg/kg | 1 | Org-016 | <1 | 145323-1 | <1 \|\| <1 | LCS-8 | 109% |
| naphthalene | mg/kg | 1 | Org-014 | <1 | 145323-1 | <1 \|\| <1 | [NR] | [NR] |
| *Surrogate* aaa-Trifluorotoluene | % | | Org-016 | 99 | 145323-1 | 78 \|\| 83 \|\| RPD: 6 | LCS-8 | 97% |

| QUALITY CONTROL<br>svTRH (C10-C40) in Soil | UNITS | PQL | METHOD | Blank | Duplicate Sm# | Duplicate results<br>Base ll Duplicate ll %RPD | Spike Sm# | Spike % Recovery |
|---|---|---|---|---|---|---|---|---|
| Date extracted | - | | | 22/04/2016 | 145323-1 | 22/04/2016 \|\| 22/04/2016 | LCS-8 | 22/04/2016 |
| Date analysed | - | | | 23/04/2016 | 145323-1 | 23/04/2016 \|\| 23/04/2016 | LCS-8 | 23/04/2016 |
| TRHC$_{10}$ - C$_{14}$ | mg/kg | 50 | Org-003 | <50 | 145323-1 | <50 \|\| <50 | LCS-8 | 125% |
| TRHC$_{15}$ - C$_{28}$ | mg/kg | 100 | Org-003 | <100 | 145323-1 | <100 \|\| <100 | LCS-8 | 132% |
| TRHC$_{29}$ - C$_{36}$ | mg/kg | 100 | Org-003 | <100 | 145323-1 | <100 \|\| <100 | LCS-8 | 127% |
| TRH>C$_{10}$-C$_{16}$ | mg/kg | 50 | Org-003 | <50 | 145323-1 | <50 \|\| <50 | LCS-8 | 125% |
| TRH>C$_{16}$-C$_{34}$ | mg/kg | 100 | Org-003 | <100 | 145323-1 | <100 \|\| <100 | LCS-8 | 132% |
| TRH>C$_{34}$-C$_{40}$ | mg/kg | 100 | Org-003 | <100 | 145323-1 | <100 \|\| <100 | LCS-8 | 127% |
| *Surrogate* o-Terphenyl | % | | Org-003 | 85 | 145323-1 | 82 \|\| 81 \|\| RPD: 1 | LCS-8 | 94% |

| QUALITY CONTROL<br>PAHs in Soil | UNITS | PQL | METHOD | Blank | Duplicate Sm# | Duplicate results<br>Base ll Duplicate ll %RPD | Spike Sm# | Spike % Recovery |
|---|---|---|---|---|---|---|---|---|
| Date extracted | - | | | 22/04/2016 | 145323-1 | 22/04/2016 \|\| 22/04/2016 | LCS-8 | 22/04/2016 |
| Date analysed | - | | | 22/04/2016 | 145323-1 | 22/04/2016 \|\| 22/04/2016 | LCS-8 | 22/04/2016 |
| Naphthalene | mg/kg | 0.1 | Org-012 | <0.1 | 145323-1 | <0.1 \|\| <0.1 | LCS-8 | 95% |
| Acenaphthylene | mg/kg | 0.1 | Org-012 | <0.1 | 145323-1 | <0.1 \|\| <0.1 | [NR] | [NR] |
| Acenaphthene | mg/kg | 0.1 | Org-012 | <0.1 | 145323-1 | <0.1 \|\| <0.1 | [NR] | [NR] |
| Fluorene | mg/kg | 0.1 | Org-012 | <0.1 | 145323-1 | <0.1 \|\| <0.1 | LCS-8 | 96% |
| Phenanthrene | mg/kg | 0.1 | Org-012 | <0.1 | 145323-1 | 0.1 \|\| 0.2 \|\| RPD: 67 | LCS-8 | 109% |
| Anthracene | mg/kg | 0.1 | Org-012 | <0.1 | 145323-1 | <0.1 \|\| <0.1 | [NR] | [NR] |
| Fluoranthene | mg/kg | 0.1 | Org-012 | <0.1 | 145323-1 | 0.6 \|\| 0.7 \|\| RPD: 15 | LCS-8 | 97% |
| Pyrene | mg/kg | 0.1 | Org-012 | <0.1 | 145323-1 | 0.7 \|\| 0.8 \|\| RPD: 13 | LCS-8 | 105% |
| Benzo(a)anthracene | mg/kg | 0.1 | Org-012 | <0.1 | 145323-1 | 0.4 \|\| 0.4 \|\| RPD: 0 | [NR] | [NR] |
| Chrysene | mg/kg | 0.1 | Org-012 | <0.1 | 145323-1 | 0.4 \|\| 0.5 \|\| RPD: 22 | LCS-8 | 82% |
| Benzo(b,j +k)fluoranthene | mg/kg | 0.2 | Org-012 | <0.2 | 145323-1 | 0.9 \|\| 1 \|\| RPD: 11 | [NR] | [NR] |

| QUALITY CONTROL<br><br>PAHs in Soil | UNITS | PQL | METHOD | Blank | Duplicate Sm# | Duplicate results<br><br>Base ll Duplicate ll %RPD | Spike Sm# | Spike % Recovery |
|---|---|---|---|---|---|---|---|---|
| Benzo(a)pyrene | mg/kg | 0.05 | Org-012 | <0.05 | 145323-1 | 0.4 \|\| 0.5 \|\| RPD: 22 | LCS-8 | 90% |
| Indeno(1,2,3-c,d)pyrene | mg/kg | 0.1 | Org-012 | <0.1 | 145323-1 | 0.3 \|\| 0.3 \|\| RPD: 0 | [NR] | [NR] |
| Dibenzo(a,h)anthracene | mg/kg | 0.1 | Org-012 | <0.1 | 145323-1 | <0.1 \|\| <0.1 | [NR] | [NR] |
| Benzo(g,h,i)perylene | mg/kg | 0.1 | Org-012 | <0.1 | 145323-1 | 0.3 \|\| 0.3 \|\| RPD: 0 | [NR] | [NR] |
| *Surrogate p*-Terphenyl-d14 | % | | Org-012 | 93 | 145323-1 | 89 \|\| 91 \|\| RPD: 2 | LCS-8 | 92% |
| QUALITY CONTROL<br><br>Organochlorine Pesticides in soil | UNITS | PQL | METHOD | Blank | Duplicate Sm# | Duplicate results<br><br>Base ll Duplicate ll %RPD | Spike Sm# | Spike % Recovery |
| Date extracted | - | | | 22/04/2016 | 145323-1 | 22/04/2016 \|\| 22/04/2016 | LCS-8 | 22/04/2016 |
| Date analysed | - | | | 23/04/2016 | 145323-1 | 23/04/2016 \|\| 23/04/2016 | LCS-8 | 23/04/2016 |
| HCB | mg/kg | 0.1 | Org-005 | <0.1 | 145323-1 | <0.1 \|\| <0.1 | [NR] | [NR] |
| alpha-BHC | mg/kg | 0.1 | Org-005 | <0.1 | 145323-1 | <0.1 \|\| <0.1 | LCS-8 | 78% |
| gamma-BHC | mg/kg | 0.1 | Org-005 | <0.1 | 145323-1 | <0.1 \|\| <0.1 | [NR] | [NR] |
| beta-BHC | mg/kg | 0.1 | Org-005 | <0.1 | 145323-1 | <0.1 \|\| <0.1 | LCS-8 | 75% |
| Heptachlor | mg/kg | 0.1 | Org-005 | <0.1 | 145323-1 | <0.1 \|\| <0.1 | LCS-8 | 75% |
| delta-BHC | mg/kg | 0.1 | Org-005 | <0.1 | 145323-1 | <0.1 \|\| <0.1 | [NR] | [NR] |
| Aldrin | mg/kg | 0.1 | Org-005 | <0.1 | 145323-1 | <0.1 \|\| <0.1 | LCS-8 | 82% |
| Heptachlor Epoxide | mg/kg | 0.1 | Org-005 | <0.1 | 145323-1 | <0.1 \|\| <0.1 | LCS-8 | 77% |
| gamma-Chlordane | mg/kg | 0.1 | Org-005 | <0.1 | 145323-1 | <0.1 \|\| <0.1 | [NR] | [NR] |
| alpha-chlordane | mg/kg | 0.1 | Org-005 | <0.1 | 145323-1 | <0.1 \|\| <0.1 | [NR] | [NR] |
| Endosulfan I | mg/kg | 0.1 | Org-005 | <0.1 | 145323-1 | <0.1 \|\| <0.1 | [NR] | [NR] |
| pp-DDE | mg/kg | 0.1 | Org-005 | <0.1 | 145323-1 | <0.1 \|\| <0.1 | LCS-8 | 79% |
| Dieldrin | mg/kg | 0.1 | Org-005 | <0.1 | 145323-1 | <0.1 \|\| <0.1 | LCS-8 | 79% |
| Endrin | mg/kg | 0.1 | Org-005 | <0.1 | 145323-1 | <0.1 \|\| <0.1 | LCS-8 | 82% |
| pp-DDD | mg/kg | 0.1 | Org-005 | <0.1 | 145323-1 | <0.1 \|\| <0.1 | LCS-8 | 80% |
| Endosulfan II | mg/kg | 0.1 | Org-005 | <0.1 | 145323-1 | <0.1 \|\| <0.1 | [NR] | [NR] |
| pp-DDT | mg/kg | 0.1 | Org-005 | <0.1 | 145323-1 | <0.1 \|\| <0.1 | [NR] | [NR] |
| Endrin Aldehyde | mg/kg | 0.1 | Org-005 | <0.1 | 145323-1 | <0.1 \|\| <0.1 | [NR] | [NR] |
| Endosulfan Sulphate | mg/kg | 0.1 | Org-005 | <0.1 | 145323-1 | <0.1 \|\| <0.1 | LCS-8 | 70% |
| Methoxychlor | mg/kg | 0.1 | Org-005 | <0.1 | 145323-1 | <0.1 \|\| <0.1 | [NR] | [NR] |
| *Surrogate* TCMX | % | | Org-005 | 90 | 145323-1 | 88 \|\| 90 \|\| RPD: 2 | [NR] | [NR] |

| QUALITY CONTROL<br><br>Organophosphorus Pesticides | UNITS | PQL | METHOD | Blank | Duplicate Sm# | Duplicate results<br><br>Base ll Duplicate ll %RPD | Spike Sm# | Spike % Recovery |
|---|---|---|---|---|---|---|---|---|
| Date extracted | - | | | 22/04/2016 | 145323-1 | 22/04/2016 \|\| 22/04/2016 | LCS-8 | 22/04/2016 |
| Date analysed | - | | | 23/04/2016 | 145323-1 | 23/04/2016 \|\| 23/04/2016 | LCS-8 | 23/04/2016 |
| Azinphos-methyl (Guthion) | mg/kg | 0.1 | Org-008 | <0.1 | 145323-1 | <0.1 \|\| <0.1 | [NR] | [NR] |
| Bromophos-ethyl | mg/kg | 0.1 | Org-008 | <0.1 | 145323-1 | <0.1 \|\| <0.1 | [NR] | [NR] |
| Chlorpyriphos | mg/kg | 0.1 | Org-008 | <0.1 | 145323-1 | <0.1 \|\| <0.1 | LCS-8 | 84% |
| Chlorpyriphos-methyl | mg/kg | 0.1 | Org-008 | <0.1 | 145323-1 | <0.1 \|\| <0.1 | [NR] | [NR] |
| Diazinon | mg/kg | 0.1 | Org-008 | <0.1 | 145323-1 | <0.1 \|\| <0.1 | [NR] | [NR] |
| Dichlorvos | mg/kg | 0.1 | Org-008 | <0.1 | 145323-1 | <0.1 \|\| <0.1 | LCS-8 | 76% |
| Dimethoate | mg/kg | 0.1 | Org-008 | <0.1 | 145323-1 | <0.1 \|\| <0.1 | [NR] | [NR] |
| Ethion | mg/kg | 0.1 | Org-008 | <0.1 | 145323-1 | <0.1 \|\| <0.1 | LCS-8 | 87% |
| Fenitrothion | mg/kg | 0.1 | Org-008 | <0.1 | 145323-1 | <0.1 \|\| <0.1 | LCS-8 | 113% |
| Malathion | mg/kg | 0.1 | Org-008 | <0.1 | 145323-1 | <0.1 \|\| <0.1 | LCS-8 | 65% |
| Parathion | mg/kg | 0.1 | Org-008 | <0.1 | 145323-1 | <0.1 \|\| <0.1 | LCS-8 | 111% |
| Ronnel | mg/kg | 0.1 | Org-008 | <0.1 | 145323-1 | <0.1 \|\| <0.1 | LCS-8 | 93% |
| *Surrogate* TCMX | % | | Org-008 | 90 | 145323-1 | 88 \|\| 90 \|\| RPD: 2 | LCS-8 | 90% |

| QUALITY CONTROL<br><br>PCBs in Soil | UNITS | PQL | METHOD | Blank | Duplicate Sm# | Duplicate results<br><br>Base ll Duplicate ll %RPD | Spike Sm# | Spike % Recovery |
|---|---|---|---|---|---|---|---|---|
| Date extracted | - | | | 22/04/2016 | 145323-1 | 22/04/2016 \|\| 22/04/2016 | LCS-8 | 22/04/2016 |
| Date analysed | - | | | 23/04/2016 | 145323-1 | 23/04/2016 \|\| 23/04/2016 | LCS-8 | 23/04/2016 |
| Aroclor 1016 | mg/kg | 0.1 | Org-006 | <0.1 | 145323-1 | <0.1 \|\| <0.1 | [NR] | [NR] |
| Aroclor 1221 | mg/kg | 0.1 | Org-006 | <0.1 | 145323-1 | <0.1 \|\| <0.1 | [NR] | [NR] |
| Aroclor 1232 | mg/kg | 0.1 | Org-006 | <0.1 | 145323-1 | <0.1 \|\| <0.1 | [NR] | [NR] |
| Aroclor 1242 | mg/kg | 0.1 | Org-006 | <0.1 | 145323-1 | <0.1 \|\| <0.1 | [NR] | [NR] |
| Aroclor 1248 | mg/kg | 0.1 | Org-006 | <0.1 | 145323-1 | <0.1 \|\| <0.1 | [NR] | [NR] |
| Aroclor 1254 | mg/kg | 0.1 | Org-006 | <0.1 | 145323-1 | <0.1 \|\| <0.1 | LCS-8 | 82% |
| Aroclor 1260 | mg/kg | 0.1 | Org-006 | <0.1 | 145323-1 | <0.1 \|\| <0.1 | [NR] | [NR] |
| *Surrogate* TCLMX | % | | Org-006 | 90 | 145323-1 | 88 \|\| 90 \|\| RPD: 2 | LCS-8 | 90% |

| QUALITY CONTROL<br><br>Acid Extractable metals in soil | UNITS | PQL | METHOD | Blank | Duplicate Sm# | Duplicate results<br><br>Base II Duplicate II %RPD | Spike Sm# | Spike % Recovery |
|---|---|---|---|---|---|---|---|---|
| Date prepared | - | | | 22/04/2016 | 145323-1 | 22/04/2016 \|\| 22/04/2016 | LCS-8 | 22/04/2016 |
| Date analysed | - | | | 22/04/2016 | 145323-1 | 22/04/2016 \|\| 22/04/2016 | LCS-8 | 22/04/2016 |
| Arsenic | mg/kg | 4 | Metals-020 ICP-AES | <4 | 145323-1 | 5 \|\| <4 | LCS-8 | 117% |
| Cadmium | mg/kg | 0.4 | Metals-020 ICP-AES | <0.4 | 145323-1 | 0.4 \|\| <0.4 | LCS-8 | 108% |
| Chromium | mg/kg | 1 | Metals-020 ICP-AES | <1 | 145323-1 | 14 \|\| 13 \|\| RPD: 7 | LCS-8 | 110% |
| Copper | mg/kg | 1 | Metals-020 ICP-AES | <1 | 145323-1 | 48 \|\| 43 \|\| RPD: 11 | LCS-8 | 114% |
| Lead | mg/kg | 1 | Metals-020 ICP-AES | <1 | 145323-1 | 56 \|\| 60 \|\| RPD: 7 | LCS-8 | 109% |
| Mercury | mg/kg | 0.1 | Metals-021 CV-AAS | <0.1 | 145323-1 | 0.5 \|\| 0.4 \|\| RPD: 22 | LCS-8 | 100% |
| Nickel | mg/kg | 1 | Metals-020 ICP-AES | <1 | 145323-1 | 27 \|\| 22 \|\| RPD: 20 | LCS-8 | 105% |
| Zinc | mg/kg | 1 | Metals-020 ICP-AES | <1 | 145323-1 | 70 \|\| 69 \|\| RPD: 1 | LCS-8 | 106% |
| QUALITY CONTROL<br><br>Misc Soil - Inorg | UNITS | PQL | METHOD | Blank | Duplicate Sm# | Duplicate results<br><br>Base II Duplicate II %RPD | Spike Sm# | Spike % Recovery |
| Date prepared | - | | | 22/04/2016 | 145323-1 | 22/04/2016 \|\| 22/04/2016 | LCS-1 | 22/04/2016 |
| Date analysed | - | | | 26/04/2016 | 145323-1 | 26/04/2016 \|\| 26/04/2016 | LCS-1 | 26/04/2016 |
| Total Phenolics (as Phenol) | mg/kg | 5 | Inorg-031 | <5 | 145323-1 | <5 \|\| <5 | LCS-1 | 101% |
| QUALITY CONTROL<br><br>Misc Inorg - Soil | UNITS | PQL | METHOD | Blank | Duplicate Sm# | Duplicate results<br><br>Base II Duplicate II %RPD | Spike Sm# | Spike % Recovery |
| Date prepared | - | | | 26/04/2016 | [NT] | [NT] | LCS-1 | 26/04/2016 |
| Date analysed | - | | | 26/04/2016 | [NT] | [NT] | LCS-1 | 26/04/2016 |
| pH 1:5 soil:water | pH Units | | Inorg-001 | [NT] | [NT] | [NT] | LCS-1 | 101% |
| QUALITY CONTROL<br><br>CEC | UNITS | PQL | METHOD | Blank | Duplicate Sm# | Duplicate results<br><br>Base II Duplicate II %RPD | Spike Sm# | Spike % Recovery |
| Date prepared | - | | | 27/04/2016 | 145323-7 | 27/04/2016 \|\| 27/04/2016 | LCS-2 | 27/04/2016 |
| Date analysed | - | | | 27/04/2016 | 145323-7 | 27/04/2016 \|\| 27/04/2016 | LCS-2 | 27/04/2016 |
| Exchangeable Ca | meq/100g | 0.1 | Metals-009 | <0.1 | 145323-7 | 2.3 \|\| 2.4 \|\| RPD: 4 | LCS-2 | 114% |
| Exchangeable K | meq/100g | 0.1 | Metals-009 | <0.1 | 145323-7 | 0.1 \|\| 0.1 \|\| RPD: 0 | LCS-2 | 110% |
| Exchangeable Mg | meq/100g | 0.1 | Metals-009 | <0.1 | 145323-7 | 1.8 \|\| 2.0 \|\| RPD: 11 | LCS-2 | 111% |

| QUALITY CONTROL<br>CEC | UNITS | PQL | METHOD | Blank | Duplicate Sm# | Duplicate results<br>Base II Duplicate II %RPD | Spike Sm# | Spike % Recovery |
|---|---|---|---|---|---|---|---|---|
| Exchangeable Na | meq/100 g | 0.1 | Metals-009 | <0.1 | 145323-7 | 0.36 \|\| 0.37 \|\| RPD: 3 | LCS-2 | 100% |

| QUALITY CONTROL<br>vTRH(C6-C10)/BTEXN in Soil | UNITS | Dup. Sm# | Duplicate<br>Base + Duplicate + %RPD | Spike Sm# | Spike % Recovery |
|---|---|---|---|---|---|
| Date extracted | - | 145323-11 | 22/04/2016 \|\| 22/04/2016 | 145323-2 | 22/04/2016 |
| Date analysed | - | 145323-11 | 23/04/2016 \|\| 23/04/2016 | 145323-2 | 23/04/2016 |
| TRHC$_{6}$ - C$_{9}$ | mg/kg | 145323-11 | <25 \|\| <25 | 145323-2 | 104% |
| TRHC$_{6}$ - C$_{10}$ | mg/kg | 145323-11 | <25 \|\| <25 | 145323-2 | 104% |
| Benzene | mg/kg | 145323-11 | <0.2 \|\| <0.2 | 145323-2 | 97% |
| Toluene | mg/kg | 145323-11 | <0.5 \|\| <0.5 | 145323-2 | 103% |
| Ethylbenzene | mg/kg | 145323-11 | <1 \|\| <1 | 145323-2 | 105% |
| m+p-xylene | mg/kg | 145323-11 | <2 \|\| <2 | 145323-2 | 107% |
| o-Xylene | mg/kg | 145323-11 | <1 \|\| <1 | 145323-2 | 102% |
| naphthalene | mg/kg | 145323-11 | <1 \|\| <1 | [NR] | [NR] |
| *Surrogate* aaa-Trifluorotoluene | % | 145323-11 | 94 \|\| 91 \|\| RPD: 3 | 145323-2 | 87% |

| QUALITY CONTROL<br>svTRH (C10-C40) in Soil | UNITS | Dup. Sm# | Duplicate<br>Base + Duplicate + %RPD | Spike Sm# | Spike % Recovery |
|---|---|---|---|---|---|
| Date extracted | - | 145323-11 | 22/04/2016 \|\| 22/04/2016 | 145323-2 | 22/04/2016 |
| Date analysed | - | 145323-11 | 23/04/2016 \|\| 23/04/2016 | 145323-2 | 23/04/2016 |
| TRHC$_{10}$ - C$_{14}$ | mg/kg | 145323-11 | <50 \|\| <50 | 145323-2 | 112% |
| TRHC$_{15}$ - C$_{28}$ | mg/kg | 145323-11 | <100 \|\| <100 | 145323-2 | 105% |
| TRHC$_{29}$ - C$_{36}$ | mg/kg | 145323-11 | <100 \|\| <100 | 145323-2 | # |
| TRH>C$_{10}$-C$_{16}$ | mg/kg | 145323-11 | <50 \|\| <50 | 145323-2 | 112% |
| TRH>C$_{16}$-C$_{34}$ | mg/kg | 145323-11 | <100 \|\| <100 | 145323-2 | 105% |
| TRH>C$_{34}$-C$_{40}$ | mg/kg | 145323-11 | <100 \|\| <100 | 145323-2 | # |
| *Surrogate* o-Terphenyl | % | 145323-11 | 82 \|\| 82 \|\| RPD: 0 | 145323-2 | 86% |

| QUALITY CONTROL<br>PAHs in Soil | UNITS | Dup. Sm# | Duplicate<br>Base + Duplicate + %RPD | Spike Sm# | Spike % Recovery |
|---|---|---|---|---|---|
| Date extracted | - | 145323-11 | 22/04/2016 \|\| 22/04/2016 | 145323-2 | 22/04/2016 |
| Date analysed | - | 145323-11 | 22/04/2016 \|\| 22/04/2016 | 145323-2 | 22/04/2016 |
| Naphthalene | mg/kg | 145323-11 | <0.1 \|\| <0.1 | 145323-2 | 90% |
| Acenaphthylene | mg/kg | 145323-11 | <0.1 \|\| <0.1 | [NR] | [NR] |
| Acenaphthene | mg/kg | 145323-11 | <0.1 \|\| <0.1 | [NR] | [NR] |
| Fluorene | mg/kg | 145323-11 | <0.1 \|\| <0.1 | 145323-2 | 92% |
| Phenanthrene | mg/kg | 145323-11 | <0.1 \|\| <0.1 | 145323-2 | 93% |
| Anthracene | mg/kg | 145323-11 | <0.1 \|\| <0.1 | [NR] | [NR] |
| Fluoranthene | mg/kg | 145323-11 | 0.2 \|\| 0.2 \|\| RPD: 0 | 145323-2 | 81% |
| Pyrene | mg/kg | 145323-11 | 0.2 \|\| 0.2 \|\| RPD: 0 | 145323-2 | 76% |
| Benzo(a)anthracene | mg/kg | 145323-11 | <0.1 \|\| <0.1 | [NR] | [NR] |
| Chrysene | mg/kg | 145323-11 | <0.1 \|\| 0.1 | 145323-2 | 79% |

| QUALITY CONTROL PAHs in Soil | UNITS | Dup. Sm# | Duplicate Base + Duplicate + %RPD | Spike Sm# | Spike % Recovery |
|---|---|---|---|---|---|
| Benzo(b,j+k)fluoranthene | mg/kg | 145323-11 | <0.2 \|\| 0.2 | [NR] | [NR] |
| Benzo(a)pyrene | mg/kg | 145323-11 | 0.07 \|\| 0.1 \|\| RPD: 35 | 145323-2 | 73% |
| Indeno(1,2,3-c,d)pyrene | mg/kg | 145323-11 | <0.1 \|\| 0.1 | [NR] | [NR] |
| Dibenzo(a,h)anthracene | mg/kg | 145323-11 | <0.1 \|\| <0.1 | [NR] | [NR] |
| Benzo(g,h,i)perylene | mg/kg | 145323-11 | <0.1 \|\| 0.1 | [NR] | [NR] |
| *Surrogate p*-Terphenyl-d14 | % | 145323-11 | 94 \|\| 100 \|\| RPD: 6 | 145323-2 | 85% |
| QUALITY CONTROL Organochlorine Pesticides in soil | UNITS | Dup. Sm# | Duplicate Base + Duplicate + %RPD | Spike Sm# | Spike % Recovery |
| Date extracted | - | 145323-11 | 22/04/2016 \|\| 22/04/2016 | 145323-2 | 22/04/2016 |
| Date analysed | - | 145323-11 | 23/04/2016 \|\| 23/04/2016 | 145323-2 | 23/04/2016 |
| HCB | mg/kg | 145323-11 | <0.1 \|\| <0.1 | [NR] | [NR] |
| alpha-BHC | mg/kg | 145323-11 | <0.1 \|\| <0.1 | 145323-2 | 79% |
| gamma-BHC | mg/kg | 145323-11 | <0.1 \|\| <0.1 | [NR] | [NR] |
| beta-BHC | mg/kg | 145323-11 | <0.1 \|\| <0.1 | 145323-2 | 74% |
| Heptachlor | mg/kg | 145323-11 | <0.1 \|\| <0.1 | 145323-2 | 73% |
| delta-BHC | mg/kg | 145323-11 | <0.1 \|\| <0.1 | [NR] | [NR] |
| Aldrin | mg/kg | 145323-11 | <0.1 \|\| <0.1 | 145323-2 | 82% |
| Heptachlor Epoxide | mg/kg | 145323-11 | <0.1 \|\| <0.1 | 145323-2 | 73% |
| gamma-Chlordane | mg/kg | 145323-11 | <0.1 \|\| <0.1 | [NR] | [NR] |
| alpha-chlordane | mg/kg | 145323-11 | <0.1 \|\| <0.1 | [NR] | [NR] |
| Endosulfan I | mg/kg | 145323-11 | <0.1 \|\| <0.1 | [NR] | [NR] |
| pp-DDE | mg/kg | 145323-11 | <0.1 \|\| <0.1 | 145323-2 | 76% |
| Dieldrin | mg/kg | 145323-11 | <0.1 \|\| <0.1 | 145323-2 | 77% |
| Endrin | mg/kg | 145323-11 | <0.1 \|\| <0.1 | 145323-2 | 79% |
| pp-DDD | mg/kg | 145323-11 | <0.1 \|\| <0.1 | 145323-2 | 78% |
| Endosulfan II | mg/kg | 145323-11 | <0.1 \|\| <0.1 | [NR] | [NR] |
| pp-DDT | mg/kg | 145323-11 | <0.1 \|\| <0.1 | [NR] | [NR] |
| Endrin Aldehyde | mg/kg | 145323-11 | <0.1 \|\| <0.1 | [NR] | [NR] |
| Endosulfan Sulphate | mg/kg | 145323-11 | <0.1 \|\| <0.1 | 145323-2 | 73% |
| Methoxychlor | mg/kg | 145323-11 | <0.1 \|\| <0.1 | [NR] | [NR] |
| *Surrogate* TCMX | % | 145323-11 | 93 \|\| 88 \|\| RPD: 6 | [NR] | [NR] |

| QUALITY CONTROL Organophosphorus Pesticides | UNITS | Dup. Sm# | Duplicate Base + Duplicate + %RPD | Spike Sm# | Spike % Recovery |
|---|---|---|---|---|---|
| Date extracted | - | 145323-11 | 22/04/2016 \|\| 22/04/2016 | 145323-2 | 22/04/2016 |
| Date analysed | - | 145323-11 | 23/04/2016 \|\| 23/04/2016 | 145323-2 | 23/04/2016 |
| Azinphos-methyl (Guthion) | mg/kg | 145323-11 | <0.1 \|\| <0.1 | [NR] | [NR] |
| Bromophos-ethyl | mg/kg | 145323-11 | <0.1 \|\| <0.1 | [NR] | [NR] |
| Chlorpyriphos | mg/kg | 145323-11 | <0.1 \|\| <0.1 | 145323-2 | 84% |
| Chlorpyriphos-methyl | mg/kg | 145323-11 | <0.1 \|\| <0.1 | [NR] | [NR] |
| Diazinon | mg/kg | 145323-11 | <0.1 \|\| <0.1 | [NR] | [NR] |
| Dichlorvos | mg/kg | 145323-11 | <0.1 \|\| <0.1 | 145323-2 | 78% |
| Dimethoate | mg/kg | 145323-11 | <0.1 \|\| <0.1 | [NR] | [NR] |
| Ethion | mg/kg | 145323-11 | <0.1 \|\| <0.1 | 145323-2 | 81% |
| Fenitrothion | mg/kg | 145323-11 | <0.1 \|\| <0.1 | 145323-2 | 109% |
| Malathion | mg/kg | 145323-11 | <0.1 \|\| <0.1 | 145323-2 | 68% |
| Parathion | mg/kg | 145323-11 | <0.1 \|\| <0.1 | 145323-2 | 83% |
| Ronnel | mg/kg | 145323-11 | <0.1 \|\| <0.1 | 145323-2 | 98% |
| *Surrogate* TCMX | % | 145323-11 | 93 \|\| 88 \|\| RPD: 6 | 145323-2 | 103% |
| QUALITY CONTROL PCBs in Soil | UNITS | Dup. Sm# | Duplicate Base + Duplicate + %RPD | Spike Sm# | Spike % Recovery |
| Date extracted | - | 145323-11 | 22/04/2016 \|\| 22/04/2016 | 145323-2 | 22/04/2016 |
| Date analysed | - | 145323-11 | 23/04/2016 \|\| 23/04/2016 | 145323-2 | 23/04/2016 |
| Aroclor 1016 | mg/kg | 145323-11 | <0.1 \|\| <0.1 | [NR] | [NR] |
| Aroclor 1221 | mg/kg | 145323-11 | <0.1 \|\| <0.1 | [NR] | [NR] |
| Aroclor 1232 | mg/kg | 145323-11 | <0.1 \|\| <0.1 | [NR] | [NR] |
| Aroclor 1242 | mg/kg | 145323-11 | <0.1 \|\| <0.1 | [NR] | [NR] |
| Aroclor 1248 | mg/kg | 145323-11 | <0.1 \|\| <0.1 | [NR] | [NR] |
| Aroclor 1254 | mg/kg | 145323-11 | <0.1 \|\| <0.1 | 145323-2 | 84% |
| Aroclor 1260 | mg/kg | 145323-11 | <0.1 \|\| <0.1 | [NR] | [NR] |
| *Surrogate* TCLMX | % | 145323-11 | 93 \|\| 88 \|\| RPD: 6 | 145323-2 | 103% |
| QUALITY CONTROL Acid Extractable metals in soil | UNITS | Dup. Sm# | Duplicate Base + Duplicate + %RPD | Spike Sm# | Spike % Recovery |
| Date prepared | - | 145323-11 | 22/04/2016 \|\| 22/04/2016 | 145323-2 | 22/04/2016 |
| Date analysed | - | 145323-11 | 22/04/2016 \|\| 22/04/2016 | 145323-2 | 22/04/2016 |
| Arsenic | mg/kg | 145323-11 | 6 \|\| 7 \|\| RPD: 15 | 145323-2 | 86% |
| Cadmium | mg/kg | 145323-11 | <0.4 \|\| <0.4 | 145323-2 | 88% |
| Chromium | mg/kg | 145323-11 | 28 \|\| 27 \|\| RPD: 4 | 145323-2 | 87% |
| Copper | mg/kg | 145323-11 | 11 \|\| 9 \|\| RPD: 20 | 145323-2 | 105% |
| Lead | mg/kg | 145323-11 | 16 \|\| 17 \|\| RPD: 6 | 145323-2 | 124% |
| Mercury | mg/kg | 145323-11 | <0.1 \|\| <0.1 | 145323-2 | 96% |
| Nickel | mg/kg | 145323-11 | 6 \|\| 5 \|\| RPD: 18 | 145323-2 | 89% |
| Zinc | mg/kg | 145323-11 | 10 \|\| 7 \|\| RPD: 35 | 145323-2 | 72% |

| QUALITY CONTROL<br>Misc Soil - Inorg | UNITS | Dup. Sm# | Duplicate<br>Base + Duplicate + %RPD | Spike Sm# | Spike % Recovery |
|---|---|---|---|---|---|
| Date prepared | - | 145323-11 | 22/04/2016 \|\| 22/04/2016 | 145323-2 | 22/04/2016 |
| Date analysed | - | 145323-11 | 26/04/2016 \|\| 26/04/2016 | 145323-2 | 26/04/2016 |
| Total Phenolics (as Phenol) | mg/kg | 145323-11 | <5 \|\| <5 | 145323-2 | 93% |

**Report Comments:**

TRH_S(semivol):# PQL has been raised due to interference from analytes(other than those being tested) in the sample/s.Percent recovery is not possible to report as the high concentration of analytes in the sample/s have caused interference.

OC/OP/PCBs in soil: PQL has been raised due to interference from analytes(other than those being tested) in the sample/s.

Asbestos: A portion of the supplied sample was sub-sampled for asbestos analysis according to Envirolab procedures. We cannot guarantee that this sub-sample is indicative of the entire sample. Envirolab recommends supplying 40-50g of sample in its own container.
Note: Samples 145323-1 to 14 were sub-sampled from jars provided by the client.

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

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

## Quality Control Definitions

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

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

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

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

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

## Laboratory Acceptance Criteria

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

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

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

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

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

**From:** Tim Wright
**Sent:** Thursday, 2 June 2016 2:51 PM
**To:** Christopher Bagia; Paula Maurici
**Subject:** FW: Parramatta

**Tim Wright** | Snr Associate / Snr Environmental Engineer
**Douglas Partners Pty Ltd** | ABN 75 053 980 117 | www.douglaspartners.com.au
96 Hermitage Road West Ryde NSW 2114 | PO Box 472 West Ryde NSW 1685
P: 02 9809 0666 | F: 02 9809 4095 | M: 0409 543 517 | E: Tim.Wright@douglaspartners.com.au





**From:** Jeremy Faircloth [mailto:JFaircloth@envirolab.com.au]
**Sent:** Friday, 29 April 2016 3:49 PM
**To:** Christopher Bagia
**Cc:** Tim Wright; Aileen Hie
**Subject:** RE: Parramatta

Afternoon,
The guys have told me they see what appears to be bitumen in the samples.

I hope this helps.

Cheers,

**Regards,**

**Jeremy Faircloth | Organics Supervisor | Envirolab Services Pty Ltd**

**Great Chemistry, Great Service.**

12 Ashley Street Chatswood NSW 2067
**T** 612 9910 6200 **F** 612 9910 6201
jfaircloth@envirolab.com.au | www.envirolab.com.au

**From:** Jeremy Faircloth
**Sent:** Friday, 29 April 2016 2:36 PM
**To:** 'Chris.Bagia@douglaspartners.com.au'
**Cc:** Tim Wright (tim.wright@douglaspartners.com.au); Aileen Hie
**Subject:** RE: Parramatta

Gidday Chris,
Here are the chromatograms that we have on file, they are all the same profiles just different concentrations. 9/10 are off the scale there but I can get those amended if you need.

Ill get someone to have a look at those samples later on today for you.

If there is anything else, please don't hesitate to ask,

---

**From:** Aileen Hie
**Sent:** Friday, 29 April 2016 2:18 PM
**To:** Jeremy Faircloth
**Subject:** FW: Parramatta

Can you do this Jeremy?

**Regards,**

**Aileen Hie | Sample Receipt Supervisor | Envirolab Services Pty Ltd**

**Great Chemistry, Great Service.**

12 Ashley Street Chatswood NSW 2067
**T** 612 9910 6200 **F** 612 9910 6201
ahie@envirolab.com.au | www.envirolab.com.au



---

**From:** Christopher Bagia [mailto:Chris.Bagia@douglaspartners.com.au]
**Sent:** Friday, 29 April 2016 1:38 PM
**To:** Aileen Hie
**Cc:** Tim Wright
**Subject:** Parramatta

Hi Aileen

We got some unexpected high hits of TRH and PAH in BH02, 07, 09, 10 and 12. The site history suggests that it shouldn't be this high as there is no previous signs of contamination on or around the site.

Could you please get someone to have a look at the Chromatogram to see what it might be. As well as checking the samples in the jars themselves for bitumen.

The Job Number is: 85374.02

ELS#: 145323

Kindest Regards

Chris

---

**Christopher Bagia** | Environmental Scientist
**Douglas Partners Pty Ltd** | ABN 75 053 980 117 | www.douglaspartners.com.au
96 Hermitage Road West Ryde NSW 2114 | PO Box 472 West Ryde NSW 1685
P: 02 9809 0666 | F: 02 9809 4095 | E: Chris.Bagia@douglaspartners.com.au



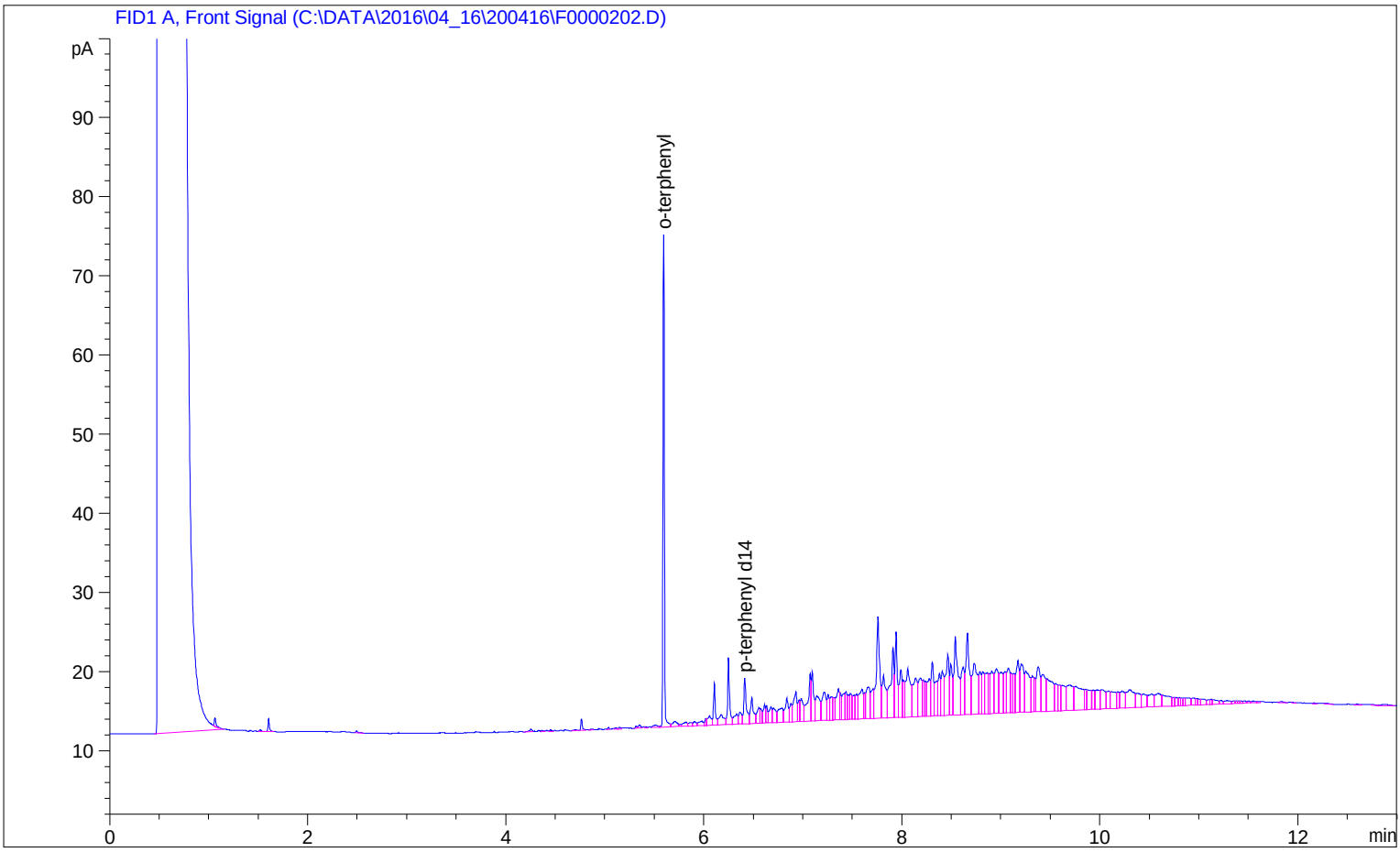




This email has been scanned by the Symantec Email Security.cloud service.
For more information please visit http://www.symanteccloud.com

Data File C:\DATA\2016\04_16\200416\F0000202.D
Sample Name: s145323-2

```
==========================================================================
Acq. Operator   :                                  Seq. Line : 202
Acq. Instrument : GC#4                              Location : Vial 52
Injection Date  : 23/04/2016 9:54:13 AM                  Inj :   1
                                                  Inj Volume : 1 µl
Acq. Method     : C:\CHEM32\1\METHODS\NEPM JF.M
Last changed    : 15/04/2016 5:27:11 PM
Analysis Method : C:\METHODS\2016\04_16\200416F-PROCESSING.M
Last changed    : 26/04/2016 8:44:01 AM
                  (modified after loading)
Method Info     : FAST TPH WITH 15M HP5 COLUMNS
```




```
==========================================================================
                    External Standard Report
==========================================================================

Sorted By             :      Signal
Calib. Data Modified  :      21/04/2016 10:07:05 AM
Multiplier:                   :      1.0000
Dilution:                     :      1.0000
Do not use Multiplier & Dilution Factor with ISTDs

Signal 1: FID1 A, Front Signal

RetTime  Type     Area     Amt/Area    Amount   Grp   Name
 [min]          [pA*s]                 [mg/L]
-------|------|----------|----------|----------|--|------------------
  5.596 VV    I   59.51939 1.43762e-1    8.55664    o-terphenyl
  6.415 VV    I   10.19207 3.42443e-1    3.49021    p-terphenyl d14
```

Data File C:\DATA\2016\04_16\200416\F0000202.D
Sample Name: s145323-2

Totals : 12.04685

==========

Summed Peaks Report

==========

Signal 1: FID1 A, Front Signal

| Name | Start Time [min] | End Time [min] | Total Area [pA*s] | Amount [mg/L] |
|---|---|---|---|---|
| TRH C10-C14 | 2.020 | 4.120 | 3.80423e-1 | 0.0577 |
| NEPM >C10-C16 | 2.560 | 4.810 | 2.93756 | 0.4458 |
| TRH C15-C28 | 4.121 | 7.860 | 296.29492 | 45.8422 |
| NEPM >C16-C34 | 4.811 | 9.000 | 652.04749 | 100.8835 |
| TRH C29-C36 | 7.861 | 9.330 | 467.05841 | 70.0830 |
| NEPM >C34-C40 | 9.001 | 10.410 | 290.05180 | 43.5229 |

Totals : 260.8351

==========

Final Summed Peaks Report

==========

Signal 1: FID1 A, Front Signal

| Name | Total Area [pA*s] | Amount [mg/L] |
|---|---|---|
| TRH C10-C14 | 3.80423e-1 | 0.0577 |
| NEPM >C10-C16 | 2.93756 | 0.4458 |
| TRH C15-C28 | 296.29492 | 45.8422 |
| NEPM >C16-C34 | 652.04749 | 100.8835 |
| TRH C29-C36 | 467.05841 | 70.0830 |
| NEPM >C34-C40 | 290.05180 | 43.5229 |
| o-terphenyl | 59.51939 | 8.5566 |
| p-terphenyl d14 | 10.19207 | 3.4902 |

Totals : 272.8820

*** End of Report ***

# CHAIN OF CUSTODY

**Douglas Partners**
Geotechnics | Environment | Groundwater

| | | | |
|---|---|---|---|
| **Client:** Douglas Partners | **Project Number** 73315.02 | **To:** | Envirolab Services |
| **Contact Person:** Michael Whittaker | **Project Name:** Parramatta | **Contact Person:** | Aileen Hie |
| **Project Mgr:** Tim Wright | **PO No.:** | **Address:** | 12 Ashley Street |
| | **lab Quote No. :** | | Chatswood NSW 2068 |
| **Address:** 96 Hermitage Road | **Date results required:** | **Phone:** | 02 9910 6200 |
| West Ryde NSW 2114 | **Or choose:** standard | **Fax:** | 02 9910 6201 |
| | *Note: Inform lab in advance if urgent turnaround is required - surcharges apply* | **Email:** | ahie@envirolab.com.au |
| **Phone:** 9809 0666 **Mob:** 0447 282 095 | **Report format:** esdat / PDF / Excel | **Laboratory Report No:** | |
| **Email:** Tim.wright @douglaspartners.com.au | **Comments:** | **Lab Comments:** | |
| Michael.whittaker @douglaspartners.com.au | | | |

| Sample information | | | | | | Tests Required | | | | | | | | | | | Comments |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lab Sample ID | Field Sample ID | Depth | Date sampled | Container Type | Type of sample | Combo 8a | PCB | pH | CEC | Asbestos ID | | | | | | Combo | Provide as much information about the sample as you can |
| 1 | BH01 | 0.3-0.4 | 14.4.16 | Jar | Soil | X | X | X | X | | | | | | | | |
| 2 | BH02 | 0.25-0.35 | 14.4.16 | Jar | Soil | X | X | X | X | | | | | | | | |
| 3 | BH03 | 0.5-0.6 | 14.4.16 | Jar | Soil | X | X | X | X | | | | | | | | |
| 4 | BH04 | 0.3-0.4 | 15/ 14.4.16 | Jar | Soil | X | X | X | X | | | | | | | | |
| 5 | BH05 | 0.3-0.4 | 15/ 14.4.16 | Jar | Soil | X | X | X | X | | | | | | | | |
| 6 | BH06 | 0.5-0.6 | 15/ 14.4.16 | Jar | Soil | X | X | X | X | | | | | | | | |
| 7 | BH07 | 0.35-0.45 | 19.4.16 | Jar | Soil | X | X | X | X | | | | | | | | |
| 8 | BH08 | 0.3-0.4 | 19.4.16 | Jar | Soil | X | X | X | X | | | | | | | | |
| 9 | BH09 | 0.3-0.4 | 19.4.16 | Jar | Soil | X | X | X | X | | | | | | | | |
| 10 | BH10 | 0.4-0.5 | 19.4.16 | Jar | Soil | X | X | X | X | | | | | | | | |
| 11 | BH11 | 0.45-0.55 | 19.4.16 | Jar | Soil | X | X | X | X | | | | | | | | |
| 12 | BH12 | 0.2-0.3 | 19.4.16 | Jar | Soil | X | X | X | X | | | | | | | | |
| 13 | BD1 | | 15/ 19.4.16 | Jar | Soil | X | | | | | | | | | | | |
| 14 | BD1 ~~BD2~~ | | 19.4.16 | Jar | Soil | X | | | | | | | | | | | |
| 15 | T3 A01 | | 14.4.16 | Bag | ACM | | | | | X | | | | | | | |

| | | |
|---|---|---|
| **Relinquished by:** Douglas Partners | **Sample Receipt** | ***Lab use only:*** |
| **Hand delivered / Courier (by whom)** | **Received by (Company):** ELS | **Samples Received: Cool or Ambient (circle one)** |
| **Condition of Sample at dispatch Cool or Ambient (circle)** | **Print Name:** James Goddard | **Temperature Received at:** (if applicable) |
| **Temperature (if Applicable):** | **Date & Time:** 21/4/16 1600 | **Transported by: Hand delivered / courier** |
| **Print Name: Michael Whittaker** | **Signature:** | |
| **Date & Time:** | | |
| **Signature:** | | Page 1 of 1 |

ENVIROLAB

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

Job No: 145323
Date Received: 21/4/16
Time Received: 16:00
Received by: JAG
Temp: Cool/Ambient
Cooling: Ice/Icepack
Security: Intact/Broken/None

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** | Douglas Partners Pty Ltd |
| **Attention** | Michael Whittaker, Tim Wright |

| Sample Login Details | |
|---|---|
| **Your Reference** | 85374.02, Parramatta |
| **Envirolab Reference** | **145323** |
| **Date Sample Received** | 21/04/2016 |
| **Date Instructions Received** | 21/04/2016 |
| **Date Results Expected to be Reported** | **29/04/2016** |

| Sample Condition | |
|---|---|
| **Samples received in appropriate condition for analysis** | YES |
| **No. of Samples Provided** | 14 Soils 1 Material |
| **Turnaround Time Requested** | Standard |
| **Temperature on receipt (°C)** | 17.8 |
| **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* | *PAHs in Soil* | *Organochlorine Pesticides in soil* | *Organophosphorus Pesticides* | *PCBs in Soil* | *Acid Extractable metals in soil* | *Total Phenolics (as Phenol)* | *pH 1:5 soil:water* | *CEC* | *Asbestos ID - soils* | *Asbestos ID - materials* |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| BH01-0.3-0.4 | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | | | ✓ | |
| BH02-0.25-0.35 | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | |
| BH03-0.5-0.6 | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | | | ✓ | |
| BH04-0.3-0.4 | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | | | ✓ | |
| BH05-0.3-0.4 | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | | | ✓ | |
| BH06-0.5-0.6 | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | |
| BH07-0.35-0.45 | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | |
| BH08-0.3-0.4 | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | | | ✓ | |
| BH09-0.3-0.4 | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | | | ✓ | |
| BH10-0.4-0.5 | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | | | ✓ | |
| BH11-0.45-0.55 | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | | | ✓ | |
| BH12-0.2-0.3 | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | |
| BD1 | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | | | ✓ | |
| BD1 | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | | | ✓ | |
| T3 A01 | | | | | | | | | | | | ✓ |

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

# CERTIFICATE OF ANALYSIS 154230

**Client:**

**Douglas Partners Pty Ltd**
96 Hermitage Rd
West Ryde
NSW 2114

**Attention:** Michael Whittaker

**Sample log in details:**

| | | | |
|---|---|---|---|
| Your Reference: | **85374.02, AHPS & PPS** | | |
| No. of samples: | 6 Waters | | |
| Date samples received / completed instructions received | 26/9/16 | / | 26/9/16 |

**Analysis Details:**

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

**Report Details:**

| | | | |
|---|---|---|---|
| Date results requested by: / Issue Date: | 4/10/16 | / | 4/10/16 |
| Date of Preliminary Report: | Not Issued | | |

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

**Results Approved By:**

David Springer
General Manager

| VOCs in water<br>Our Reference:<br>Your Reference<br><br>Date Sampled<br>Type of sample | UNITS<br>----------<br>-<br>----------<br> | 154230-1<br>MW1<br><br>16/09/2016<br>Water | 154230-2<br>102<br><br>16/09/2016<br>Water | 154230-3<br>103<br><br>16/09/2016<br>Water |
|---|---|---|---|---|
| Date extracted | - | 27/09/2016 | 27/09/2016 | 27/09/2016 |
| Date analysed | - | 27/09/2016 | 27/09/2016 | 28/09/2016 |
| Dichlorodifluoromethane | µg/L | <10 | <10 | <10 |
| Chloromethane | µg/L | <10 | <10 | <10 |
| Vinyl Chloride | µg/L | <10 | <10 | <10 |
| Bromomethane | µg/L | <10 | <10 | <10 |
| Chloroethane | µg/L | <10 | <10 | <10 |
| Trichlorofluoromethane | µg/L | <10 | <10 | <10 |
| 1,1-Dichloroethene | µg/L | <1 | <1 | <1 |
| Trans-1,2-dichloroethene | µg/L | <1 | <1 | <1 |
| 1,1-dichloroethane | µg/L | <1 | <1 | <1 |
| Cis-1,2-dichloroethene | µg/L | <1 | <1 | <1 |
| Bromochloromethane | µg/L | <1 | <1 | <1 |
| Chloroform | µg/L | 16 | <1 | <1 |
| 2,2-dichloropropane | µg/L | <1 | <1 | <1 |
| 1,2-dichloroethane | µg/L | <1 | <1 | <1 |
| 1,1,1-trichloroethane | µg/L | <1 | <1 | <1 |
| 1,1-dichloropropene | µg/L | <1 | <1 | <1 |
| Cyclohexane | µg/L | <1 | <1 | <1 |
| Carbon tetrachloride | µg/L | <1 | <1 | <1 |
| Benzene | µg/L | <1 | <1 | <1 |
| Dibromomethane | µg/L | <1 | <1 | <1 |
| 1,2-dichloropropane | µg/L | <1 | <1 | <1 |
| Trichloroethene | µg/L | <1 | <1 | <1 |
| Bromodichloromethane | µg/L | 4 | <1 | <1 |
| trans-1,3-dichloropropene | µg/L | <1 | <1 | <1 |
| cis-1,3-dichloropropene | µg/L | <1 | <1 | <1 |
| 1,1,2-trichloroethane | µg/L | <1 | <1 | <1 |
| Toluene | µg/L | <1 | <1 | <1 |
| 1,3-dichloropropane | µg/L | <1 | <1 | <1 |
| Dibromochloromethane | µg/L | <1 | <1 | <1 |
| 1,2-dibromoethane | µg/L | <1 | <1 | <1 |
| Tetrachloroethene | µg/L | <1 | <1 | <1 |
| 1,1,1,2-tetrachloroethane | µg/L | <1 | <1 | <1 |
| Chlorobenzene | µg/L | <1 | <1 | <1 |
| Ethylbenzene | µg/L | <1 | <1 | <1 |
| Bromoform | µg/L | <1 | <1 | <1 |
| m+p-xylene | µg/L | <2 | <2 | <2 |
| Styrene | µg/L | <1 | <1 | <1 |
| 1,1,2,2-tetrachloroethane | µg/L | <1 | <1 | <1 |
| o-xylene | µg/L | <1 | <1 | <1 |

| VOCs in water<br>Our Reference:<br>Your Reference<br><br>Date Sampled<br>Type of sample | UNITS<br>----------<br>-<br>---------- | 154230-1<br>MW1<br><br>16/09/2016<br>Water | 154230-2<br>102<br><br>16/09/2016<br>Water | 154230-3<br>103<br><br>16/09/2016<br>Water |
|---|---|---|---|---|
| 1,2,3-trichloropropane | µg/L | <1 | <1 | <1 |
| Isopropylbenzene | µg/L | <1 | <1 | <1 |
| Bromobenzene | µg/L | <1 | <1 | <1 |
| n-propyl benzene | µg/L | <1 | <1 | <1 |
| 2-chlorotoluene | µg/L | <1 | <1 | <1 |
| 4-chlorotoluene | µg/L | <1 | <1 | <1 |
| 1,3,5-trimethyl benzene | µg/L | <1 | <1 | <1 |
| Tert-butyl benzene | µg/L | <1 | <1 | <1 |
| 1,2,4-trimethyl benzene | µg/L | <1 | <1 | 1 |
| 1,3-dichlorobenzene | µg/L | <1 | <1 | <1 |
| Sec-butyl benzene | µg/L | <1 | <1 | <1 |
| 1,4-dichlorobenzene | µg/L | <1 | <1 | <1 |
| 4-isopropyl toluene | µg/L | <1 | <1 | <1 |
| 1,2-dichlorobenzene | µg/L | <1 | <1 | <1 |
| n-butyl benzene | µg/L | <1 | <1 | <1 |
| 1,2-dibromo-3-chloropropane | µg/L | <1 | <1 | <1 |
| 1,2,4-trichlorobenzene | µg/L | <1 | <1 | <1 |
| Hexachlorobutadiene | µg/L | <1 | <1 | <1 |
| 1,2,3-trichlorobenzene | µg/L | <1 | <1 | <1 |
| *Surrogate* Dibromofluoromethane | % | 124 | 123 | 125 |
| *Surrogate* toluene-d8 | % | 99 | 97 | 98 |
| *Surrogate* 4-BFB | % | 121 | 120 | 126 |

| vTRH(C6-C10)/BTEXN in Water | | | | | | |
|---|---|---|---|---|---|---|
| Our Reference: | UNITS | 154230-1 | 154230-2 | 154230-3 | 154230-5 | 154230-6 |
| Your Reference | ---------- - | MW1 | 102 | 103 | Spike | Blank |
| Date Sampled | ---------- | 16/09/2016 | 16/09/2016 | 16/09/2016 | 16/09/2016 | 16/09/2016 |
| Type of sample | | Water | Water | Water | Water | Water |
| Date extracted | - | 27/09/2016 | 27/09/2016 | 27/09/2016 | 26/09/2016 | 26/09/2016 |
| Date analysed | - | 28/09/2016 | 28/09/2016 | 28/09/2016 | 27/09/2016 | 27/09/2016 |
| TRHC$_6$ - C$_9$ | µg/L | 15 | <10 | 13 | [NA] | [NA] |
| TRHC$_6$ - C$_{10}$ | µg/L | 15 | <10 | 24 | [NA] | [NA] |
| TRHC$_6$ - C$_{10}$ less BTEX (F1) | µg/L | 15 | <10 | 24 | [NA] | [NA] |
| Benzene | µg/L | <1 | <1 | <1 | 99% | <1 |
| Toluene | µg/L | <1 | <1 | <1 | 103% | <1 |
| Ethylbenzene | µg/L | <1 | <1 | <1 | 109% | <1 |
| m+p-xylene | µg/L | <2 | <2 | <2 | 110% | <2 |
| o-xylene | µg/L | <1 | <1 | <1 | 112% | <1 |
| Naphthalene | µg/L | <1 | <1 | <1 | [NA] | [NA] |
| *Surrogate* Dibromofluoromethane | % | 124 | 123 | 125 | 128 | 126 |
| *Surrogate* toluene-d8 | % | 99 | 97 | 98 | 100 | 97 |
| *Surrogate* 4-BFB | % | 121 | 120 | 126 | 103 | 105 |

| svTRH (C10-C40) in Water | | | | |
|---|---|---|---|---|
| Our Reference: | UNITS | 154230-1 | 154230-2 | 154230-3 |
| Your Reference | ---------- | MW1 | 102 | 103 |
| | - | | | |
| Date Sampled | ---------- | 16/09/2016 | 16/09/2016 | 16/09/2016 |
| Type of sample | | Water | Water | Water |
| Date extracted | - | 28/09/2016 | 28/09/2016 | 28/09/2016 |
| Date analysed | - | 29/09/2016 | 29/09/2016 | 29/09/2016 |
| TRHC$_{10}$ - C$_{14}$ | µg/L | <50 | <50 | 62 |
| TRHC$_{15}$ - C$_{28}$ | µg/L | <100 | <100 | <100 |
| TRHC$_{29}$ - C$_{36}$ | µg/L | <100 | <100 | <100 |
| TRH>C$_{10}$ - C$_{16}$ | µg/L | <50 | <50 | <50 |
| TRH>C$_{10}$ - C$_{16}$ less Naphthalene (F2) | µg/L | <50 | <50 | <50 |
| TRH>C$_{16}$ - C$_{34}$ | µg/L | <100 | <100 | <100 |
| TRH>C$_{34}$ - C$_{40}$ | µg/L | <100 | <100 | <100 |
| *Surrogate* o-Terphenyl | % | 64 | 88 | 96 |

| PAHs in Water<br>Our Reference:<br>Your Reference | UNITS<br>---------- | 154230-1<br>MW1 | 154230-2<br>102 | 154230-3<br>103 | 154230-4<br>BD1 |
|---|---|---|---|---|---|
| Date Sampled | - ---------- | 16/09/2016 | 16/09/2016 | 16/09/2016 | 16/09/2016 |
| Type of sample | | Water | Water | Water | Water |
| Date extracted | - | 28/09/2016 | 28/09/2016 | 28/09/2016 | 28/09/2016 |
| Date analysed | - | 29/09/2016 | 29/09/2016 | 29/09/2016 | 29/09/2016 |
| Naphthalene | µg/L | <1 | <1 | <1 | <1 |
| Acenaphthylene | µg/L | <1 | <1 | <1 | <1 |
| Acenaphthene | µg/L | <1 | <1 | <1 | <1 |
| Fluorene | µg/L | <1 | <1 | <1 | <1 |
| Phenanthrene | µg/L | <1 | <1 | <1 | <1 |
| Anthracene | µg/L | <1 | <1 | <1 | <1 |
| Fluoranthene | µg/L | <1 | <1 | <1 | <1 |
| Pyrene | µg/L | <1 | <1 | <1 | <1 |
| Benzo(a)anthracene | µg/L | <1 | <1 | <1 | <1 |
| Chrysene | µg/L | <1 | <1 | <1 | <1 |
| Benzo(b,j+k)fluoranthene | µg/L | <2 | <2 | <2 | <2 |
| Benzo(a)pyrene | µg/L | <1 | <1 | <1 | <1 |
| Indeno(1,2,3-c,d)pyrene | µg/L | <1 | <1 | <1 | <1 |
| Dibenzo(a,h)anthracene | µg/L | <1 | <1 | <1 | <1 |
| Benzo(g,h,i)perylene | µg/L | <1 | <1 | <1 | <1 |
| Benzo(a)pyrene TEQ | µg/L | <5 | <5 | <5 | <5 |
| Total +ve PAH's | µg/L | NIL (+)VE | NIL (+)VE | NIL (+)VE | NIL (+)VE |
| *Surrogate p*-Terphenyl-d14 | % | 68 | 97 | 94 | 98 |

| OCP in water<br>Our Reference:<br>Your Reference | UNITS<br>----------<br>- | 154230-1<br>MW1 | 154230-2<br>102 | 154230-3<br>103 |
|---|---|---|---|---|
| Date Sampled | ---------- | 16/09/2016 | 16/09/2016 | 16/09/2016 |
| Type of sample | | Water | Water | Water |
| Date extracted | - | 28/09/2016 | 28/09/2016 | 28/09/2016 |
| Date analysed | - | 29/09/2016 | 29/09/2016 | 29/09/2016 |
| HCB | µg/L | <0.2 | <0.2 | <0.2 |
| alpha-BHC | µg/L | <0.2 | <0.2 | <0.2 |
| gamma-BHC | µg/L | <0.2 | <0.2 | <0.2 |
| beta-BHC | µg/L | <0.2 | <0.2 | <0.2 |
| Heptachlor | µg/L | <0.2 | <0.2 | <0.2 |
| delta-BHC | µg/L | <0.2 | <0.2 | <0.2 |
| Aldrin | µg/L | <0.2 | <0.2 | <0.2 |
| Heptachlor Epoxide | µg/L | <0.2 | <0.2 | <0.2 |
| gamma-Chlordane | µg/L | <0.2 | <0.2 | <0.2 |
| alpha-Chlordane | µg/L | <0.2 | <0.2 | <0.2 |
| Endosulfan I | µg/L | <0.2 | <0.2 | <0.2 |
| pp-DDE | µg/L | <0.2 | <0.2 | <0.2 |
| Dieldrin | µg/L | <0.2 | <0.2 | <0.2 |
| Endrin | µg/L | <0.2 | <0.2 | <0.2 |
| pp-DDD | µg/L | <0.2 | <0.2 | <0.2 |
| Endosulfan II | µg/L | <0.2 | <0.2 | <0.2 |
| pp-DDT | µg/L | <0.2 | <0.2 | <0.2 |
| Endrin Aldehyde | µg/L | <0.2 | <0.2 | <0.2 |
| Endosulfan Sulphate | µg/L | <0.2 | <0.2 | <0.2 |
| Methoxychlor | µg/L | <0.2 | <0.2 | <0.2 |
| *Surrogate* TCMX | % | 92 | 135 | 138 |

| OP Pesticides in water | | | | |
|---|---|---|---|---|
| Our Reference: | UNITS | 154230-1 | 154230-2 | 154230-3 |
| Your Reference | ---------- | MW1 | 102 | 103 |
| | - | | | |
| Date Sampled | ---------- | 16/09/2016 | 16/09/2016 | 16/09/2016 |
| Type of sample | | Water | Water | Water |
| Date extracted | - | 28/09/2016 | 28/09/2016 | 28/09/2016 |
| Date analysed | - | 29/09/2016 | 29/09/2016 | 29/09/2016 |
| Azinphos-methyl (Guthion) | µg/L | <0.2 | <0.2 | <0.2 |
| Bromophos ethyl | µg/L | <0.2 | <0.2 | <0.2 |
| Chlorpyriphos | µg/L | <0.2 | <0.2 | <0.2 |
| Chlorpyriphos-methyl | µg/L | <0.2 | <0.2 | <0.2 |
| Diazinon | µg/L | <0.2 | <0.2 | <0.2 |
| Dichlorovos | µg/L | <0.2 | <0.2 | <0.2 |
| Dimethoate | µg/L | <0.2 | <0.2 | <0.2 |
| Ethion | µg/L | <0.2 | <0.2 | <0.2 |
| Fenitrothion | µg/L | <0.2 | <0.2 | <0.2 |
| Malathion | µg/L | <0.2 | <0.2 | <0.2 |
| Parathion | µg/L | <0.2 | <0.2 | <0.2 |
| Ronnel | µg/L | <0.2 | <0.2 | <0.2 |
| *Surrogate* TCMX | % | 92 | 135 | 138 |

| PCBs in Water | | | | |
|---|---|---|---|---|
| Our Reference: | UNITS | 154230-1 | 154230-2 | 154230-3 |
| Your Reference | ---------- | MW1 | 102 | 103 |
| | - | | | |
| Date Sampled | ---------- | 16/09/2016 | 16/09/2016 | 16/09/2016 |
| Type of sample | | Water | Water | Water |
| Date extracted | - | 28/09/2016 | 28/09/2016 | 28/09/2016 |
| Date analysed | - | 29/09/2016 | 29/09/2016 | 29/09/2016 |
| Aroclor 1016 | µg/L | <2 | <2 | <2 |
| Aroclor 1221 | µg/L | <2 | <2 | <2 |
| Aroclor 1232 | µg/L | <2 | <2 | <2 |
| Aroclor 1242 | µg/L | <2 | <2 | <2 |
| Aroclor 1248 | µg/L | <2 | <2 | <2 |
| Aroclor 1254 | µg/L | <2 | <2 | <2 |
| Aroclor 1260 | µg/L | <2 | <2 | <2 |
| *Surrogate* TCLMX | % | 92 | 135 | 138 |

| Total Phenolics in Water | | | | |
|---|---|---|---|---|
| Our Reference: | UNITS | 154230-1 | 154230-2 | 154230-3 |
| Your Reference | ---------- | MW1 | 102 | 103 |
| | - | | | |
| Date Sampled | ---------- | 16/09/2016 | 16/09/2016 | 16/09/2016 |
| Type of sample | | Water | Water | Water |
| Date extracted | - | 27/09/2016 | 27/09/2016 | 27/09/2016 |
| Date analysed | - | 27/09/2016 | 27/09/2016 | 27/09/2016 |
| Total Phenolics (as Phenol) | mg/L | <0.05 | <0.05 | <0.05 |

| HM in water - dissolved | | | | | |
|---|---|---|---|---|---|
| Our Reference: | UNITS | 154230-1 | 154230-2 | 154230-3 | 154230-4 |
| Your Reference | ---------- | MW1 | 102 | 103 | BD1 |
| Date Sampled | - ---------- | 16/09/2016 | 16/09/2016 | 16/09/2016 | 16/09/2016 |
| Type of sample | | Water | Water | Water | Water |
| Date prepared | - | 27/09/2016 | 27/09/2016 | 27/09/2016 | 27/09/2016 |
| Date analysed | - | 27/09/2016 | 27/09/2016 | 27/09/2016 | 27/09/2016 |
| Arsenic-Dissolved | µg/L | 2 | <1 | <1 | <1 |
| Cadmium-Dissolved | µg/L | <0.1 | <0.1 | 0.2 | <0.1 |
| Chromium-Dissolved | µg/L | <1 | <1 | <1 | <1 |
| Copper-Dissolved | µg/L | 2 | <1 | 23 | <1 |
| Lead-Dissolved | µg/L | <1 | <1 | 2 | <1 |
| Mercury-Dissolved | µg/L | <0.05 | <0.05 | <0.05 | <0.05 |
| Nickel-Dissolved | µg/L | 12 | 1 | 53 | 1 |
| Zinc-Dissolved | µg/L | 65 | 12 | 340 | 11 |

| Perfluoroalkylated Substances in Waters | | | | |
|---|---|---|---|---|
| Our Reference: | UNITS | 154230-1 | 154230-2 | 154230-3 |
| Your Reference | ---------- | MW1 | 102 | 103 |
| Date Sampled | ---------- | 16/09/2016 | 16/09/2016 | 16/09/2016 |
| Type of sample | | Water | Water | Water |
| Date prepared | - | 04/10/2016 | 04/10/2016 | 04/10/2016 |
| Date analysed | - | 04/10/2016 | 04/10/2016 | 04/10/2016 |
| Perfluorohexanesulfonic acid | µg/L | <0.01 | <0.01 | <0.01 |
| Perfluorooctanesulfonic acid PFOS | µg/L | <0.01 | <0.01 | <0.01 |
| Perfluorooctanoic acid PFOA | µg/L | <0.01 | <0.01 | <0.01 |
| 6:2 FTS | µg/L | <0.01 | <0.01 | <0.01 |
| 8:2 FTS | µg/L | <0.01 | <0.01 | <0.01 |
| Surrogate $^{13}C_4$ PFOS | % | 98 | 99 | 99 |

| Cations in water Dissolved | | | | |
|---|---|---|---|---|
| Our Reference: | UNITS | 154230-1 | 154230-2 | 154230-3 |
| Your Reference | ---------- | MW1 | 102 | 103 |
| | - | | | |
| Date Sampled | ---------- | 16/09/2016 | 16/09/2016 | 16/09/2016 |
| Type of sample | | Water | Water | Water |
| Date digested | - | 27/09/2016 | 27/09/2016 | 27/09/2016 |
| Date analysed | - | 27/09/2016 | 27/09/2016 | 27/09/2016 |
| Calcium - Dissolved | mg/L | 11 | 23 | 10 |
| Magnesium - Dissolved | mg/L | 18 | 33 | 130 |
| Hardness | mgCaCO3/L | 100 | 190 | 540 |

| Method ID | Methodology Summary |
|---|---|
| Org-013 | Water samples are analysed directly by purge and trap GC-MS. |
| Org-016 | Soil samples are extracted with methanol and spiked into water prior to analysing by purge and trap GC-MS. Water samples are analysed directly by purge and trap GC-MS. F1 = (C6-C10)-BTEX as per NEPM B1 Guideline on Investigation Levels for Soil and Groundwater. |
| Org-003 | Soil samples are extracted with Dichloromethane/Acetone and waters with Dichloromethane and analysed by GC-FID.<br>F2 = (>C10-C16)-Naphthalene as per NEPM B1 Guideline on Investigation Levels for Soil and Groundwater (HSLs Tables 1A (3, 4)). Note Naphthalene is determined from the VOC analysis. |
| Org-012 | Soil samples are extracted with Dichloromethane/Acetone and waters with Dichloromethane and analysed by GC-MS. Benzo(a)pyrene TEQ as per NEPM B1 Guideline on Investigation Levels for Soil and Groundwater - 2013. |
| Org-005 | Soil samples are extracted with dichloromethane/acetone and waters with dichloromethane and analysed by GC with dual ECD's. |
| Org-008 | Soil samples are extracted with dichloromethane/acetone and waters with dichloromethane and analysed by GC with dual ECD's. |
| Org-006 | Soil samples are extracted with dichloromethane/acetone and waters with dichloromethane and analysed by GC-ECD. |
| Inorg-031 | Total Phenolics by segmented flow analyser (in line distillation with colourimetric finish).<br>Solids are extracted in a caustic media prior to analysis. |
| Metals-022 ICP-MS | Determination of various metals by ICP-MS. |
| Metals-021 | Determination of Mercury by Cold Vapour AAS. |
| Org-035 | Soil samples are extracted with Methanol, evaporated and reconsistuted. Waters are directly injected and/or concentrated after SPE. Analysis is undertaken with LC-MS/MS.<br><br>PFAS results include the sum of branched and linear isomers where applicable.<br><br>Please contact the laboratory if estimates of Measurement Uncertainty are required as per WA DER. |
| Metals-020 | Determination of various metals by ICP-AES. |

| QUALITY CONTROL<br><br>VOCs in water | UNITS | PQL | METHOD | Blank | Duplicate Sm# | Duplicate results<br><br>Base \|\| Duplicate \|\| %RPD | Spike Sm# | Spike % Recovery |
|---|---|---|---|---|---|---|---|---|
| Date extracted | - | | | 27/09/2016 | 154230-1 | 27/09/2016 \|\| 28/09/2016 | LCS-W1 | 27/09/2016 |
| Date analysed | - | | | 27/09/2016 | 154230-1 | 27/09/2016 \|\| 28/09/2016 | LCS-W1 | 27/09/2016 |
| Dichlorodifluoromethane | µg/L | 10 | Org-013 | <10 | 154230-1 | <10 \|\| <10 | [NR] | [NR] |
| Chloromethane | µg/L | 10 | Org-013 | <10 | 154230-1 | <10 \|\| <10 | [NR] | [NR] |
| Vinyl Chloride | µg/L | 10 | Org-013 | <10 | 154230-1 | <10 \|\| <10 | [NR] | [NR] |
| Bromomethane | µg/L | 10 | Org-013 | <10 | 154230-1 | <10 \|\| <10 | [NR] | [NR] |
| Chloroethane | µg/L | 10 | Org-013 | <10 | 154230-1 | <10 \|\| <10 | [NR] | [NR] |
| Trichlorofluoromethane | µg/L | 10 | Org-013 | <10 | 154230-1 | <10 \|\| <10 | [NR] | [NR] |
| 1,1-Dichloroethene | µg/L | 1 | Org-013 | <1 | 154230-1 | <1 \|\| <1 | [NR] | [NR] |
| Trans-1,2-dichloroethene | µg/L | 1 | Org-013 | <1 | 154230-1 | <1 \|\| <1 | [NR] | [NR] |
| 1,1-dichloroethane | µg/L | 1 | Org-013 | <1 | 154230-1 | <1 \|\| <1 | LCS-W1 | 107% |
| Cis-1,2-dichloroethene | µg/L | 1 | Org-013 | <1 | 154230-1 | <1 \|\| <1 | [NR] | [NR] |
| Bromochloromethane | µg/L | 1 | Org-013 | <1 | 154230-1 | <1 \|\| <1 | [NR] | [NR] |
| Chloroform | µg/L | 1 | Org-013 | <1 | 154230-1 | 16 \|\| 16 \|\| RPD: 0 | LCS-W1 | 107% |
| 2,2-dichloropropane | µg/L | 1 | Org-013 | <1 | 154230-1 | <1 \|\| <1 | [NR] | [NR] |
| 1,2-dichloroethane | µg/L | 1 | Org-013 | <1 | 154230-1 | <1 \|\| <1 | LCS-W1 | 107% |
| 1,1,1-trichloroethane | µg/L | 1 | Org-013 | <1 | 154230-1 | <1 \|\| <1 | LCS-W1 | 107% |
| 1,1-dichloropropene | µg/L | 1 | Org-013 | <1 | 154230-1 | <1 \|\| <1 | [NR] | [NR] |
| Cyclohexane | µg/L | 1 | Org-013 | <1 | 154230-1 | <1 \|\| <1 | [NR] | [NR] |
| Carbon tetrachloride | µg/L | 1 | Org-013 | <1 | 154230-1 | <1 \|\| <1 | [NR] | [NR] |
| Benzene | µg/L | 1 | Org-013 | <1 | 154230-1 | <1 \|\| <1 | [NR] | [NR] |
| Dibromomethane | µg/L | 1 | Org-013 | <1 | 154230-1 | <1 \|\| <1 | [NR] | [NR] |
| 1,2-dichloropropane | µg/L | 1 | Org-013 | <1 | 154230-1 | <1 \|\| <1 | [NR] | [NR] |
| Trichloroethene | µg/L | 1 | Org-013 | <1 | 154230-1 | <1 \|\| <1 | LCS-W1 | 114% |
| Bromodichloromethane | µg/L | 1 | Org-013 | <1 | 154230-1 | 4 \|\| 4 \|\| RPD: 0 | LCS-W1 | 109% |
| trans-1,3-dichloropropene | µg/L | 1 | Org-013 | <1 | 154230-1 | <1 \|\| <1 | [NR] | [NR] |
| cis-1,3-dichloropropene | µg/L | 1 | Org-013 | <1 | 154230-1 | <1 \|\| <1 | [NR] | [NR] |
| 1,1,2-trichloroethane | µg/L | 1 | Org-013 | <1 | 154230-1 | <1 \|\| <1 | [NR] | [NR] |
| Toluene | µg/L | 1 | Org-013 | <1 | 154230-1 | <1 \|\| <1 | [NR] | [NR] |
| 1,3-dichloropropane | µg/L | 1 | Org-013 | <1 | 154230-1 | <1 \|\| <1 | [NR] | [NR] |
| Dibromochloromethane | µg/L | 1 | Org-013 | <1 | 154230-1 | <1 \|\| <1 | LCS-W1 | 107% |
| 1,2-dibromoethane | µg/L | 1 | Org-013 | <1 | 154230-1 | <1 \|\| <1 | [NR] | [NR] |
| Tetrachloroethene | µg/L | 1 | Org-013 | <1 | 154230-1 | <1 \|\| <1 | LCS-W1 | 104% |
| 1,1,1,2-tetrachloroethane | µg/L | 1 | Org-013 | <1 | 154230-1 | <1 \|\| <1 | [NR] | [NR] |
| Chlorobenzene | µg/L | 1 | Org-013 | <1 | 154230-1 | <1 \|\| <1 | [NR] | [NR] |
| Ethylbenzene | µg/L | 1 | Org-013 | <1 | 154230-1 | <1 \|\| <1 | [NR] | [NR] |
| Bromoform | µg/L | 1 | Org-013 | <1 | 154230-1 | <1 \|\| <1 | [NR] | [NR] |
| m+p-xylene | µg/L | 2 | Org-013 | <2 | 154230-1 | <2 \|\| <2 | [NR] | [NR] |
| Styrene | µg/L | 1 | Org-013 | <1 | 154230-1 | <1 \|\| <1 | [NR] | [NR] |
| 1,1,2,2-tetrachloroethane | µg/L | 1 | Org-013 | <1 | 154230-1 | <1 \|\| <1 | [NR] | [NR] |
| o-xylene | µg/L | 1 | Org-013 | <1 | 154230-1 | <1 \|\| <1 | [NR] | [NR] |

| QUALITY CONTROL<br><br>VOCs in water | UNITS | PQL | METHOD | Blank | Duplicate Sm# | Duplicate results<br><br>Base ll Duplicate ll %RPD | Spike Sm# | Spike % Recovery |
|---|---|---|---|---|---|---|---|---|
| 1,2,3-trichloropropane | µg/L | 1 | Org-013 | <1 | 154230-1 | <1 \|\| <1 | [NR] | [NR] |
| Isopropylbenzene | µg/L | 1 | Org-013 | <1 | 154230-1 | <1 \|\| <1 | [NR] | [NR] |
| Bromobenzene | µg/L | 1 | Org-013 | <1 | 154230-1 | <1 \|\| <1 | [NR] | [NR] |
| n-propyl benzene | µg/L | 1 | Org-013 | <1 | 154230-1 | <1 \|\| <1 | [NR] | [NR] |
| 2-chlorotoluene | µg/L | 1 | Org-013 | <1 | 154230-1 | <1 \|\| <1 | [NR] | [NR] |
| 4-chlorotoluene | µg/L | 1 | Org-013 | <1 | 154230-1 | <1 \|\| <1 | [NR] | [NR] |
| 1,3,5-trimethyl benzene | µg/L | 1 | Org-013 | <1 | 154230-1 | <1 \|\| <1 | [NR] | [NR] |
| Tert-butyl benzene | µg/L | 1 | Org-013 | <1 | 154230-1 | <1 \|\| <1 | [NR] | [NR] |
| 1,2,4-trimethyl benzene | µg/L | 1 | Org-013 | <1 | 154230-1 | <1 \|\| <1 | [NR] | [NR] |
| 1,3-dichlorobenzene | µg/L | 1 | Org-013 | <1 | 154230-1 | <1 \|\| <1 | [NR] | [NR] |
| Sec-butyl benzene | µg/L | 1 | Org-013 | <1 | 154230-1 | <1 \|\| <1 | [NR] | [NR] |
| 1,4-dichlorobenzene | µg/L | 1 | Org-013 | <1 | 154230-1 | <1 \|\| <1 | [NR] | [NR] |
| 4-isopropyl toluene | µg/L | 1 | Org-013 | <1 | 154230-1 | <1 \|\| <1 | [NR] | [NR] |
| 1,2-dichlorobenzene | µg/L | 1 | Org-013 | <1 | 154230-1 | <1 \|\| <1 | [NR] | [NR] |
| n-butyl benzene | µg/L | 1 | Org-013 | <1 | 154230-1 | <1 \|\| <1 | [NR] | [NR] |
| 1,2-dibromo-3-chloropropane | µg/L | 1 | Org-013 | <1 | 154230-1 | <1 \|\| <1 | [NR] | [NR] |
| 1,2,4-trichlorobenzene | µg/L | 1 | Org-013 | <1 | 154230-1 | <1 \|\| <1 | [NR] | [NR] |
| Hexachlorobutadiene | µg/L | 1 | Org-013 | <1 | 154230-1 | <1 \|\| <1 | [NR] | [NR] |
| 1,2,3-trichlorobenzene | µg/L | 1 | Org-013 | <1 | 154230-1 | <1 \|\| <1 | [NR] | [NR] |
| *Surrogate* Dibromofluoromethane | % | | Org-013 | 118 | 154230-1 | 124 \|\| 117 \|\| RPD: 6 | LCS-W1 | 103% |
| *Surrogate* toluene-d8 | % | | Org-013 | 99 | 154230-1 | 99 \|\| 97 \|\| RPD: 2 | LCS-W1 | 99% |
| *Surrogate* 4-BFB | % | | Org-013 | 123 | 154230-1 | 121 \|\| 121 \|\| RPD: 0 | LCS-W1 | 99% |

| QUALITY CONTROL<br>vTRH(C6-C10)/BTEXN in Water | UNITS | PQL | METHOD | Blank | Duplicate Sm# | Duplicate results<br>Base ll Duplicate ll %RPD | Spike Sm# | Spike % Recovery |
|---|---|---|---|---|---|---|---|---|
| Date extracted | - | | | 26/09/2016 | 154230-1 | 27/09/2016 \|\| 28/09/2016 | LCS-W1 | 26/09/2016 |
| Date analysed | - | | | 27/09/2016 | 154230-1 | 28/09/2016 \|\| 28/09/2016 | LCS-W1 | 27/09/2016 |
| TRHC$_6$ - C$_9$ | µg/L | 10 | Org-016 | <10 | 154230-1 | 15 \|\| 15 \|\| RPD: 0 | LCS-W1 | 107% |
| TRHC$_6$ - C$_{10}$ | µg/L | 10 | Org-016 | <10 | 154230-1 | 15 \|\| 15 \|\| RPD: 0 | LCS-W1 | 107% |
| Benzene | µg/L | 1 | Org-016 | <1 | 154230-1 | <1 \|\| <1 | LCS-W1 | 99% |
| Toluene | µg/L | 1 | Org-016 | <1 | 154230-1 | <1 \|\| <1 | LCS-W1 | 107% |
| Ethylbenzene | µg/L | 1 | Org-016 | <1 | 154230-1 | <1 \|\| <1 | LCS-W1 | 110% |
| m+p-xylene | µg/L | 2 | Org-016 | <2 | 154230-1 | <2 \|\| <2 | LCS-W1 | 109% |
| o-xylene | µg/L | 1 | Org-016 | <1 | 154230-1 | <1 \|\| <1 | LCS-W1 | 113% |
| Naphthalene | µg/L | 1 | Org-013 | <1 | 154230-1 | <1 \|\| <1 | [NR] | [NR] |
| *Surrogate* Dibromofluoromethane | % | | Org-016 | 129 | 154230-1 | 124 \|\| 117 \|\| RPD: 6 | LCS-W1 | 126% |
| *Surrogate* toluene-d8 | % | | Org-016 | 98 | 154230-1 | 99 \|\| 97 \|\| RPD: 2 | LCS-W1 | 103% |
| *Surrogate* 4-BFB | % | | Org-016 | 106 | 154230-1 | 121 \|\| 121 \|\| RPD: 0 | LCS-W1 | 101% |

| QUALITY CONTROL<br>svTRH (C10-C40) in Water | UNITS | PQL | METHOD | Blank | Duplicate Sm# | Duplicate results<br>Base ll Duplicate ll %RPD | Spike Sm# | Spike % Recovery |
|---|---|---|---|---|---|---|---|---|
| Date extracted | - | | | 28/09/2016 | [NT] | [NT] | LCS-W3 | 28/09/2016 |
| Date analysed | - | | | 29/09/2016 | [NT] | [NT] | LCS-W3 | 29/09/2016 |
| TRHC$_{10}$ - C$_{14}$ | µg/L | 50 | Org-003 | <50 | [NT] | [NT] | LCS-W3 | 119% |
| TRHC$_{15}$ - C$_{28}$ | µg/L | 100 | Org-003 | <100 | [NT] | [NT] | LCS-W3 | 116% |
| TRHC$_{29}$ - C$_{36}$ | µg/L | 100 | Org-003 | <100 | [NT] | [NT] | LCS-W3 | 111% |
| TRH>C$_{10}$ - C$_{16}$ | µg/L | 50 | Org-003 | <50 | [NT] | [NT] | LCS-W3 | 119% |
| TRH>C$_{16}$ - C$_{34}$ | µg/L | 100 | Org-003 | <100 | [NT] | [NT] | LCS-W3 | 116% |
| TRH>C$_{34}$ - C$_{40}$ | µg/L | 100 | Org-003 | <100 | [NT] | [NT] | LCS-W3 | 111% |
| *Surrogate* o-Terphenyl | % | | Org-003 | 79 | [NT] | [NT] | LCS-W3 | 68% |

| QUALITY CONTROL<br>PAHs in Water | UNITS | PQL | METHOD | Blank | Duplicate Sm# | Duplicate results<br>Base ll Duplicate ll %RPD | Spike Sm# | Spike % Recovery |
|---|---|---|---|---|---|---|---|---|
| Date extracted | - | | | 28/09/2016 | [NT] | [NT] | LCS-W3 | 28/09/2016 |
| Date analysed | - | | | 29/09/2016 | [NT] | [NT] | LCS-W3 | 29/09/2016 |
| Naphthalene | µg/L | 1 | Org-012 | <1 | [NT] | [NT] | LCS-W3 | 73% |
| Acenaphthylene | µg/L | 1 | Org-012 | <1 | [NT] | [NT] | [NR] | [NR] |
| Acenaphthene | µg/L | 1 | Org-012 | <1 | [NT] | [NT] | [NR] | [NR] |
| Fluorene | µg/L | 1 | Org-012 | <1 | [NT] | [NT] | LCS-W3 | 82% |
| Phenanthrene | µg/L | 1 | Org-012 | <1 | [NT] | [NT] | LCS-W3 | 87% |
| Anthracene | µg/L | 1 | Org-012 | <1 | [NT] | [NT] | [NR] | [NR] |
| Fluoranthene | µg/L | 1 | Org-012 | <1 | [NT] | [NT] | LCS-W3 | 80% |
| Pyrene | µg/L | 1 | Org-012 | <1 | [NT] | [NT] | LCS-W3 | 81% |
| Benzo(a)anthracene | µg/L | 1 | Org-012 | <1 | [NT] | [NT] | [NR] | [NR] |

| QUALITY CONTROL<br>PAHs in Water | UNITS | PQL | METHOD | Blank | Duplicate Sm# | Duplicate results<br>Base II Duplicate II %RPD | Spike Sm# | Spike % Recovery |
|---|---|---|---|---|---|---|---|---|
| Chrysene | µg/L | 1 | Org-012 | <1 | [NT] | [NT] | [NR] | [NR] |
| Benzo(b,j +k)fluoranthene | µg/L | 2 | Org-012 | <2 | [NT] | [NT] | [NR] | [NR] |
| Benzo(a)pyrene | µg/L | 1 | Org-012 | <1 | [NT] | [NT] | LCS-W3 | 84% |
| Indeno(1,2,3-c,d)pyrene | µg/L | 1 | Org-012 | <1 | [NT] | [NT] | [NR] | [NR] |
| Dibenzo(a,h)anthracene | µg/L | 1 | Org-012 | <1 | [NT] | [NT] | [NR] | [NR] |
| Benzo(g,h,i)perylene | µg/L | 1 | Org-012 | <1 | [NT] | [NT] | [NR] | [NR] |
| *Surrogate p*-Terphenyl-d14 | % | | Org-012 | 80 | [NT] | [NT] | LCS-W3 | 79% |
| QUALITY CONTROL<br>OCP in water | UNITS | PQL | METHOD | Blank | Duplicate Sm# | Duplicate results<br>Base II Duplicate II %RPD | Spike Sm# | Spike % Recovery |
| Date extracted | - | | | 28/09/2016 | [NT] | [NT] | LCS-W1 | 28/09/2016 |
| Date analysed | - | | | 29/09/2016 | [NT] | [NT] | LCS-W1 | 29/09/2016 |
| HCB | µg/L | 0.2 | Org-005 | <0.2 | [NT] | [NT] | [NR] | [NR] |
| alpha-BHC | µg/L | 0.2 | Org-005 | <0.2 | [NT] | [NT] | LCS-W1 | 82% |
| gamma-BHC | µg/L | 0.2 | Org-005 | <0.2 | [NT] | [NT] | [NR] | [NR] |
| beta-BHC | µg/L | 0.2 | Org-005 | <0.2 | [NT] | [NT] | LCS-W1 | 77% |
| Heptachlor | µg/L | 0.2 | Org-005 | <0.2 | [NT] | [NT] | LCS-W1 | 84% |
| delta-BHC | µg/L | 0.2 | Org-005 | <0.2 | [NT] | [NT] | [NR] | [NR] |
| Aldrin | µg/L | 0.2 | Org-005 | <0.2 | [NT] | [NT] | LCS-W1 | 77% |
| Heptachlor Epoxide | µg/L | 0.2 | Org-005 | <0.2 | [NT] | [NT] | LCS-W1 | 77% |
| gamma-Chlordane | µg/L | 0.2 | Org-005 | <0.2 | [NT] | [NT] | [NR] | [NR] |
| alpha-Chlordane | µg/L | 0.2 | Org-005 | <0.2 | [NT] | [NT] | [NR] | [NR] |
| Endosulfan I | µg/L | 0.2 | Org-005 | <0.2 | [NT] | [NT] | [NR] | [NR] |
| pp-DDE | µg/L | 0.2 | Org-005 | <0.2 | [NT] | [NT] | LCS-W1 | 74% |
| Dieldrin | µg/L | 0.2 | Org-005 | <0.2 | [NT] | [NT] | LCS-W1 | 77% |
| Endrin | µg/L | 0.2 | Org-005 | <0.2 | [NT] | [NT] | LCS-W1 | 71% |
| pp-DDD | µg/L | 0.2 | Org-005 | <0.2 | [NT] | [NT] | LCS-W1 | 73% |
| Endosulfan II | µg/L | 0.2 | Org-005 | <0.2 | [NT] | [NT] | [NR] | [NR] |
| pp-DDT | µg/L | 0.2 | Org-005 | <0.2 | [NT] | [NT] | [NR] | [NR] |
| Endrin Aldehyde | µg/L | 0.2 | Org-005 | <0.2 | [NT] | [NT] | [NR] | [NR] |
| Endosulfan Sulphate | µg/L | 0.2 | Org-005 | <0.2 | [NT] | [NT] | LCS-W1 | 79% |
| Methoxychlor | µg/L | 0.2 | Org-005 | <0.2 | [NT] | [NT] | [NR] | [NR] |
| *Surrogate* TCMX | % | | Org-005 | 103 | [NT] | [NT] | LCS-W1 | 123% |

| QUALITY CONTROL<br>OP Pesticides in water | UNITS | PQL | METHOD | Blank | Duplicate Sm# | Duplicate results<br>Base ll Duplicate ll %RPD | Spike Sm# | Spike % Recovery |
|---|---|---|---|---|---|---|---|---|
| Date extracted | - | | | 28/09/2016 | [NT] | [NT] | LCS-W1 | 28/09/2016 |
| Date analysed | - | | | 29/09/2016 | [NT] | [NT] | LCS-W1 | 29/09/2016 |
| Azinphos-methyl (Guthion) | µg/L | 0.2 | Org-008 | <0.2 | [NT] | [NT] | [NR] | [NR] |
| Bromophos ethyl | µg/L | 0.2 | Org-008 | <0.2 | [NT] | [NT] | [NR] | [NR] |
| Chlorpyriphos | µg/L | 0.2 | Org-008 | <0.2 | [NT] | [NT] | LCS-W1 | 84% |
| Chlorpyriphos-methyl | µg/L | 0.2 | Org-008 | <0.2 | [NT] | [NT] | [NR] | [NR] |
| Diazinon | µg/L | 0.2 | Org-008 | <0.2 | [NT] | [NT] | [NR] | [NR] |
| Dichlorovos | µg/L | 0.2 | Org-008 | <0.2 | [NT] | [NT] | LCS-W1 | 98% |
| Dimethoate | µg/L | 0.2 | Org-008 | <0.2 | [NT] | [NT] | [NR] | [NR] |
| Ethion | µg/L | 0.2 | Org-008 | <0.2 | [NT] | [NT] | LCS-W1 | 110% |
| Fenitrothion | µg/L | 0.2 | Org-008 | <0.2 | [NT] | [NT] | LCS-W1 | 104% |
| Malathion | µg/L | 0.2 | Org-008 | <0.2 | [NT] | [NT] | LCS-W1 | 85% |
| Parathion | µg/L | 0.2 | Org-008 | <0.2 | [NT] | [NT] | LCS-W1 | 116% |
| Ronnel | µg/L | 0.2 | Org-008 | <0.2 | [NT] | [NT] | LCS-W1 | 95% |
| *Surrogate* TCMX | % | | Org-008 | 103 | [NT] | [NT] | LCS-W1 | 122% |

| QUALITY CONTROL<br>PCBs in Water | UNITS | PQL | METHOD | Blank | Duplicate Sm# | Duplicate results<br>Base ll Duplicate ll %RPD | Spike Sm# | Spike % Recovery |
|---|---|---|---|---|---|---|---|---|
| Date extracted | - | | | 28/09/2016 | [NT] | [NT] | LCS-W1 | 28/09/2016 |
| Date analysed | - | | | 29/09/2016 | [NT] | [NT] | LCS-W1 | 29/09/2016 |
| Aroclor 1016 | µg/L | 2 | Org-006 | <2 | [NT] | [NT] | [NR] | [NR] |
| Aroclor 1221 | µg/L | 2 | Org-006 | <2 | [NT] | [NT] | [NR] | [NR] |
| Aroclor 1232 | µg/L | 2 | Org-006 | <2 | [NT] | [NT] | [NR] | [NR] |
| Aroclor 1242 | µg/L | 2 | Org-006 | <2 | [NT] | [NT] | [NR] | [NR] |
| Aroclor 1248 | µg/L | 2 | Org-006 | <2 | [NT] | [NT] | [NR] | [NR] |
| Aroclor 1254 | µg/L | 2 | Org-006 | <2 | [NT] | [NT] | LCS-W1 | 75% |
| Aroclor 1260 | µg/L | 2 | Org-006 | <2 | [NT] | [NT] | [NR] | [NR] |
| *Surrogate* TCLMX | % | | Org-006 | 103 | [NT] | [NT] | LCS-W1 | 122% |

| QUALITY CONTROL<br>Total Phenolics in Water | UNITS | PQL | METHOD | Blank | Duplicate Sm# | Duplicate results<br>Base II Duplicate II %RPD | Spike Sm# | Spike % Recovery |
|---|---|---|---|---|---|---|---|---|
| Date extracted | - | | | 27/09/2016 | [NT] | [NT] | LCS-W1 | 27/09/2016 |
| Date analysed | - | | | 27/09/2016 | [NT] | [NT] | LCS-W1 | 27/09/2016 |
| Total Phenolics (as Phenol) | mg/L | 0.05 | Inorg-031 | <0.05 | [NT] | [NT] | LCS-W1 | 105% |
| QUALITY CONTROL<br>HM in water - dissolved | UNITS | PQL | METHOD | Blank | Duplicate Sm# | Duplicate results<br>Base II Duplicate II %RPD | Spike Sm# | Spike % Recovery |
| Date prepared | - | | | 27/09/2016 | [NT] | [NT] | LCS-W1 | 27/09/2016 |
| Date analysed | - | | | 27/09/2016 | [NT] | [NT] | LCS-W1 | 27/09/2016 |
| Arsenic-Dissolved | µg/L | 1 | Metals-022 ICP-MS | <1 | [NT] | [NT] | LCS-W1 | 101% |
| Cadmium-Dissolved | µg/L | 0.1 | Metals-022 ICP-MS | <0.1 | [NT] | [NT] | LCS-W1 | 102% |
| Chromium-Dissolved | µg/L | 1 | Metals-022 ICP-MS | <1 | [NT] | [NT] | LCS-W1 | 97% |
| Copper-Dissolved | µg/L | 1 | Metals-022 ICP-MS | <1 | [NT] | [NT] | LCS-W1 | 99% |
| Lead-Dissolved | µg/L | 1 | Metals-022 ICP-MS | <1 | [NT] | [NT] | LCS-W1 | 102% |
| Mercury-Dissolved | µg/L | 0.05 | Metals-021 | <0.05 | [NT] | [NT] | LCS-W1 | 94% |
| Nickel-Dissolved | µg/L | 1 | Metals-022 ICP-MS | <1 | [NT] | [NT] | LCS-W1 | 101% |
| Zinc-Dissolved | µg/L | 1 | Metals-022 ICP-MS | <1 | [NT] | [NT] | LCS-W1 | 101% |
| QUALITY CONTROL<br>Perfluoroalkylated Substances in Waters | UNITS | PQL | METHOD | Blank | Duplicate Sm# | Duplicate results<br>Base II Duplicate II %RPD | Spike Sm# | Spike % Recovery |
| Date prepared | - | | | 04/04/2016 | 154230-1 | 04/10/2016 \|\| 04/10/2016 | LCS-W1 | 04/04/2016 |
| Date analysed | - | | | 04/04/2016 | 154230-1 | 04/10/2016 \|\| 04/10/2016 | LCS-W1 | 04/04/2016 |
| Perfluorohexanesulfonic acid | µg/L | 0.01 | Org-035 | <0.01 | 154230-1 | <0.01 \|\| <0.01 | LCS-W1 | 103% |
| Perfluorooctanesulfonic acid PFOS | µg/L | 0.01 | Org-035 | <0.01 | 154230-1 | <0.01 \|\| <0.01 | LCS-W1 | 103% |
| Perfluorooctanoic acid PFOA | µg/L | 0.01 | Org-035 | <0.01 | 154230-1 | <0.01 \|\| <0.01 | LCS-W1 | 101% |
| 6:2 FTS | µg/L | 0.01 | Org-035 | <0.01 | 154230-1 | <0.01 \|\| <0.01 | LCS-W1 | 108% |
| 8:2 FTS | µg/L | 0.01 | Org-035 | <0.01 | 154230-1 | <0.01 \|\| <0.01 | LCS-W1 | 100% |
| Surrogate $^{13}C_4$ PFOS | % | | Org-035 | 100 | 154230-1 | 98 \|\| 100 \|\| RPD: 2 | LCS-W1 | 98% |

| QUALITY CONTROL<br><br>Cations in water Dissolved | UNITS | PQL | METHOD | Blank | Duplicate Sm# | Duplicate results<br><br>Base II Duplicate II %RPD | Spike Sm# | Spike % Recovery |
|---|---|---|---|---|---|---|---|---|
| Date digested | - | | | 27/09/2016 | [NT] | [NT] | LCS-W1 | 27/09/2016 |
| Date analysed | - | | | 27/09/2016 | [NT] | [NT] | LCS-W1 | 27/09/2016 |
| Calcium - Dissolved | mg/L | 0.5 | Metals-020 | <0.5 | [NT] | [NT] | LCS-W1 | 101% |
| Magnesium - Dissolved | mg/L | 0.5 | Metals-020 | <0.5 | [NT] | [NT] | LCS-W1 | 107% |
| Hardness | mgCaCO3/L | 3 | | [NT] | [NT] | [NT] | [NR] | [NR] |

| QUALITY CONTROL<br>Perfluoroalkylated Substances in Waters | UNITS | Dup. Sm# | Duplicate<br>Base + Duplicate + %RPD | Spike Sm# | Spike % Recovery |
|---|---|---|---|---|---|
| Date prepared | - | [NT] | [NT] | 154230-2 | 04/04/2016 |
| Date analysed | - | [NT] | [NT] | 154230-2 | 04/04/2016 |
| Perfluorohexanesulfonic acid | µg/L | [NT] | [NT] | 154230-2 | 101% |
| Perfluorooctanesulfonic acid PFOS | µg/L | [NT] | [NT] | 154230-2 | 98% |
| Perfluorooctanoic acid PFOA | µg/L | [NT] | [NT] | 154230-2 | 100% |
| 6:2 FTS | µg/L | [NT] | [NT] | 154230-2 | 103% |
| 8:2 FTS | µg/L | [NT] | [NT] | 154230-2 | 92% |
| Surrogate $^{13}C_4$ PFOS | % | [NT] | [NT] | 154230-2 | 99% |

**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.

Measurement Uncertainty estimates are available for most tests upon request.

# CHAIN OF CUSTODY

**Douglas Partners**
*Geotechnics | Environment | Groundwater*

| | | | |
|---|---|---|---|
| **Client:** | Douglas Partners | **Project Number** | 85374.02 |
| **Contact Person:** | Michael Whittaker | **Project Name:** | AHPS & PPS |
| **Project Mgr:** | Tim Wright | **PO No.:** | |
| | | **lab Quote No. :** | |
| **Address:** | 96 Hermitage Road<br>West Ryde NSW 2114 | **Date results required:**<br>**Or choose: standard**<br>*Note: Inform lab in advance if urgent turnaround is required - surcharges apply* | |
| **Phone:** | 9809 0666 **Mob:** 0447 282 095 | **Report format: esdat / PDF / Excel** | |
| **Email:** | michael.whittaker@douglaspartners.com.au<br>tim.wright@douglaspartners.com.au | **Comments:** | |

| | |
|---|---|
| **To:** | Envirolab Services |
| **Contact Person:** | Aileen Hie |
| **Address:** | 12 Ashley Street<br>Chatswood NSW 2068 |
| **Phone:** | 02 9910 6200 |
| **Fax:** | 02 9910 6201 |
| **Email:** | ahie@envirolab.com.au |
| **Laboratory Report No:** | |
| **Lab Comments:** | |

| Sample information | | | | | | Tests Required | | | | | | | | | | | Comments |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Lab Sample ID** | **Field Sample ID** | **Depth** | **Date sampled** | **Container Type** | **Type of sample** | Combo 8 | VOC | PFAS (Inlcuding PFOS and PFOA) | Hardness | Metals | PAH | Spike + Blank | | | | **Combo** | **Provide as much information about the sample as you can** |
| 1 | MW1 | - | 16/9 | Bottle | GW | X | X | X | X | | | | | | | | |
| 2 | 102 | - | 16/9 | Bottle | GW | X | X | X | X | | | | | | | | |
| 3 | 103 | - | 16/9 | Bottle | GW | X | X | X | X | | | | | | | | |
| 4 | BD1 | - | 16/9 | Bottle | GW | | | | | X | X | | | | | | |
| 5,6 | Spike + Blank | | 16/9 | Bottle | GW | | | | | | | X | | | | | |

ENVIROLAB

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

Job No: 154230

Date Received: 26/09/16
Time Received: 14:00
Received by: D.F.
Temp: Cool/Ambient
Cooling: Ice/Icepack
Security: Intact/Broken/None

| | | |
|---|---|---|
| **Relinquished by: Douglas Partners** | **Sample Receipt** | ***Lab use only:*** |
| **Courier (by whom)** | **Received by (Company):** Envirol Services | **Samples Received: Cool or Ambient (circle one)** |
| **Condition of Sample at dispatch Cool or Ambient (circle)** | **Print Name:** Daniel Ford | **Temperature Received at:** (if applicable) |
| **Temperature (if Applicable):** | **Date & Time:** 26/09/16 14:00 | **Transported by: Hand delivered / courier** |
| **Print Name:** Michael Whittaker | **Signature:** | |
| **Date & Time:** | | |
| **Signature:** | | |

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** | Douglas Partners Pty Ltd |
| **Attention** | Michael Whittaker |

| Sample Login Details | |
|---|---|
| **Your Reference** | 85374.02, AHPS & PPS |
| **Envirolab Reference** | **154230** |
| **Date Sample Received** | 26/09/2016 |
| **Date Instructions Received** | 26/09/2016 |
| **Date Results Expected to be Reported** | **04/10/2016** |

| Sample Condition | |
|---|---|
| **Samples received in appropriate condition for analysis** | YES |
| **No. of Samples Provided** | 6 Waters |
| **Turnaround Time Requested** | Standard |
| **Temperature on receipt (°C)** | 6.6 |
| **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* | *VOCs in water* | *vTRH(C6-C10)/BTEXN in Water* | *svTRH (C10-C40) in Water* | *PAHs in Water* | *OCP in water* | *OP Pesticides in water* | *PCBs in Water* | *Total Phenolics in Water* | *HM in water - dissolved* | *Perfluoroalkylated Substances in Waters* | *Cations in water Dissolved* |
|---|---|---|---|---|---|---|---|---|---|---|---|
| MW1 | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| 102 | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| 103 | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| BD1 | | | | ✓ | | | | | ✓ | | |
| Spike | | ✓ | | | | | | | | | |
| Blank | | ✓ | | | | | | | | | |