Douglas Partners
Geotechnics / Environment / Groundwater

Integrated Practical Solutions

Report on Updated Preliminary Site (Contamination) Investigation

Ignis Project Stage 2
Tambourine Bay Road, Riverview

Prepared for
St Ignatius College

Project 85108.04
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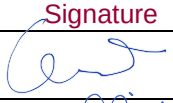
Author		31 January 2020
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Report on Updated Preliminary Site (Contamination) Investigation
Ignis Project Stage 2
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1. Introduction

This report presents the results of an updated Preliminary Site (Contamination) Investigation (PSI) undertaken for the proposed ignis project stage 2 at St Ignatius' College, Tambourine Bay Road, Riverview. The investigation was undertaken for St Ignatius' College, Riverview in consultation with EPM Projects Pty Ltd, project managers. The work was completed in accordance with Douglas Partners (DP)'s proposal SYD191048 dated 3 October 2019.

It is understood that Ignis Project Stage 2 will include the redevelopment of a portion of the St Ignatius' College Riverview campus for a new four storey building (the new 'Wallace Building') over one basement level. Refurbishment of a portion of the existing O'Neill Building (to the west) and landscaping to the north and south of the new Wallace building are also proposed.

DP has previously prepared a preliminary (contamination) site investigation[1] (DP (2015)) for the entire school campus, which includes the current site (the basketball court). DP (2015) identified some potential contamination within the main site when taking into account the proposed land use. Accordingly, and recommended that targeted (or limited) intrusive soil sampling be conducted to characterise contamination (if any) at the site.

The updated PSI includes a review of the previous report (DP, 2015) regarding the site history and changes in aerial photography since 2015, and the results of intrusive investigations and sampling from three boreholes within the current site boundary (Drawing 1, Appendix A). A preliminary waste classification assessment is also presented to assist in budgeting for the disposal of surplus soils created as a result of the proposed development.

In the preparation of this report, reference has been made to the following guidelines endorsed by the NSW EPA:

- National Environment Protection Council (NEPC) *National Environment Protection (Assessment of site Contamination), Measure 1999 (as amended in 2013),* (NEPC, 2013);
- NSW EPA, *Sampling Design Guidelines* (EPA, 1995); and
- NSW OEH, *Contaminated Sites: Guidelines for Consultants Reporting on Contaminated Sites* (OEH, 2011).

It is noted that a geotechnical investigation was also conducted concurrently by DP and this has been reported under a separate cover (Report reference 85108.04.R.001.Rev0 dated January 2020).

[1] Report on *Preliminary Site Investigation for Contamination, Proposed Further Development Areas of Senior School Saint Ignatius' College, Riverview,* dated 16 October 2015 (project reference: 85108.00.R.001.Rev0)

2. Scope of Work

- Review the previous report and aerial photography since 2015;
- Undertake a site walkover to identify Potential Areas of Environmental Concern (PAEC);
- Development of a conceptual site model (CSM);
- Collection of soil samples from three geotechnical boreholes for contamination testing;
- Screening of all samples collected with a photo-ionisation detector (PID) to assess the likely presence or absence of volatile organic compounds (VOC);
- Laboratory analysis of selected samples for a range of commonly encountered contaminants including, metals, polycyclic aromatic hydrocarbons (PAH), total recoverable hydrocarbons (TRH), benzene, toluene, ethylbenzene and xylene (BTEX), phenols, organochlorine pesticides (OCP), organophosphorus pesticides (OPP), polychlorinated biphenyls (PCB), pH, cation exchange capacity (CEC) and asbestos;
- Field sampling and laboratory analysis in compliance with standard environmental protocols, including a Quality Assurance / Quality Control (QA / QC) plan consisting of 10% replicate sampling, appropriate Chain-of-Custody procedures and in-house laboratory QA / QC testing; and
- Preparation of this report.

3. Site Information

3.1 Site Identification and Description

The greater Saint Ignatius' College Riverview campus is approximately 40 hectares and is surrounded by Riverview Street, College Road South and residential dwellings to the north, and the Lane Cove River to the south. The site for the proposed development and the subject of this report is an irregular shaped area of approximately 1900 m^2 within the central portion of the senior school grounds and is shown on Drawing 1 in Appendix A. The site is currently occupied by asphalt basketball courts and is bounded by Loyola Drive to the east, the existing Wallace Building to the south, the O'Neill Building to the west and another asphalt basketball court to the north. The site is within the parcel of land legally known at Lot 10 in Deposited Plan 1142773.

3.2 Geology, Topography and Hydrogeology

The ground surface across the site slopes downwards to the east with relatively steep slopes adjacent to the basketball courts. Levels vary from RL 35 m relative to Australian Height Datum (AHD) at the eastern side of the O'Neill Building to approximately RL 27 m AHD at Loyola Drive, with the basketball courts at about RL 30-31 m AHD. Some terracing and small retaining structures are present across the site.

The *Sydney 1:100 000 Geological Series Sheet* indicates that the site is underlain by Hawkesbury Sandstone (Rh). Hawkesbury Sandstone typically comprises medium to coarse grained quartz

sandstone with minor shale and laminite lenses. Ashfield Shale (Rwa) is mapped to the north-east of the site, which typically comprises dark-grey to black shale, claystone and siltstone with fine sandstone laminae.

The Sydney *1:100,000 Soil Landscape Sheet* indicates a Lambert soil landscape which is formed by erosional processes. The landscape typically comprises undulating to rolling low hills on Hawkesbury Sandstone commonly with rock outcrops.

The *1:25 000 Acid Sulphate Soils (ASS) Risk Map* indicates that the site is located within an area of no known occurrence of ASS and is approximately 200 m away from an area with mapped probability of occurrence of ASS (sediments beneath the Lane Cove River).

A search of the NSW Office of Water groundwater database revealed one groundwater in the vicinity of the school. The work summary for the bore (GW053747) indicates it was drilled in 1982 to a depth of 30.48 m and was intended for recreation purposes. The search results are provided in Appendix B.

4. Review of Previous Report (DP, 2015)

As part of the updated PSI, the DP (2015) report was reviewed and is summarised in below.

DP (2015) comprised of a desktop review to assess the potential for contamination of the entire St Ignatius College campus, including the current site. A site walkover, review of historical aerial photographs, regulatory notice search, SafeWork NSW Records search and review of the council Section 10.7 (formerly the Section 149) certificate was undertaken.

Aerial photography from 2016 to the present day was also reviewed by DP as part of the current investigation in order to augment the previous findings. Review of DP (2015) and associated aerial photography from 2016 to present day indicates that there has been some cut and fill works on the site to establish the playing fields whereas the basketball court has remained similar to its current state since 2015.

DP (2015) indicated that the most significant risks associated with contamination at the campus were associated with historical filling, hazardous building materials from possible refurbishment/redevelopment works in the past and pesticides being used as pest control beneath floors and concrete slabs and other parts of the school grounds. The contaminants of concern were identified as metals, hydrocarbons, pesticides and asbestos.

DP (2015) stated that '…*a targeted (or limited) intrusive soil sampling be undertaken at parts of the proposed development site, particularly in areas that have been filled..'.*

5. 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 is designed to provide the framework for identifying how a 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.

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 pathways between the above source (S1) and receptors (R1 to R8) are provided in Table 1.

Table 1: Summary of Potential Complete Pathways

Potential Source	Transport Pathway	Receptor
(S1) Contaminated ground (from imported filling, hazardous building materials and pesticide use)	(P1) Ingestion and dermal contact	(R1) Site users (R2) Construction workers (R3) Maintenance workers
	(P2) Inhalation of dust (P3) Inhalation of vapours	(R1) Site users (R2) Construction workers (R3) Maintenance workers (R4) Adjacent site users
	(P4) Surface water run off (P6) Lateral migration of groundwater	(R5) Surface water
	(P5) Leaching and vertical migration into groundwater	(R6) Groundwater
	(P7) Contact with terrestrial ecology	(R7) Terrestrial ecology
	(P8) Contact with in-ground structures	(R8) In-ground structures

6. Fieldwork, Analytical Rationale and Method

6.1 Data Quality Objectives and Project Quality Procedures

The investigation has been devised broadly in accordance with 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.

An evaluation of the DQO is presented in Appendix C.

6.2 Data Quality Indicators

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

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

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

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

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

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

An evaluation of the DQI is presented in Appendix C.

6.3 Soil Sampling and Rationale

Environmental field work, including drilling and soil sampling, was undertaken on 20 January 2020.

The minimum number of sampling points for a site of this size (0.19 ha) in accordance with the NSW EPA *Sampling Design Guidelines (1995)* for contaminated site investigation would be seven sampling points. However, given the review of previous investigation (relatively low potential for contamination at the site), the limited nature of the intrusive investigation and the targeted area of environmental concern (refer CSM); three borehole locations (BH1, BH2 and BH3) were drilled to characterise the potential contamination in soil.

The test locations are shown on Drawing 1 in Appendix A.

Selected soil samples were analysed for the contaminants of potential concern (COPC) identified in the CSM. Samples were selected based on site observations (odour, staining etc.), PID readings and their location within the subsoil strata (i.e. filling or natural).

6.4 Drilling Methods

The field work for the current investigation included the drilling of three boreholes (BH1 to BH3) to depths of between 8.35 m and 8.90 m using a small track-mounted Comacchio Geo 205 drilling rig. The boreholes were commenced using solid flight augers down to bedrock. Standard penetration tests (SPTs) were carried out and soil samples were collected for laboratory testing in each borehole. The boreholes were then extended into bedrock using NMLC diamond core drilling techniques to obtain continuous core samples of the bedrock.

The actual depths of drilling are indicated in the borehole logs in Appendix C.

6.5 Soil Sampling Procedures

Environmental (soil) sampling was performed according to standard operating procedures outlined in the DP *Field Procedures Manual*. All sampling data was recorded on borehole logs included in Appendix C and samples selected for laboratory analysis were recorded on DP chain-of-custody (COC) sheets.

The general soil sampling procedure comprised:

- Use of disposable sampling equipment including disposal 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;
- Screening of replicate soil samples collected in sealed plastic bags for total photo-ionisable compounds using a calibrated PID; and
- Placement of sample containers and bags into a cooled, insulated and sealed container for transport to the laboratory.

Envirolab Services Pty Ltd (Envirolab), accredited by NATA, was employed to conduct primary sample analysis. The laboratories are required to carry out in-house QC procedures.

6.6 Analytical Rationale

The analytical scheme for soil samples was designed to obtain an indication of the potential presence and possible distribution of identified CoPC as identified in the CSM. Filling samples were analysed as a priority, and from varying depth, based on fieldwork observations (such as the presence of bricks or galss which could be an indicator of possible asbestos or staining) for the primary contaminants of concerns as identified in Section 6. The results of the analytical testing were compared with the adopted SAC discussed in Section 7.

7. Site Assessment Criteria

The Site Assessment Criteria (SAC) applied in the current investigation are informed by the CSM, which identified human and environmental receptors to potential contamination on the site (refer to Section 5), as well as consideration of the proposed development.

The analytical results from the laboratory testing have been assessed (as a Tier 1 assessment) against the investigation and screening levels in Schedule B1 of NEPC (2013). This guideline has been endorsed by the NSW EPA under the *Contaminated Land Management* Act 1997. The Schedule provides investigation and screening levels for commonly encountered contaminants which are applicable to generic land uses and include consideration of, where relevant, the soil type and the depth of contamination.

7.1 Health Investigation and Screening Levels

The Health Investigation Levels (HIL) and Health Screening Levels (HSL) are scientifically-based, generic assessment criteria designed to be used in the first stage (Tier 1) of an assessment of potential human health risk from chronic exposure to contaminants.

HILs are applicable to assessing health risk arising via all relevant pathways of exposure for a range of metals and organic substances. The HIL are generic to all soil types and apply generally to a depth of 3 m below the surface for residential use. Site-specific conditions may determine the depth to which HILs apply for other land uses.

HSLs are applicable to selected petroleum compounds and fractions to assess the risk to human health via the inhalation pathway. HSL have been developed for different land uses, soil types and depths to contamination.

Given the proposed development is part of St Ignatius College, the most conservative land use criteria has been applied. In summary, the SAC is as follows:

- HIL C (public open space including secondary schools and footpaths);
- HSL A & B (low to high density residential) - NEPC 2013 states that secondary school buildings should be assessed using HSL A, therefore HSL A&B has been applied;
- HSL A (low to high density residential- for direct contact).

As dominant soil types encountered comprised sandy clay/sand, values for sand have been adopted as sand is more conservative for HSL application. HSL for a depth of 0 m to < 1 m have been adopted as potential contamination sources likely to impact surface soils. This depth range is also the most conservative.

The adopted HILs and HSLs for the contaminants of concern are shown in Table 2.

Table 2: Health Investigation and Screening Levels

Contaminants		HIL – C / HSL A (Direct Contact)	HSL A&B sand 0 m to <1 m
Metals	Arsenic	300	-
	Cadmium	90	-
	Chromium (VI)	300	-
	Copper	17000	-
	Lead	600	-
	Mercury (inorganic)	80	-
	Nickel	1200	-
	Zinc	30 000	-
PAH	Benzo(a)pyrene TEQ[1]	3	-
	Total PAH	300	-
	Naphthalene	*1400	3
Phenols	Phenol (Pentachlorophenol as initial screen)	120	-
TRH	C6-C10	*4400	-
	>C10-C16	*3300	-
	>C16-C34	*4500	-
	>C34-C40	*6300	-
	C6 – C10 (less BTEX) [F1]	-	45
	>C10-C16 (less Naphthalene) [F2]	-	110
BTEX	Benzene	*100	0.5
	Toluene	*14 000	160
	Ethylbenzene	*4500	NL
	Xylenes	*12 000	40
OCP	DDT+DDE+DDD	400	-
	Aldrin and dieldrin	10	-
	Chlordane	70	-
	Endosulfan	340	-
	Endrin	20	-
	Heptachlor	10	-
	HCB	10	-
	Methoxychlor	400	-
OPP	Chlorpyrifos	250	-
PCB	PCBs	1	-

Notes to Tale 5:

1 sum of carcinogenic PAH

2 non dioxin-like PCB only

3 The soil saturation concentration (Csat) is defined as the soil concentration at which the porewater phase cannot dissolve any more of an individual chemical. The soil vapour that is in equilibrium with the porewater will be at its maximum. If the derived soil HSL exceeds Csat, a soil vapour source concentration for a petroleum mixture could not exceed a level that would results in the maximum allowable vapour risk for the given scenario. For these scenarios, no HSL is presented for these chemicals and the HSL is shown as 'not limiting' or 'NL'.

* Direct contact HSL.

7.2 Ecological Investigation Levels and Ecological Screening Levels

Ecological Investigation Levels (EILs) and ecological screening levels (ESLs) to be determined in accordance with NEPC (2013), if ultimately deemed appropriate.

Schedule B5A of NEPC (2013) states that the aim *of the EILs is that varying levels of protection will be provided to the following ecological receptors at all sites:*

- *Biota supporting ecological processes, including microorganisms and soil invertebrates;*
- *Native flora and fauna;*
- *Introduced flora and fauna; and*
- *Transitory or permanent wildlife.*

Furthermore, Schedule B5A of NEPC (2013) states that *Commercial and industrial land, particularly in long-established industrial areas, is often heavily contaminated by past activities or fill materials used to level the area. In these cases, jurisdictions may determine that HILs are the most appropriate soil quality criteria and that EILs are not applicable. In many cases, the only generic ecological value for this land use will be 'transitory wildlife'.*

Based on the architectural drawings provided for the proposed development, it is understood that the proposed development will include excavation of a one level basement across the entire site footprint with minimal landscaping. Therefore, the value of the site for soil organisms and the risk of exposure of soil contamination to transitory wildlife is considered very low.

Therefore, it is considered that human health risk screening levels are more appropriate and EILs and ESLs are not relevant to the current assessment.

7.3 Management Limits for Petroleum Hydrocarbons

In addition to appropriate consideration and application of the HSLs and ESLs, there are additional considerations which reflect the nature and properties of petroleum hydrocarbons, including:

- Formation of observable light non-aqueous phase liquids (LNAPL);
- Fire and explosion hazards; and

- Effects on buried infrastructure e.g. penetration of, or damage to, in-ground services.

Management Limits to avoid or minimise these potential effects have been adopted in NEPC (2013) as interim Tier 1 guidance. Management Limits have been derived in NEPC (2013) for the same four petroleum fractions as the HSLs (F1 to F4). The adopted Management Limits, from Table 1B (7), Schedule B1 of NEPC (2013) are shown on Table 3. The following site specific data and assumptions have been used to determine the Management Limits:

- The Management Limits will apply to any depth within the soil profile;
- The Management Limits for commercial and industrial apply; and
- The soils encountered at the site comprised various types including sand and clay. A "coarse" soil texture (being the most conservative soil type) has been adopted.

Table 3: Management Limits

Analyte		Management Limit (mg/kg)
TRH	$C_6 - C_{10}$	700
	$>C_{10}-C_{16}$	1,000
	$>C_{16}-C_{34}$	3,500
	$>C_{34}-C_{40}$	10,000

7.4 Asbestos in Soil

Bonded asbestos containing material (ACM) is the most common form of asbestos contamination across Australia, generally arising from:

- Inadequate removal and disposal practices during demolition of buildings containing asbestos products;
- Widespread dumping of asbestos products and asbestos containing fill on vacant land and development sites; and
- Commonly occurring in historical fill containing unsorted demolition materials.

Mining, manufacturing or distribution of asbestos products may result in sites being contaminated by friable asbestos including free fibres. Severe weathering or damage to bonded ACM may also result in the formation of friable asbestos comprising fibrous asbestos (FA) and / or asbestos fines (AF).

Asbestos only poses a risk to human health when asbestos fibres are made airborne and inhaled. If asbestos is bound in a matrix such as cement or resin, it is not readily made airborne except through substantial physical damage. Bonded ACM in sound condition represents a low human health risk, whilst both FA and AF materials have the potential to generate, or be associated with, free asbestos fibres. Consequently, FA and AF must be carefully managed to prevent the release of asbestos fibres into the air.

A detailed asbestos assessment was not undertaken as part of these works as it was unknown at the time of preparing the proposal if asbestos was a likely contaminant. As an initial screen, the site assessment criteria for asbestos are as follows:

- No visible asbestos cement materials (ACM) at the sampling locations; and
- No asbestos detected at the laboratory reporting limit of 0.1 g/kg.

7.5 Preliminary Waste Classification

The preliminary waste classification was generally completed in accordance with the NSW EPA *Waste Classification Guidelines* 2014 (EPA, 2014).

Table 4: Six Step Procedure for Waste Classification

Step	Comments	Rationale
1. Is the waste special waste?	No	No asbestos containing materials (ACM), clinical or related waste, or waste tyres were observed in the test pits. Asbestos was not detected by the analytical laboratory.
2. Is the waste liquid waste?	No	The fill comprised a soil matrix.
3. Is the waste "pre-classified"?	No	The filling material is not pre-classified with reference to EPA (2014). The natural material, if classified as VENM, is pre-classified as General Solid Waste (non-putrescible).
4. Does the waste possess hazardous waste characteristics?	No	The waste was not observed to contain or considered at risk to contain explosives, gases, flammable solids, oxidising agents, organic peroxides, toxic substances, corrosive substances, coal tar, batteries, lead paint or dangerous goods containers.
5. Determining a wastes classification using chemical assessment	Conducted	Refer to Table D2.
6. Is the waste putrescible or non-putrescible?	No	The fill does not contain materials considered to be putrescible [1].

Notes

1. Wastes that are generally not classified as putrescible include soils, timber, garden trimmings, agricultural, forest and crop materials, and natural fibrous organic and vegetative materials (EPA, 2014).

8. Field Work Results

Details of the subsurface conditions encountered in each borehole are provided in the detailed log sheets in Appendix B, together with notes defining classification methods and descriptive terms.

The subsurface conditions encountered in current site investigation can be summarised as:

- ASPHALTIC CONCRETE & ROADBASE - 0.05 m thick asphaltic concrete over fine to coarse igneous roadbase to 0.25 m depth in all boreholes;
- FILL - Gravelly sand, clayey sand and sandy clay, with varying proportions of igneous, ironstone and sandstone gravel, moderately and well compacted to depths of between 0.4 m and 3.9 m in all boreholes. Brick, glass, rootlets and leaves were also present within the fill in BH2;
- RESIDUAL SOIL - Hard sandy clay was encountered in BH2 only at a depth of between 3.9 m and 4.2 m; and
- SANDSTONE BEDROCK - Very low, low and medium strength sandstone from depths of between 0.4 m and 4.2 m, generally becoming medium and/or high strength with depth. Some weathered seams and bands of very low and low strength sandstone were present throughout the boreholes, as well as some low and medium strength ironstone bands near the top of the sandstone.

9. Results of Laboratory Analysis

The tabulated analytical results are summarised together with the SAC in Table D1 in Appendix D. The laboratory certificates of analysis and associated chain of custody documentation are provided in Appendix E.

For waste classification purposes, the results of laboratory analysis for soil samples are compared to criteria sourced from NSW EPA *Waste Classification Guidelines,* 2014 in Table D2 in Appendix D.

10. Discussion

Concentrations of arsenic, cadmium, chromium, lead, mercury, nickel and zinc were within the respective SAC.

Reported concentrations of TRH were within the respective SAC.

Concentrations of BTEX, OCP, OPP, PCB and total phenols were not detected above the laboratory's practical quantitation limits (PQL) and are within the respective SAC.

Reported benzo(a)pyrene concentration in sample BH3/0.9-1.0 (3.2 mg/kg) exceeded the SAC of 3.0 mg/kg. The elevated concentration is considered likely to be either the presence of contaminated filling or the historical use of the site. As the concentration of benzo(a)pyrene in this sample is less than 250% of the HILC, the location is not considered as a contamination 'hotspot' and no remediation is required.

It is noted that although no asbestos was detected at the laboratory's limit of reporting of 0.1 g/kg, the presence of glass and brick within filling indicates the possible presence of hazardous materials (including asbestos) within filling in untested locations at the site.

10.1 Waste Classification

Concentrations of chemical contaminants for analysed filling samples are within the CT1 criteria for general solid waste classification under EPA (2014) with the exception of:

- B(a)P in samples BH2/0.25-0.35 m, BH2/2.4-2.5 m and BH3/0.9-1.0 m - exceeding the GSW CT1 (0.8 mg/kg).

TCLP test were conducted on samples BH2/2.4-2.5 and BH3/0.9-1.0 for the analytes exceeding the CT1 thresholds. The SCC and TCLP concentrations for those samples were within the contaminant thresholds SCC1 and TCLP1, for GSW.

On the basis of the observations at the time of sampling and the reported analytical results (including TCLP), the preliminary *in situ* waste classification for filling material within the subject site is general solid waste (non-putrescible)). Further assessment and testing will need to be undertaken to provide a final waste classification prior to off-site disposal.

11. Conclusion and Recommendations

On the basis of the findings of this updated PSI and the previous PSI, and in the context of the conceptual site model, it is concluded the defined site is suitable, from a site contamination standpoint, for the proposed redevelopment.

Please note that an *ex situ* waste classification would be required to:

- Confirm the provisional, *in situ* waste classification reported in Section 10.3; and
- Inform the lawful disposal of any surplus material i.e. material requiring off-site disposal following any excavations necessary to form the proposed development.

It is noted that although no asbestos was detected at the laboratory's limit of reporting of 0.1 g/kg, the presence of glass and brick within fill indicates the possible presence of hazardous materials (including asbestos) within fill in untested locations.

It is recommended that during any future development of the site, an unexpected finds protocol (UFP) is included in a site environmental management plan to assess and manage unexpected finds of contamination. Unexpected finds may include areas between our testing locations and / or localised areas of asbestos contamination in fill that was used to form the site levels.

12. Limitations

Douglas Partners (DP) has prepared this report (or services) for this project at St Ignatius College, Tambourine Bay Road, Riverview in accordance with DP's proposal SYD191048 dated 3 October 2019.The work was carried out under DP's Conditions of Engagement. This report is provided for the exclusive use of St Ignatius College 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.

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.

The contents of this report do not constitute formal design components such as are required, by the Health and Safety Legislation and Regulations, to be included in a Safety Report specifying the hazards likely to be encountered during construction and the controls required to mitigate risk. This design process requires risk assessment to be undertaken, with such assessment being dependent upon factors relating to likelihood of occurrence and consequences of damage to property and to life. This, in turn, requires project data and analysis presently beyond the knowledge and project role respectively of DP. DP may be able, however, to assist the client in carrying out a risk assessment of potential hazards contained in the Comments section of this report, as an extension to the current scope of works, if so requested, and provided that suitable additional information is made available to DP. Any such risk assessment would, however, be necessarily restricted to the (geotechnical / environmental / groundwater) components set out in this report and to their application by the project designers to project design, construction, maintenance and demolition.

Appendix A

About This Report

Drawings

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

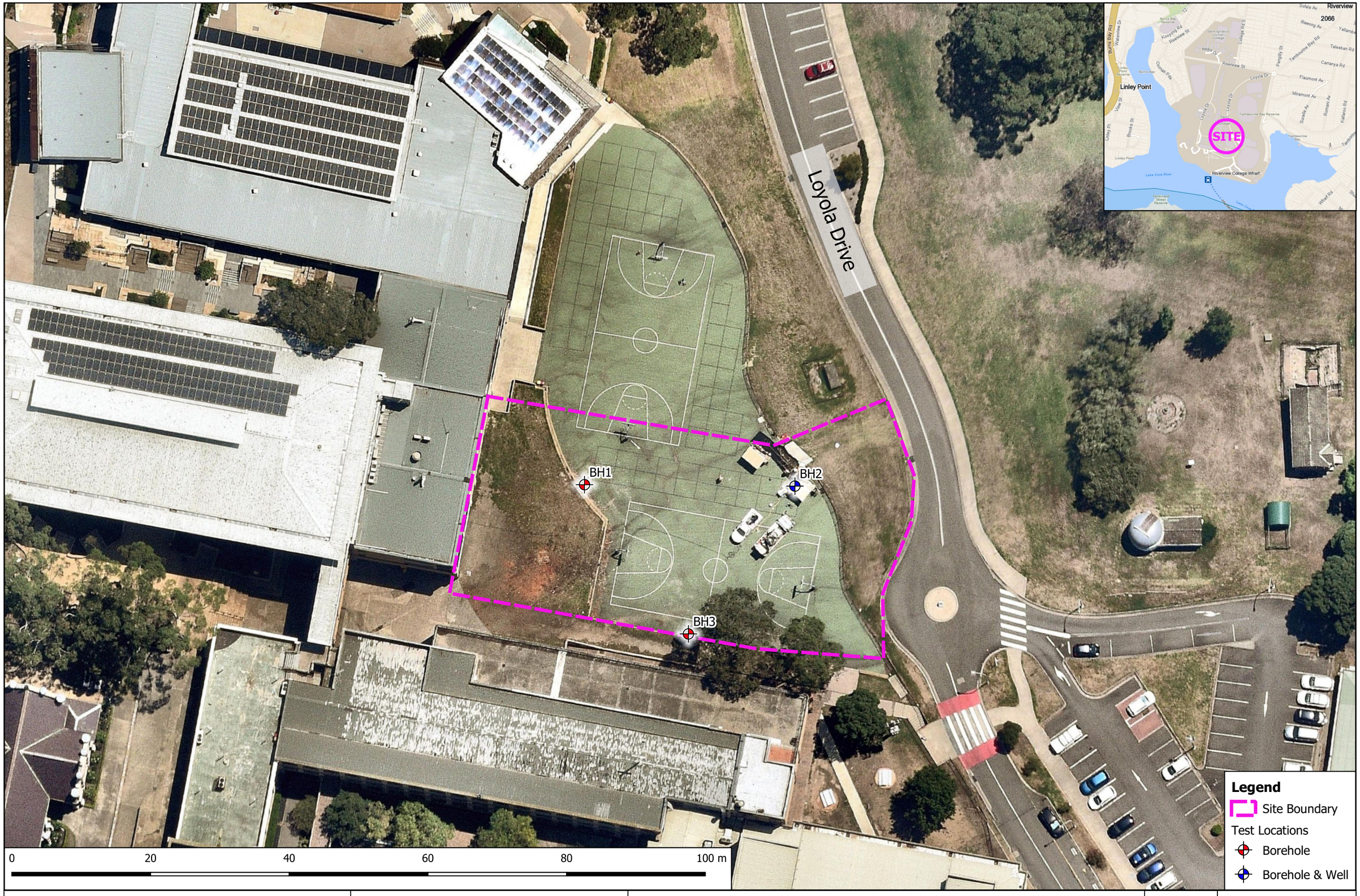
In the event that conditions encountered on site during construction appear to vary from those which were expected from the information contained in the report, DP requests that it be immediately notified. Most problems are much more readily resolved when conditions are exposed rather than at some later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



Douglas Partners
Geotechnics / Environment / Groundwater

CLIENT:	St Ignatius' College Riverview		
OFFICE:	Sydney	DRAWN BY:	MB
SCALE:	1:500 @ A3	DATE:	29/01/2020

TITLE: **Test Location Plan**
Ignis Project Stage 2
St Ignatius' College, Tambourine Bay Road, Riverview

N

PROJECT No:	85108.04
DRAWING No:	1
REVISION:	0

Appendix B

Groundwater Bore Searches

Descriptive Notes, Borehole Logs

Results of Groundwater Bore Search

NSW Office of Water
Work Summary

GW053747

Licence: 10BL122120 **Licence Status:** CANCELLED

Authorised Purpose (s): IRRIGATION,STOCK,DOMESTIC
Intended Purpose(s): RECREATION (GROUNDWATER)

Work Type: Bore open thru rock
Work Status:
Construct.Method: Cable Tool
Owner Type: Private

Commenced Date:
Completion Date: 01/10/1982
Final Depth: 30.50 m
Drilled Depth: 30.50 m

Contractor Name:
Driller: John Hans Iselt
Assistant Driller:

Property: N/A
GWMA: -
GW Zone: -
Standing Water Level (m):
Salinity Description: 0-500 ppm
Yield (L/s):

Site Details

Site Chosen By:

	County	Parish	Cadastre
Form A:	CUMBE	CUMBE.057	232
Licensed:	CUMBERLAND	WILLOUGHBY	Whole Lot //

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

Elevation: 0.00 m (A.H.D.)
Elevation Source: (Unknown)
Northing: 6255781.0
Easting: 329699.0
Latitude: 33°49'28.2"S
Longitude: 151°09'35.2"E

GS Map: -
MGA Zone: 0
Coordinate Source:

Construction

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

Hole	Pipe	Component	Type	From (m)	To (m)	Outside Diameter (mm)	Inside Diameter (mm)	Interval	Details
1	1	Casing	Galvinised Steel	-0.20	3.00	168			Driven into Hole

Water Bearing Zones

From (m)	To (m)	Thickness (m)	WBZ Type	S.W.L. (m)	D.D.L. (m)	Yield (L/s)	Hole Depth (m)	Duration (hr)	Salinity (mg/L)
18.90	19.00	0.10	Consolidated	18.00		0.06			

Geologists Log

Drillers Log

From (m)	To (m)	Thickness (m)	Drillers Description	Geological Material	Comments
0.00	0.18	0.18	Soil Sandy	Soil	
0.18	2.65	2.47	Sandstone Yellow Silty	Sandstone	
2.65	4.42	1.77	Sandstone Silty	Sandstone	
4.42	7.50	3.08	Sandstone Yellow Silty Water Supply	Sandstone	
7.50	11.55	4.05	Sandstone Grey	Sandstone	
11.55	11.89	0.34	Shale	Shale	
11.89	30.48	18.59	Sandstone Grey	Sandstone	

Remarks

*** End of GW053747 ***

Sampling Methods

Douglas Partners

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.

Description and Classification Methods

The methods of description and classification of soils and rocks used in this report are generally based on Australian Standard AS1726:2017, Geotechnical Site Investigations. 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	19 - 63
Medium gravel	6.7 - 19
Fine gravel	2.36 – 6.7
Coarse sand	0.6 - 2.36
Medium sand	0.21 - 0.6
Fine sand	0.075 - 0.21

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

The proportions of secondary constituents of soils are described as follows:

In fine grained soils (>35% fines)

Term	Proportion of sand or gravel	Example
And	Specify	Clay (60%) and Sand (40%)
Adjective	>30%	Sandy Clay
With	15 – 30%	Clay with sand
Trace	0 - 15%	Clay with trace sand

In coarse grained soils (>65% coarse)
- with clays or silts

Term	Proportion of fines	Example
And	Specify	Sand (70%) and Clay (30%)
Adjective	>12%	Clayey Sand
With	5 - 12%	Sand with clay
Trace	0 - 5%	Sand with trace clay

In coarse grained soils (>65% coarse)
- with coarser fraction

Term	Proportion of coarser fraction	Example
And	Specify	Sand (60%) and Gravel (40%)
Adjective	>30%	Gravelly Sand
With	15 - 30%	Sand with gravel
Trace	0 - 15%	Sand with trace gravel

The presence of cobbles and boulders shall be specifically noted by beginning the description with ‘Mix of Soil and Cobbles/Boulders’ with the word order indicating the dominant first and the proportion of cobbles and boulders described together.

Soil Descriptions

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
Friable	Fr	-

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	Density Index (%)
Very loose	VL	<15
Loose	L	15-35
Medium dense	MD	35-65
Dense	D	65-85
Very dense	VD	>85

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;
- Extremely weathered material – formed from in-situ weathering of geological formations. Has soil strength but retains the structure or fabric of the parent rock;
- Alluvial soil – deposited by streams and rivers;
- Estuarine soil – deposited in coastal estuaries;
- Marine soil – deposited in a marine environment;
- Lacustrine soil – deposited in freshwater lakes;
- Aeolian soil – carried and deposited by wind;
- Colluvial soil – soil and rock debris transported down slopes by gravity;
- Topsoil – mantle of surface soil, often with high levels of organic material.
- Fill – any material which has been moved by man.

Moisture Condition – Coarse Grained Soils

For coarse grained soils the moisture condition should be described by appearance and feel using the following terms:

- Dry (D) Non-cohesive and free-running.
- Moist (M) Soil feels cool, darkened in colour.
  Soil tends to stick together.
  Sand forms weak ball but breaks easily.
- Wet (W) Soil feels cool, darkened in colour.
  Soil tends to stick together, free water forms when handling.

Moisture Condition – Fine Grained Soils

For fine grained soils the assessment of moisture content is relative to their plastic limit or liquid limit, as follows:

- ‘Moist, dry of plastic limit’ or ‘w <PL’ (i.e. hard and friable or powdery).
- ‘Moist, near plastic limit’ or ‘w ≈ PL (i.e. soil can be moulded at moisture content approximately equal to the plastic limit).
- ‘Moist, wet of plastic limit’ or ‘w >PL’ (i.e. soils usually weakened and free water forms on the hands when handling).
- ‘Wet’ or ‘w ≈LL’ (i.e. near the liquid limit).
- ‘Wet’ or ‘w >LL’ (i.e. wet of the liquid limit).

Rock Strength

Rock strength is defined by the Unconfined Compressive Strength and it 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 Point Load Strength Index $Is_{(50)}$ is commonly used to provide an estimate of the rock strength and site specific correlations should be developed to allow UCS values to be determined. The point load strength test procedure is described by Australian Standard AS4133.4.1-2007. The terms used to describe rock strength are as follows:

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

* Assumes a ratio of 20:1 for UCS to $Is_{(50)}$. It should be noted that the UCS to $Is_{(50)}$ ratio varies significantly for different rock types and specific ratios should be determined for each site.

Degree of Weathering

The degree of weathering of rock is classified as follows:

Term	Abbreviation	Description
Residual Soil	RS	Material is weathered to such an extent that it has soil properties. Mass structure and material texture and fabric of original rock are no longer visible, but the soil has not been significantly transported.
Extremely weathered	XW	Material is weathered to such an extent that it has soil properties. Mass structure and material texture and fabric of original rock are still visible
Highly weathered	HW	The whole of the rock material is discoloured, usually by iron staining or bleaching to the extent that the colour of the original rock is not recognisable. Rock strength is significantly changed by weathering. Some primary minerals have weathered to clay minerals. Porosity may be increased by leaching, or may be decreased due to deposition of weathering products in pores.
Moderately weathered	MW	The whole of the rock material is discoloured , usually by iron staining or bleaching to the extent that the colour of the original rock is not recognisable, but shows little or no change of strength from fresh rock.
Slightly weathered	SW	Rock is partially discoloured with staining or bleaching along joints but shows little or no change of strength from fresh rock.
Fresh	FR	No signs of decomposition or staining.
Note: If HW and MW cannot be differentiated use DW (see below)		
Distinctly weathered	DW	Rock strength usually changed by weathering. The rock may be highly discoloured, usually by iron staining. Porosity may be increased by leaching or may be decreased due to deposition of weathered products in pores.

Rock Descriptions

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 occasional fragments
Fractured	Core lengths of 30-100 mm with occasional shorter and longer sections
Slightly Fractured	Core lengths of 300 mm or longer with occasional sections of 100-300 mm
Unbroken	Core contains very few fractures

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 stronger. 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

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

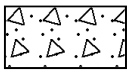
Symbols & Abbreviations

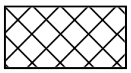
Graphic Symbols for Soil and Rock

General

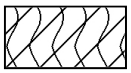

Asphalt

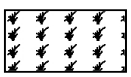

Road base

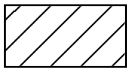

Concrete

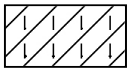

Filling

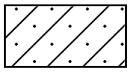
Soils


Topsoil

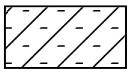

Peat

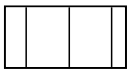

Clay

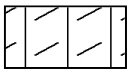

Silty clay

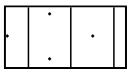

Sandy clay

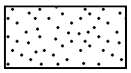

Gravelly clay

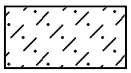

Shaly clay

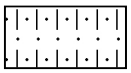

Silt


Clayey silt


Sandy silt

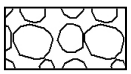

Sand

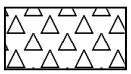

Clayey sand


Silty sand


Gravel

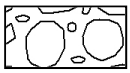

Sandy gravel


Cobbles, boulders

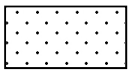

Talus

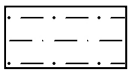
Sedimentary Rocks

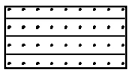

Boulder conglomerate

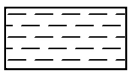

Conglomerate


Conglomeratic sandstone

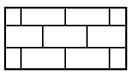

Sandstone


Siltstone

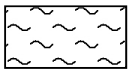

Laminite

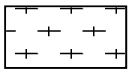

Mudstone, claystone, shale

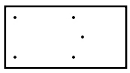

Coal


Limestone

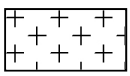
Metamorphic Rocks

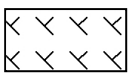

Slate, phyllite, schist

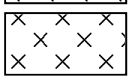

Gneiss

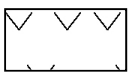

Quartzite

Igneous Rocks


Granite


Dolerite, basalt, andesite


Dacite, epidote


Tuff, breccia


Porphyry

BOREHOLE LOG

CLIENT: St Ignatius' College Riverview
PROJECT: Ignis Project Stage 2
LOCATION: Tambourine Bay Road, Riverview

SURFACE LEVEL: 30.8 AHD
EASTING: 329468.2
NORTHING: 6255423.4
DIP/AZIMUTH: 90°/--

BORE No: BH1
PROJECT No: 85108.04
DATE: 20/1/2020
SHEET 1 OF 1

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
30	0.05	ASPHALTIC CONCRETE							A/E			
	0.25	FILL/ROADBASE: fine to coarse, subangular, igneous gravel, moist, appears well compacted							A/E*			
	0.4	FILL/Gravelly SAND: fine to coarse sand, dark grey, fine to coarse igneous gravel, with clay, moist, appears well compacted										
1									A/E			
		SANDSTONE: medium grained, pale grey and orange-brown, very low strength with low to medium strength ironstone bands, Hawkesbury Sandstone							S			9,19,27 N = 46
29	1.9								A/E			
2		SANDSTONE: medium to coarse grained, red-brown and pale grey, medium strength, highly to moderately weathered, fractured then unbroken, Hawkesbury Sandstone							A/E			
									A/E			36,B refusal
28									S			
3								2.78m: Cs, 60mm				PL(A) = 1
								3.07m: Cs, 60mm				
								3.18m: B0°, sm, pl, cly co				PL(A) = 0.6
								3.3m: Cs, 40mm				
27												
4									C	100	87	
								4.36m: B0°, sm, pl, cly co				
								4.4m: B0°, sm, pl, cly co				PL(A) = 0.7
26												
5												
	5.35	SANDSTONE: medium to coarse grained, pale grey and orange-brown, thinly and cross bedded, high strength, slightly weathered to fresh, slightly fractured, Hawkesbury Sandstone										
25								5.65m: Cz, 10mm				PL(A) = 1.2
6												
								6.04m: B0°, sm, pl, cly co				
								6.12m: B0°, ro, pl, cly vn				
24									C	100	93	PL(A) = 1.3
7								7.12m: Ds, 130mm				
23								7.82-7.97m: J70°, ti				PL(A) = 1.3
8												
												PL(A) = 1.3
	8.35	Bore discontinued at 8.35m Target depth reached.										
22												
9												
21												

RIG: Comacchio Geo 205 **DRILLER:** Terratest **LOGGED:** IT **CASING:** HW to 2.6m

TYPE OF BORING: Solid flight auger (TC-bit) to 2.5m; NMLC coring to 8.35m

WATER OBSERVATIONS: No free groundwater observed whilst augering

REMARKS: *BD2/200120 duplicate sample at 0.4-0.5m

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: St Ignatius' College Riverview
PROJECT: Ignis Project Stage 2
LOCATION: Tambourine Bay Road, Riverview

SURFACE LEVEL: 31.0 AHD
EASTING: 329453.2
NORTHING: 6255445
DIP/AZIMUTH: 90°/--

BORE No: BH2
PROJECT No: 85108.04
DATE: 21/1/2020
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Degree of Weathering	Graphic Log	Rock Strength	Water	Fracture Spacing (m)	Discontinuities	Sampling & In Situ Testing: Type	Core Rec. %	RQD %	Test Results & Comments
		B - Bedding J - Joint S - Shear F - Fault	EW HW MW SW FS FR		Ex Low Very Low Low Medium High Very High Ex High		0.01 0.05 0.10 0.50 1.00					
31	0.05	ASPHALTIC CONCRETE										
	0.25	FILL/ROADBASE: fine to coarse, subangular, igneous gravel, moist, appears well compacted							A/E			
		FILL/Clayey SAND: fine to medium, grey-brown, trace fine to coarse ironstone and sandstone gravel, brick, glass, rootlets and leaves, moist, appears moderately compacted							A/E			
30	1								A/E			
									S			17,19,12 N = 31
									A/E			
29	2								A/E			
	2.2	FILL/Sandy CLAY: low to medium plasticity, grey-brown, fine to medium sand, trace fine to coarse ironstone and sandstone gravel, brick, glass, rootlets and leaves, w>PL, appears moderately compacted							A/E			
									S			6,7,8 N = 15
28	3								A/E			
									A/E			
	3.9	Sandy CLAY CI: medium plasticity, orange-brown, fine to medium, w>PL, hard, residual							A/E			
27	4								S			2,6,32 N = 38
	4.2	SANDSTONE: medium grained, pale grey and orange-brown, very low strength with medium strength ironstone bands, Hawkesbury Sandstone							A/E			
	4.82	SANDSTONE: medium to coarse grained, pale grey, red-brown and orange-brown, high strength, moderately to slightly weathered, slightly fractured to unbroken, Hawkesbury Sandstone						4.55m: Cs, 270mm	C	100	74	PL(A) = 3
26	5											PL(A) = 1.5
25	6							5.75m: CORE LOSS: 70mm				
	6.17	SANDSTONE: medium to coarse grained, pale grey, red-brown and orange-brown, thinly and cross bedded, medium to high strength, moderately to slightly weathered, fractured to unbroken, Hawkesbury Sandstone						6.79m: B0°, sm, pl, cly co 6.88m: B0°, sm, pl, cly co, fe stn 6.95m: B0°, sm, pl, cly co, fe stn 7.05m: Cs, 20mm 7.29m: Cs, 40mm 7.48m: Cs, 50mm	C	97	89	PL(A) = 1
24	7											
	7.68	SANDSTONE: medium to coarse grained, pale grey, medium then high strength, fresh, unbroken, Hawkesbury Sandstone										PL(A) = 0.8
23	8											PL(A) = 1.4
	8.75	Bore discontinued at 8.75m Target depth reached.										
22	9											

RIG: Comacchio Geo 205 **DRILLER:** Terratest **LOGGED:** IT **CASING:** HW to 4.4m

TYPE OF BORING: Solid flight auger (TC-bit) to 4.5m; NMLC coring to 8.75m

WATER OBSERVATIONS: No free groundwater observed whilst augering

REMARKS: Groundwater well installed: blank PVC 0.0-2.53m, screen PVC 2.53-8.53m, backfill 0.0-1.0m, bentonite 1.0-2.0m, gravel 2.0-8.53m, gatic cover at the surface.

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: St Ignatius' College Riverview
PROJECT: Ignis Project Stage 2
LOCATION: Tambourine Bay Road, Riverview

SURFACE LEVEL: 30.4 AHD
EASTING: 329483.6
NORTHING: 6255444.8
DIP/AZIMUTH: 90°/--

BORE No: BH3
PROJECT No: 85108.04
DATE: 20/1/2020
SHEET 1 OF 1

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)	Type	Core Rec. %	RQD %	Test Results & Comments
30	0.05	ASPHALTIC CONCRETE							A/E			
	0.25	FILL/ROADBASE: fine to coarse, subangular, igneous gravel, moist, appears generally well compacted							A/E			
29	1	FILL/Clayey SAND: fine to coarse, dark grey, with fine to coarse igneous gravel, moist, appears moderately compacted							A/E			
		0.4m: becoming brown, with fine to coarse ironstone and sandstone gravel							S			6,5,5 N = 10
	1.7	SANDSTONE: medium grained, red-brown, orange-brown and pale grey, thinly and cross bedded, low to medium then medium strength, moderately to slightly weathered, fractured, Hawkesbury Sandstone							A/E			
28	2								A/E			
									A/E*			25,B refusal
									S			
								2.65m: Cs, 10mm 2.81m: Cs, 35mm 2.96m: B0°, sm, pl, cly co 3.07m: B0°, sm, pl, cly vn, fe stn 3.11m: Cs, 50mm 3.2m: B0°, sm, pl, cly co				PL(A) = 1
27	3								C	100	88	PL(A) = 0.4
26	4							4.14m: B0°, sm, pl, fe stn 4.32m: Cz, 10mm, cly vn, fe stn 4.51m: Cs, 40mm				PL(A) = 0.9
	5							4.95m: Cs, 10mm 5.04m: B0-5°, ro, pl, cly vn				PL(A) = 1.1
	5.12	SANDSTONE: medium to coarse grained, red-brown, orange-brown and pale grey, thinly and cross bedded, high strength, moderately to slightly weathered, unbroken, Hawkesbury Sandstone						5.69m: B0°, ro, pl, cly vn	C	100	96	
25	6											PL(A) = 1.6
24	7											PL(A) = 1.8
23		7.79m: becoming fresh							C	100	100	
22	8	8.52-8.56m: siltstone band										PL(A) = 1.6 PL(A) = 2.7
21	8.9	Bore discontinued at 8.9m Target depth reached.										PL(A) = 1
	9											

RIG: Comacchio Geo 205 **DRILLER:** Terratest **LOGGED:** IT **CASING:** HW to 2.6m

TYPE OF BORING: Diatube to 0.15m; Solid flight auger (TC-bit) to 2.5m; NMLC coring to 8.9m

WATER OBSERVATIONS: No free groundwater observed whilst augering

REMARKS: *BD1/200120 duplicate sample at 2.4-2.5m

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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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	S1 Introduction (objective) S11 Conclusion and Recommendations
Identify Inputs to the Decision	S1 Introduction S3 Site Identification, Description and Site Geology, Topography and Hydrogeology Mapping S4 Review of Previous Report S5 Conceptual Site Model S7 Site Assessment Criteria S8 Fieldwork Results S9 Laboratory Results
Define the Boundary of the Assessment	S3 Site Identification, Description Drawing 1 - Appendix C
Develop a Decision Rule	S7 Site Assessment Criteria
Specify Acceptable Limits on Decision Errors	S6 Fieldwork, Analysis and QA/QC S7 Site Assessment Criteria QA/QC Procedures and Results – Sections Q2, Q3
Optimise the Design for Obtaining Data	S2 Scope of Works S6 Fieldwork, Analysis and QA/QC 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 Table Q2. Reference should be made to the fieldwork and analysis procedures in Section 6 and the laboratory certificates in Appendix E for further details.

Table Q2: Laboratory QC

Item	Frequency	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 lab batch	<PQL	yes
Laboratory duplicates	10% primary samples	Laboratory specific [1]	
Matrix Spikes	1 per lab batch	70-130% recovery (inorganics); 60-140% (organics); 10-140% (SVOC, speciated phenols)	yes
Surrogate Spikes	organics by GC	70-130% recovery (inorganics); 60-140% (organics); 10-140% (SVOC, speciated phenols)	yes
Control Samples	1 per lab batch	70-130% recovery (inorganics); 60-140% (organics); 10-140% (SVOC, speciated phenols)	yes

NOTES: 1 ELS: <5xPQL – any RPD; >5xPQL – 0-50%RPD

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

Q2. Intra-Laboratory Replicates

Intra-laboratory replicates were analysed as an internal check of the reproducibility within the primary laboratory Envirolab Services (ELS) and as a measure of consistency of sampling techniques. The comparative results of analysis between original and intra-laboratory replicate samples are summarised in Table Q3.

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.

The calculated RPD values were within the acceptable range of ± 30 for inorganic analytes and ± 50% for organics with the exception of those in shading. However, the actual differences in concentrations were low.

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

Inter-laboratory replicate sample have not been undertaken, however, it is considered that the data quality ore reliability is not affected as the primary samples and intra-laboratory duplicate samples were analyzed at a NATA accredited laboratory. The duplicate sample laboratory results indicated that the results are reliable.

Table Q3: Relative Percentage Difference Results – Intra-laboratory Replicates

Lab	Sample ID	Date Sampled	Media	Units	Metals										PAH				TRH				BTEX				Phenol
					As	Cd	Cr	Cu	Pb	Hg	Ni	Zn	Fe	Mn	total	BaP TEQ	BaP	Naphthalene	C6-C10	>C10-C16	>C16-C34	>C34-C40	Benzene	Ethylbenzene	Toluene	Xylene Total	Phenol
SOIL																											
ELS	BD2/200120	20/01/20120	filling	mg/kg	<4	<0.4	8	6	11	<0.1	<1	5	-	-	0.72	<0.5	0.08	<1	<25	<50	<100	<100	<0.2	<1	<0.5	<1	-
ELS	BH1/0.4-0.5	20/01/20120	filling	mg/kg	5	<0.4	18	7	11	<0.1	<1	5	-	-	<0.05	<0.5	<0.05	<1	<25	<50	<100	<100	<0.2	<1	<0.5	<1	<5
Difference				mg/kg	1	0.0	10	1	0.0	0.0	0.0	0.0	-	-	0.67	0.0	0.03	0.o	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-
RPD				%	22	0.0	77	15	0.0	0.0	0.0	0.0	-	-	174	0.0	46	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-

Notes: - not applicable, not tested

Q1.1 Review of Laboratory Comments

The laboratory certificates all included the QA / QC testing and results undertaken.

Comments provided in the laboratory certificates, including any exceedances of their QA / QC, are discussed in Table Q4, below. Overall, it is considered that the acceptable standards were achieved for the laboratory analysis and that the results are acceptable for use in this assessment.

Table Q4: Laboratory Comments

Lab Report ID	Lab Comment	DP Comment
ELS 235114	Acid Extractable Metals in Soil: The laboratory RPD acceptance criteria has been exceeded for 235114-1 for Cr. Therefore a triplicate result has been issued as laboratory sample number 235114-8. Percent recovery is not possible to report due to the inhomogeneous nature of the element/s in the sample/s. However an acceptable recovery was obtained for the LCS. PAHs in Soil: Percent recovery for the matrix spike is not possible to report due to interference from analytes in sample 235114-2. Asbestos: A portion of the supplied samples were sub-sampled for asbestos analysis according to Envirolab procedures. We cannot guarantee that these sub-samples are indicative of the entire sample. Envirolab recommends supplying 40-50g of sample in its own container. Note: Samples requested for asbestos testing were sub-sampled from jars provided by the client.	This is not considered to impact the usability of the data

Q2. 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 Q5.

Table Q5: Data Quality Indicators

Data Quality Indicator	Method(s) of Achievement
Completeness	Planned systematic and selected target locations sampled; Preparation of field logs, sample location plan and chain of custody (COC) records; Preparation of field groundwater sampling sheets; Laboratory sample receipt information received confirming receipt of samples intact and appropriateness of the chain of custody; Samples analysed for contaminants of potential concern (COPC) identified in the Conceptual Site Model (CSM); Completion of COC documentation; NATA endorsed laboratory certificates provided by the laboratory; 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; Works undertaken by appropriately experienced and trained DP environmental scientist / engineer; Use of NATA registered laboratories, with test methods the same or similar between laboratories; Satisfactory results for field and laboratory QC samples.
Representativeness	Target media sampled; Spatial and temporal distribution of sample locations; Sample numbers recovered and analysed are considered to be representative of the target media and complying with DQOs; Samples were extracted and analysed within holding times; Samples were analysed in accordance with the analysis request.
Precision	Acceptable RPD between original samples and replicates; 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

Summary of Laboratory Results for Soil and Waste Classification

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Table D1: Summary of Laboratory Results – Metals, TRH, BTEX, PAH

			Metals								TRH						BTEX				PAH			
			Arsenic	Cadmium	Total Chromium	Copper	Lead	Mercury (inorganic)	Nickel	Zinc	TRH C6 - C10	TRH >C10-C16	F1 ((C6-C10)-BTEX)	F2 (>C10-C16 less Naphthalene)	F3 (>C16-C34)	F4 (>C34-C40)	Benzene	Toluene	Ethylbenzene	Total Xylenes	Naphthalene [b]	Benzo(a)pyrene (BaP)	Benzo(a)pyrene TEQ	Total PAHs
		PQL	4	0.4	1	1	1	0.1	1	1	25	50	25	50	100	100	0.2	0.5	1	1	1	0.05	0.5	0.05
Sample ID	Depth	Sampled Date	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
BH1/0.4-0.5	0m	20/01/2020	**5**	<0.4	**18**	**7**	**11**	<0.1	<1	**5**	<25	<50	<25	<50	<100	<100	<0.2	<0.5	<1	<3	<1	<0.05	<0.5	<0.05
			300 NA	90 NA	300 NA	17000 NA	600 NA	80 NA	1200 NA	30000 NA	NC NA	NC NA	45 NA	110 NA	NC NA	NC NA	0.5 NA	160 NA	55 NA	40 NA	3 NA	NC NA	3 NA	300 NA
BD2/200120	0m	20/01/2020	<4	<0.4	**8**	**6**	**11**	<0.1	<1	**5**	<25	<50	<25	<50	<100	<100	<0.2	<0.5	<1	<3	<1	**0.08**	<0.5	**0.72**
			300 NA	90 NA	300 NA	17000 NA	600 NA	80 NA	1200 NA	30000 NA	NC NA	NC NA	45 NA	110 NA	NC NA	NC NA	0.5 NA	160 NA	55 NA	40 NA	3 NA	NC NA	3 NA	300 NA
BH2/0.25-0.35	0m	21/01/2020	**5**	<0.4	**14**	**9**	**22**	**0.1**	**4**	**35**	<25	<50	<25	<50	**160**	**140**	<0.2	<0.5	<1	<3	<1	**0.94**	**1.4**	**14**
			300 NA	90 NA	300 NA	17000 NA	600 NA	80 NA	1200 NA	30000 NA	NC NA	NC NA	45 NA	110 NA	NC NA	NC NA	0.5 NA	160 NA	55 NA	40 NA	3 NA	NC NA	3 NA	300 NA
BH2/2.4-2.5	0m	21/01/2020	<4	<0.4	**36**	**10**	**17**	<0.1	**15**	**22**	<25	<50	<25	<50	**190**	**190**	<0.2	<0.5	<1	<3	<1	**0.97**	**1.4**	**12**
			300 NA	90 NA	300 NA	17000 NA	600 NA	80 NA	1200 NA	30000 NA	NC NA	NC NA	45 NA	110 NA	NC NA	NC NA	0.5 NA	160 NA	55 NA	40 NA	3 NA	NC NA	3 NA	300 NA
BH3/0.9-1.0	0m	20/01/2020	<4	<0.4	**13**	**4**	**22**	<0.1	<1	**19**	<25	<50	<25	<50	**200**	**150**	<0.2	<0.5	<1	<3	<1	**2.2**	**3.2**	**32**
			300 NA	90 NA	300 NA	17000 NA	600 NA	80 NA	1200 NA	30000 NA	NC NA	NC NA	45 NA	110 NA	NC NA	NC NA	0.5 NA	160 NA	55 NA	40 NA	3 NA	NC NA	3 NA	300 NA
BH3/1.9-2.0	0m	20/01/2020	<4	<0.4	**22**	**2**	**11**	<0.1	<1	**5**	<25	<50	<25	<50	<100	<100	<0.2	<0.5	<1	<3	<1	**0.08**	<0.5	**0.91**
			300 NA	90 NA	300 NA	17000 NA	600 NA	80 NA	1200 NA	30000 NA	NC NA	NC NA	45 NA	110 NA	NC NA	NC NA	0.5 NA	160 NA	55 NA	40 NA	3 NA	NC NA	3 NA	300 NA
BH3/2.4-2.5	0m	20/01/2020	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT
			300 NA	90 NA	300 NA	17000 NA	600 NA	80 NA	1200 NA	30000 NA	NC NA	NC NA	45 NA	110 NA	NC NA	NC NA	0.5 NA	160 NA	55 NA	40 NA	3 NA	NC NA	3 NA	300 NA
BH1/0.4-0.5 - [TRIPLICATE]	0m	20/01/2020	<4	<0.4	**9**	**7**	**10**	<0.1	<1	**5**	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT
			300 NA	90 NA	300 NA	17000 NA	600 NA	80 NA	1200 NA	30000 NA	NC NA	NC NA	45 NA	110 NA	NC NA	NC NA	0.5 NA	160 NA	55 NA	40 NA	3 NA	NC NA	3 NA	300 NA

Lab result
HIL/HSL value EIL/ESL value

HIL/HSL exceedance EIL/ESL exceedance HIL/HSL and EIL/ESL exceedance ML exceedance ML and HIL/HSL or EIL/ESL exceedance

Indicates that asbestos has been detected by the lab below the PQL, refer to the lab report **Blue** = DC exceedance

Bold = Lab detections NT = Not tested NL = Non limiting NC = No criteria NA = Not applicable NAD = No asbestos detected

Notes:

HIL/HSL	NEPC, Schedule B1 - HIL C (Recreational / Open Space), HSL A/B (Residential / Low - High Density)
ML	NEPC, Schedule B1 - ML R/P/POS (Residential, Parkland and Public Open Space)
a	QA/QC replicate of sample listed directly below the primary sample
b	reported naphthalene laboratory result obtained from BTEXN suite
c	criteria applies to DDT only

1:11111

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Table D1: Summary of Laboratory Results – Phenol, OCP, OPP, PCB, Asbestos

			Phenol	OCP												OPP	PCB	Asbestos		
			Phenol	DDT+DDE+DDD [c]	DDD	DDE	DDT	Aldrin & Dieldrin	Total Chlordane	Total Endosulfan	Endrin	Heptachlor	HCB	Methoxychlor	Chlorpyriphos	Total PCB	Asbestos ID in soil >0.1g/kg	Trace Analysis	Asbestos (50 g)
		PQL	5	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1			
Sample ID	Depth	Sampled Date	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	-	-	-
BH1/0.4-0.5	0m	20/01/2020	<5 120 NA	<0.1 400 NA	<0.1 NC NA	<0.1 NC NA	<0.1 NC NA	<0.1 10 NA	<0.1 70 NA	<0.1 340 NA	<0.1 20 NA	<0.1 10 NA	<0.1 10 NA	<0.1 400 NA	<0.1 250 NA	<0.1 1 NA	NT	NT	NT
BD2/200120	0m	20/01/2020	NT 120 NA	NT 400 NA	NT NC NA	NT NC NA	NT NC NA	NT 10 NA	NT 70 NA	NT 340 NA	NT 20 NA	NT 10 NA	NT 10 NA	NT 400 NA	NT 250 NA	NT 1 NA	NT	NT	NT
BH2/0.25-0.35	0m	21/01/2020	<5 120 NA	<0.1 400 NA	<0.1 NC NA	<0.1 NC NA	<0.1 NC NA	<0.1 10 NA	<0.1 70 NA	<0.1 340 NA	<0.1 20 NA	<0.1 10 NA	<0.1 10 NA	<0.1 400 NA	<0.1 250 NA	<0.1 1 NA	NT	NT	NT
BH2/2.4-2.5	0m	21/01/2020	<5 120 NA	<0.1 400 NA	<0.1 NC NA	<0.1 NC NA	<0.1 NC NA	<0.1 10 NA	<0.1 70 NA	<0.1 340 NA	<0.1 20 NA	<0.1 10 NA	<0.1 10 NA	<0.1 400 NA	<0.1 250 NA	<0.1 1 NA	NT	NT	NT
BH3/0.9-1.0	0m	20/01/2020	<5 120 NA	<0.1 400 NA	<0.1 NC NA	<0.1 NC NA	<0.1 NC NA	<0.1 10 NA	<0.1 70 NA	<0.1 340 NA	<0.1 20 NA	<0.1 10 NA	<0.1 10 NA	<0.1 400 NA	<0.1 250 NA	<0.1 1 NA	NT	NT	NT
BH3/1.9-2.0	0m	20/01/2020	<5 120 NA	<0.1 400 NA	<0.1 NC NA	<0.1 NC NA	<0.1 NC NA	<0.1 10 NA	<0.1 70 NA	<0.1 340 NA	<0.1 20 NA	<0.1 10 NA	<0.1 10 NA	<0.1 400 NA	<0.1 250 NA	<0.1 1 NA	NT	NT	NT
BH3/2.4-2.5	0m	20/01/2020	NT 120 NA	NT 400 NA	NT NC NA	NT NC NA	NT NC NA	NT 10 NA	NT 70 NA	NT 340 NA	NT 20 NA	NT 10 NA	NT 10 NA	NT 400 NA	NT 250 NA	NT 1 NA	NT	NT	NT
BH1/0.4-0.5 - [TRIPLICATE]	0m	20/01/2020	NT 120 NA	NT 400 NA	NT NC NA	NT NC NA	NT NC NA	NT 10 NA	NT 70 NA	NT 340 NA	NT 20 NA	NT 10 NA	NT 10 NA	NT 400 NA	NT 250 NA	NT 1 NA	NT	NT	NT

Lab result
HIL/HSL value EIL/ESL value

HIL/HSL exceedance EIL/ESL exceedance HIL/HSL and EIL/ESL exceedance ML exceedance ML and HIL/HSL or EIL/ESL exceedance

Indicates that asbestos has been detected by the lab below the PQL, refer to the lab report **Blue** = DC exceedance

Bold = Lab detections NT = Not tested NL = Non limiting NC = No criteria NA = Not applicable NAD = No asbestos detected

Notes:

HIL/HSL	NEPC, Schedule B1 - HIL C (Recreational / Open Space), HSL A/B (Residential / Low - High Density)
ML	NEPC, Schedule B1 - ML R/P/POS (Residential, Parkland and Public Open Space)
a	QA/QC replicate of sample listed directly below the primary sample
b	reported naphthalene laboratory result obtained from BTEXN suite
c	criteria applies to DDT only

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Table D2: Summary of Laboratory Results – Metals, TRH, BTEX, PAH, Phenol, OCP, OPP, PCB, Asbestos

			Metals						TRH		BTEX																		
			Arsenic	Cadmium	Total Chromium	Lead	Mercury (inorganic)	Nickel	TRH C6 - C9	C10-C36 recoverable hydrocarbons	Benzene	Toluene	Ethylbenzene	m+p-Xylene	o-Xylene	Xylenes (total)	Benzo(a)pyrene (BaP)	TCLP Benzo(a)pyrene (BaP)	Acenaphthene	TCLP Acenaphthene	Acenaphthylene	TCLP Acenaphthylene	Anthracene	TCLP Anthracene	Benzo(a)anthracene	TCLP Benzo(a)anthracene	Benzo(b,j+k)fluoranthene	Benzo(g,h,i)perylene
		PQL	4	0.4	1	1	0.1	1	25	50	0.2	0.5	1	2	1	3	0.05	0.001	0.1	0.001	0.1	0.001	0.1	0.001	0.1	0.001	0.2	0.1
Sample ID	Depth	Sampled Date	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/L	mg/kg	mg/L	mg/kg	mg/L	mg/kg	mg/L	mg/kg	mg/L	mg/kg	mg/kg
BH1/0.4-0.5	0m	20/01/2020	5	<0.4	18	11	<0.1	<1	<25	<50	<0.2	<0.5	<1	<2	<1	<3	<0.05	NT	<0.1	NT	<0.1	NT	<0.1	NT	<0.1	NT	<0.2	<0.1
BH2/0.25-0.35	0m	21/01/2020	5	<0.4	14	22	0.1	4	<25	120	<0.2	<0.5	<1	<2	<1	<3	0.94	NT	<0.1	NT	0.2	NT	0.4	NT	1.3	NT	1	0.6
BH2/2.4-2.5	0m	21/01/2020	<4	<0.4	36	17	<0.1	15	<25	150	<0.2	<0.5	<1	<2	<1	<3	0.97	<0.001	<0.1	<0.001	0.1	<0.001	0.3	<0.001	1.2	<0.001	1	0.6
BH3/0.9-1.0	0m	20/01/2020	<4	<0.4	13	22	<0.1	<1	<25	240	<0.2	<0.5	<1	<2	<1	<3	2.2	<0.001	<0.1	<0.001	0.4	<0.001	1.1	<0.001	3	<0.001	2.9	1.2
BH3/1.9-2.0	0m	20/01/2020	<4	<0.4	22	11	<0.1	<1	<25	<50	<0.2	<0.5	<1	<2	<1	<3	0.08	NT	<0.1	NT	<0.1	NT	<0.1	NT	0.1	NT	<0.2	<0.1
BH3/2.4-2.5	0m	20/01/2020	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT
BD2/200120	0m	20/01/2020	<4	<0.4	8	11	<0.1	<1	<25	<50	<0.2	<0.5	<1	<2	<1	<3	0.08	NT	<0.1	NT	<0.1	NT	<0.1	NT	0.1	NT	<0.2	<0.1
BH1/0.4-0.5 - [TRIPLICATE]	0m	20/01/2020	<4	<0.4	9	10	<0.1	<1	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT
																											Waste Classification Criteria	
CT1 (mg/kg)			100	20	100	100	4	40	650	10000	10	288	600	N/A	N/A	1000	0.8	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
SCC1 (mg/kg)			500	100	1900	1500	50	1050	650	10000	18	518	1080	N/A	N/A	1800	10	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
TCLP1 (mg/L)			N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0.04	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
CT2 (mg/kg)			400	80	400	400	16	160	2600	40000	40	1152	2400	N/A	N/A	4000	3.2	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
SCC2(mg/kg)			2000	400	7600	6000	200	4200	2600	40000	72	2073	4320	N/A	N/A	7200	23	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
TCLP2 (mg/L)			N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0.16	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

CT1 exceedance TCLP1 and/or SCC1 exceedance CT2 exceedance TCLP2 and/or SCC2 exceedance Asbestos detection

NT = Not tested NC = No criteria AD = Asbestos detected NAD = No asbestos detected

Notes:

*	QA/QC replicate of sample listed directly below the primary sample
**	Total chromium used as initial screen for chromium(VI).
***	Total recoverable hydrocarbons (TRH) used as an initial screen for total petroleum hydrocarbons (TPH)
****	Criteria for scheduled chemicals used as an initial screen
*****	Criteria for Chlorpyrifos used as initial screen
PQL	Practical quantitation limit
CT1	NSW EPA, 2014, Waste Classification Guidelines Part 1; Classifying Waste, Maximum values of specific contaminant concentration (SCC) for classification without TCLP: General solid waste
SCC1	NSW EPA, 2014, Waste Classification Guidelines Part 1; Classifying Waste, Maximum values for leachable concentration (TCLP) and specific contaminant concentration (SCC) when used toge
TCLP1	NSW EPA, 2014, Waste Classification Guidelines Part 1; Classifying Waste, Maximum values for leachable concentration (TCLP) and specific contaminant concentration (SCC) when used toge
CT2	NSW EPA, 2014, Waste Classification Guidelines Part 1; Classifying Waste, Maximum values of specific contaminant concentration (SCC) for classification without TCLP: Restricted solid wast
SCC2	NSW EPA, 2014, Waste Classification Guidelines Part 1; Classifying Waste, Maximum values for leachable concentration (TCLP) and specific contaminant concentration (SCC) when used toge
TCLP2	NSW EPA, 2014, Waste Classification Guidelines Part 1; Classifying Waste, Maximum values for leachable concentration (TCLP) and specific contaminant concentration (SCC) when used toge

PAH																			Phenol	OCP		OPP	PCB	Asbestos		
TCLP Benzo(g,h,i)perylene	Chrysene	TCLP Chrysene	Dibenzo(a,h)anthracene	TCLP Dibenzo(a,h)anthracene	Fluoranthene	TCLP Fluoranthene	Fluorene	TCLP Fluorene	Indeno(1,2,3-c,d)pyrene	TCLP Indeno(1,2,3-c,d)pyrene	Naphthalene	TCLP Naphthalene	Phenanthrene	TCLP Phenanthrene	Pyrene	TCLP Pyrene	Total PAHs	TCLP Total PAHs	Phenol	Total Endosulfan	Total Analysed OCP	Total Analysed OPP	Total PCB	Asbestos ID in soil >0.1g/kg	Trace Analysis	Total Asbestos
0.001	0.1	0.001	0.1	0.001	0.1	0.001	0.1	0.001	0.1	0.001	1	0.001	0.1	0.001	0.1	0.001	0.05		5	0.1	0.1	0.1	0.1			
mg/L	mg/kg	mg/L	mg/kg	mg/L	mg/kg	mg/L	mg/kg	mg/L	mg/kg	mg/L	mg/kg	mg/L	mg/kg	mg/L	mg/kg	mg/L	mg/kg	mg/L	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	-	-	-
NT	<0.1	NT	<0.1	NT	<0.1	NT	<0.1	NT	<0.1	NT	<1	NT	<0.1	NT	<0.1	NT	<0.05	NT	<5	<0.1	<0.1	<0.1	<0.1	NT	NT	NT
NT	1.3	NT	0.2	NT	2.4	NT	0.2	NT	0.5	NT	<1	NT	1.7	NT	2.3	NT	14	NT	<5	<0.1	<0.1	<0.1	<0.1	NT	NT	NT
<0.001	1.2	<0.001	0.1	<0.001	1.9	<0.001	<0.1	<0.001	0.5	<0.001	<1	<0.001	1.3	<0.001	1.9	<0.001	12	NT	<5	<0.1	<0.1	<0.1	<0.1	NT	NT	NT
<0.001	3	<0.001	0.3	<0.001	5.7	<0.001	0.3	<0.001	1	<0.001	<1	<0.001	5.1	0.001	5.7	<0.001	32	0.0011	<5	<0.1	<0.1	<0.1	<0.1	NT	NT	NT
NT	0.1	NT	<0.1	NT	0.2	NT	<0.1	NT	<0.1	NT	<1	NT	0.2	NT	0.2	NT	0.91	NT	<5	<0.1	<0.1	<0.1	<0.1	NT	NT	NT
NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT
NT	0.1	NT	<0.1	NT	0.2	NT	<0.1	NT	<0.1	NT	<1	NT	0.1	NT	0.2	NT	0.72	NT	NT	NT	NT	NT	NT	NT	NT	NT
NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT
N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	200	N/A	288	60	50	4	50	N/A	N/A	N/A
N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	200	N/A	518	108	50	7.5	50	N/A	N/A	N/A
N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	800	N/A	1152	240	50	16	50	N/A	N/A	N/A
N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	800	N/A	2073	432	50	30	50	N/A	N/A	N/A
N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

Appendix E

Laboratory Certificates of Analysis, Sample Receipt Advice and Chain of Custody

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

CERTIFICATE OF ANALYSIS 235114

Client Details

Client	Douglas Partners Pty Ltd
Attention	Matthew Bennett
Address	96 Hermitage Rd, West Ryde, NSW, 2114

Sample Details

Your Reference	**85108.04, Riverview**
Number of Samples	7 Soil
Date samples received	23/01/2020
Date completed instructions received	23/01/2020

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	28/01/2020
Date of Issue	28/01/2020

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

Asbestos Approved By
Analysed by Asbestos Approved Identifier: Lucy Zhu
Authorised by Asbestos Approved Signatory: Lucy Zhu

Results Approved By
Jaimie Loa-Kum-Cheung, Metals Supervisor
Josh Williams, Senior Chemist
Lucy Zhu, Asbestos Supervisor
Priya Samarawickrama, Senior Chemist
Steven Luong, Organics Supervisor

Authorised By

Nancy Zhang, Laboratory Manager

vTRH(C6-C10)/BTEXN in Soil						
Our Reference		235114-1	235114-2	235114-3	235114-4	235114-5
Your Reference	UNITS	BH1/0.4-0.5	BH2/0.25-0.35	BH2/2.4-2.5	BH3/0.9-1.0	BH3/1.9-2.0
Date Sampled		20/01/2020	21/01/2020	21/01/2020	20/01/2020	20/01/2020
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	-	24/01/2020	24/01/2020	24/01/2020	24/01/2020	24/01/2020
Date analysed	-	25/01/2020	25/01/2020	25/01/2020	25/01/2020	25/01/2020
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
Total +ve Xylenes	mg/kg	<3	<3	<3	<3	<3
Surrogate aaa-Trifluorotoluene	%	86	93	96	89	89

vTRH(C6-C10)/BTEXN in Soil		
Our Reference		235114-7
Your Reference	UNITS	BD2/200120
Date Sampled		20/01/2020
Type of sample		Soil
Date extracted	-	24/01/2020
Date analysed	-	25/01/2020
TRH C_6 - C_9	mg/kg	<25
TRH C_6 - C_{10}	mg/kg	<25
vTPH C_6 - C_{10} less BTEX (F1)	mg/kg	<25
Benzene	mg/kg	<0.2
Toluene	mg/kg	<0.5
Ethylbenzene	mg/kg	<1
m+p-xylene	mg/kg	<2
o-Xylene	mg/kg	<1
naphthalene	mg/kg	<1
Total +ve Xylenes	mg/kg	<3
Surrogate aaa-Trifluorotoluene	%	98

svTRH (C10-C40) in Soil						
Our Reference		235114-1	235114-2	235114-3	235114-4	235114-5
Your Reference	UNITS	BH1/0.4-0.5	BH2/0.25-0.35	BH2/2.4-2.5	BH3/0.9-1.0	BH3/1.9-2.0
Date Sampled		20/01/2020	21/01/2020	21/01/2020	20/01/2020	20/01/2020
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	-	24/01/2020	24/01/2020	24/01/2020	24/01/2020	24/01/2020
Date analysed	-	25/01/2020	25/01/2020	25/01/2020	25/01/2020	25/01/2020
TRH C_{10} - C_{14}	mg/kg	<50	<50	<50	<50	<50
TRH C_{15} - C_{28}	mg/kg	<100	<100	<100	110	<100
TRH C_{29} - C_{36}	mg/kg	<100	120	150	130	<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	160	190	200	<100
TRH >C_{34} -C_{40}	mg/kg	<100	140	190	150	<100
Total +ve TRH (>C10-C40)	mg/kg	<50	300	380	350	<50
Surrogate o-Terphenyl	%	104	108	108	103	103

svTRH (C10-C40) in Soil		
Our Reference		235114-7
Your Reference	UNITS	BD2/200120
Date Sampled		20/01/2020
Type of sample		Soil
Date extracted	-	24/01/2020
Date analysed	-	25/01/2020
TRH C_{10} - C_{14}	mg/kg	<50
TRH C_{15} - C_{28}	mg/kg	<100
TRH C_{29} - C_{36}	mg/kg	<100
TRH >C_{10} -C_{16}	mg/kg	<50
TRH >C_{10} - C_{16} less Naphthalene (F2)	mg/kg	<50
TRH >C_{16} -C_{34}	mg/kg	<100
TRH >C_{34} -C_{40}	mg/kg	<100
Total +ve TRH (>C10-C40)	mg/kg	<50
Surrogate o-Terphenyl	%	103

PAHs in Soil						
Our Reference		235114-1	235114-2	235114-3	235114-4	235114-5
Your Reference	UNITS	BH1/0.4-0.5	BH2/0.25-0.35	BH2/2.4-2.5	BH3/0.9-1.0	BH3/1.9-2.0
Date Sampled		20/01/2020	21/01/2020	21/01/2020	20/01/2020	20/01/2020
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	-	24/01/2020	24/01/2020	24/01/2020	24/01/2020	24/01/2020
Date analysed	-	24/01/2020	24/01/2020	24/01/2020	24/01/2020	24/01/2020
Naphthalene	mg/kg	<0.1	0.3	<0.1	<0.1	<0.1
Acenaphthylene	mg/kg	<0.1	0.2	0.1	0.4	<0.1
Acenaphthene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Fluorene	mg/kg	<0.1	0.2	<0.1	0.3	<0.1
Phenanthrene	mg/kg	<0.1	1.7	1.3	5.1	0.2
Anthracene	mg/kg	<0.1	0.4	0.3	1.1	<0.1
Fluoranthene	mg/kg	<0.1	2.4	1.9	5.7	0.2
Pyrene	mg/kg	<0.1	2.3	1.9	5.7	0.2
Benzo(a)anthracene	mg/kg	<0.1	1.3	1.2	3.0	0.1
Chrysene	mg/kg	<0.1	1.3	1.2	3.0	0.1
Benzo(b,j+k)fluoranthene	mg/kg	<0.2	1	1	2.9	<0.2
Benzo(a)pyrene	mg/kg	<0.05	0.94	0.97	2.2	0.08
Indeno(1,2,3-c,d)pyrene	mg/kg	<0.1	0.5	0.5	1	<0.1
Dibenzo(a,h)anthracene	mg/kg	<0.1	0.2	0.1	0.3	<0.1
Benzo(g,h,i)perylene	mg/kg	<0.1	0.6	0.6	1.2	<0.1
Total +ve PAH's	mg/kg	<0.05	14	12	32	0.91
Benzo(a)pyrene TEQ calc (zero)	mg/kg	<0.5	1.4	1.4	3.2	<0.5
Benzo(a)pyrene TEQ calc(half)	mg/kg	<0.5	1.4	1.4	3.2	<0.5
Benzo(a)pyrene TEQ calc(PQL)	mg/kg	<0.5	1.4	1.4	3.2	<0.5
Surrogate p-Terphenyl-d14	%	92	93	89	93	95

PAHs in Soil		
Our Reference		235114-7
Your Reference	UNITS	BD2/200120
Date Sampled		20/01/2020
Type of sample		Soil
Date extracted	-	24/01/2020
Date analysed	-	24/01/2020
Naphthalene	mg/kg	<0.1
Acenaphthylene	mg/kg	<0.1
Acenaphthene	mg/kg	<0.1
Fluorene	mg/kg	<0.1
Phenanthrene	mg/kg	0.1
Anthracene	mg/kg	<0.1
Fluoranthene	mg/kg	0.2
Pyrene	mg/kg	0.2
Benzo(a)anthracene	mg/kg	0.1
Chrysene	mg/kg	0.1
Benzo(b,j+k)fluoranthene	mg/kg	<0.2
Benzo(a)pyrene	mg/kg	0.08
Indeno(1,2,3-c,d)pyrene	mg/kg	<0.1
Dibenzo(a,h)anthracene	mg/kg	<0.1
Benzo(g,h,i)perylene	mg/kg	<0.1
Total +ve PAH's	mg/kg	0.72
Benzo(a)pyrene TEQ calc (zero)	mg/kg	<0.5
Benzo(a)pyrene TEQ calc(half)	mg/kg	<0.5
Benzo(a)pyrene TEQ calc(PQL)	mg/kg	<0.5
Surrogate p-Terphenyl-d14	%	92

Organochlorine Pesticides in soil						
Our Reference		235114-1	235114-2	235114-3	235114-4	235114-5
Your Reference	UNITS	BH1/0.4-0.5	BH2/0.25-0.35	BH2/2.4-2.5	BH3/0.9-1.0	BH3/1.9-2.0
Date Sampled		20/01/2020	21/01/2020	21/01/2020	20/01/2020	20/01/2020
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	-	24/01/2020	24/01/2020	24/01/2020	24/01/2020	24/01/2020
Date analysed	-	24/01/2020	24/01/2020	24/01/2020	24/01/2020	24/01/2020
alpha-BHC	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
HCB	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
gamma-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
Endosulfan II	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
Endrin Aldehyde	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
Endosulfan Sulphate	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Methoxychlor	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Total +ve DDT+DDD+DDE	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Surrogate TCMX	%	89	86	86	85	87

Organophosphorus Pesticides in Soil						
Our Reference		235114-1	235114-2	235114-3	235114-4	235114-5
Your Reference	UNITS	BH1/0.4-0.5	BH2/0.25-0.35	BH2/2.4-2.5	BH3/0.9-1.0	BH3/1.9-2.0
Date Sampled		20/01/2020	21/01/2020	21/01/2020	20/01/2020	20/01/2020
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	-	24/01/2020	24/01/2020	24/01/2020	24/01/2020	24/01/2020
Date analysed	-	24/01/2020	24/01/2020	24/01/2020	24/01/2020	24/01/2020
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
Diazinon	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Chlorpyriphos-methyl	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Ronnel	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
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
Chlorpyriphos	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
Bromophos-ethyl	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Ethion	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Azinphos-methyl (Guthion)	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Surrogate TCMX	%	89	86	86	85	87

PCBs in Soil						
Our Reference		235114-1	235114-2	235114-3	235114-4	235114-5
Your Reference	UNITS	BH1/0.4-0.5	BH2/0.25-0.35	BH2/2.4-2.5	BH3/0.9-1.0	BH3/1.9-2.0
Date Sampled		20/01/2020	21/01/2020	21/01/2020	20/01/2020	20/01/2020
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	-	24/01/2020	24/01/2020	24/01/2020	24/01/2020	24/01/2020
Date analysed	-	24/01/2020	24/01/2020	24/01/2020	24/01/2020	24/01/2020
Aroclor 1016	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Aroclor 1221	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Aroclor 1232	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Aroclor 1242	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Aroclor 1248	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Aroclor 1254	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Aroclor 1260	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Total +ve PCBs (1016-1260)	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Surrogate TCMX	%	89	86	86	85	87

Acid Extractable metals in soil						
Our Reference		235114-1	235114-2	235114-3	235114-4	235114-5
Your Reference	UNITS	BH1/0.4-0.5	BH2/0.25-0.35	BH2/2.4-2.5	BH3/0.9-1.0	BH3/1.9-2.0
Date Sampled		20/01/2020	21/01/2020	21/01/2020	20/01/2020	20/01/2020
Type of sample		Soil	Soil	Soil	Soil	Soil
Date prepared	-	24/01/2020	24/01/2020	24/01/2020	24/01/2020	24/01/2020
Date analysed	-	24/01/2020	24/01/2020	24/01/2020	24/01/2020	24/01/2020
Arsenic	mg/kg	5	5	<4	<4	<4
Cadmium	mg/kg	<0.4	<0.4	<0.4	<0.4	<0.4
Chromium	mg/kg	18	14	36	13	22
Copper	mg/kg	7	9	10	4	2
Lead	mg/kg	11	22	17	22	11
Mercury	mg/kg	<0.1	0.1	<0.1	<0.1	<0.1
Nickel	mg/kg	<1	4	15	<1	<1
Zinc	mg/kg	5	35	22	19	5

Acid Extractable metals in soil			
Our Reference		235114-7	235114-8
Your Reference	UNITS	BD2/200120	BH1/0.4-0.5 - [TRIPLICATE]
Date Sampled		20/01/2020	20/01/2020
Type of sample		Soil	Soil
Date prepared	-	24/01/2020	24/01/2020
Date analysed	-	24/01/2020	24/01/2020
Arsenic	mg/kg	<4	<4
Cadmium	mg/kg	<0.4	<0.4
Chromium	mg/kg	8	9
Copper	mg/kg	6	7
Lead	mg/kg	11	10
Mercury	mg/kg	<0.1	<0.1
Nickel	mg/kg	<1	<1
Zinc	mg/kg	5	5

Misc Soil - Inorg						
Our Reference		235114-1	235114-2	235114-3	235114-4	235114-5
Your Reference	UNITS	BH1/0.4-0.5	BH2/0.25-0.35	BH2/2.4-2.5	BH3/0.9-1.0	BH3/1.9-2.0
Date Sampled		20/01/2020	21/01/2020	21/01/2020	20/01/2020	20/01/2020
Type of sample		Soil	Soil	Soil	Soil	Soil
Date prepared	-	24/01/2020	24/01/2020	24/01/2020	24/01/2020	24/01/2020
Date analysed	-	24/01/2020	24/01/2020	24/01/2020	24/01/2020	24/01/2020
Total Phenolics (as Phenol)	mg/kg	<5	<5	<5	<5	<5

Soil Aggressivity			
Our Reference		235114-4	235114-6
Your Reference	UNITS	BH3/0.9-1.0	BH3/2.4-2.5
Date Sampled		20/01/2020	20/01/2020
Type of sample		Soil	Soil
pH 1:5 soil:water	pH Units	6.1	4.8
Electrical Conductivity 1:5 soil:water	µS/cm	120	45
Chloride, Cl 1:5 soil:water	mg/kg	20	10
Sulphate, SO4 1:5 soil:water	mg/kg	56	51

Moisture						
Our Reference		235114-1	235114-2	235114-3	235114-4	235114-5
Your Reference	UNITS	BH1/0.4-0.5	BH2/0.25-0.35	BH2/2.4-2.5	BH3/0.9-1.0	BH3/1.9-2.0
Date Sampled		20/01/2020	21/01/2020	21/01/2020	20/01/2020	20/01/2020
Type of sample		Soil	Soil	Soil	Soil	Soil
Date prepared	-	24/01/2020	24/01/2020	24/01/2020	24/01/2020	24/01/2020
Date analysed	-	28/01/2020	28/01/2020	28/01/2020	28/01/2020	28/01/2020
Moisture	%	7.3	9.0	10	7.1	4.2

Moisture		
Our Reference		235114-7
Your Reference	UNITS	BD2/200120
Date Sampled		20/01/2020
Type of sample		Soil
Date prepared	-	24/01/2020
Date analysed	-	28/01/2020
Moisture	%	6.7

Asbestos ID - soils						
Our Reference		235114-1	235114-2	235114-3	235114-4	235114-5
Your Reference	UNITS	BH1/0.4-0.5	BH2/0.25-0.35	BH2/2.4-2.5	BH3/0.9-1.0	BH3/1.9-2.0
Date Sampled		20/01/2020	21/01/2020	21/01/2020	20/01/2020	20/01/2020
Type of sample		Soil	Soil	Soil	Soil	Soil
Date analysed	-	28/01/2020	28/01/2020	28/01/2020	28/01/2020	28/01/2020
Sample mass tested	g	Approx. 35g	Approx. 40g	Approx. 40g	Approx. 40g	Approx. 40g
Sample Description	-	Brown fine-grained soil & rocks	Brown fine-grained soil & rocks	Brown fine-grained soil & rocks	Brown fine-grained soil & rocks	Pink fine-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
Asbestos comments	-	NO	NO	NO	NO	NO
Trace Analysis	-	No asbestos detected	No asbestos detected	No asbestos detected	No asbestos detected	No asbestos detected

Asbestos ID - soils		
Our Reference		235114-7
Your Reference	UNITS	BD2/200120
Date Sampled		20/01/2020
Type of sample		Soil
Date analysed	-	28/01/2020
Sample mass tested	g	Approx. 30g
Sample Description	-	Brown fine-grained soil & rocks
Asbestos ID in soil	-	No asbestos detected at reporting limit of 0.1g/kg Organic fibres detected
Asbestos comments	-	NO
Trace Analysis	-	No asbestos detected

Method ID	Methodology Summary
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.
AT-008	Determination of VOCs sampled onto coconut shell charcoal sorbent tubes, that can be desorbed using carbon disulphide, and analysed by GC-MS.
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-002	Conductivity and Salinity - measured using a conductivity cell at 25°C in accordance with APHA latest edition 2510 and Rayment & Lyons.
Inorg-008	Moisture content determined by heating at 105+/-5 °C for a minimum of 12 hours.
Inorg-031	Total Phenolics by segmented flow analyser (in line distillation with colourimetric finish). Solids are extracted in a caustic media prior to analysis.
Inorg-081	Anions - a range of Anions are determined by Ion Chromatography, in accordance with APHA latest edition, 4110-B. Waters samples are filtered on receipt prior to analysis. Alternatively determined by colourimetry/turbidity using Discrete Analyser.
Metals-020	Determination of various metals by ICP-AES.
Metals-021	Determination of Mercury by Cold Vapour AAS.
Org-003	Soil samples are extracted with Dichloromethane/Acetone and waters with Dichloromethane and analysed by GC-FID. F2 = (>C10-C16)-Naphthalene as per NEPM B1 Guideline on Investigation Levels for Soil and Groundwater (HSLs Tables 1A (3, 4)). Note Naphthalene is determined from the VOC analysis.
Org-003	Soil samples are extracted with Dichloromethane/Acetone and waters with Dichloromethane and analysed by GC-FID. F2 = (>C10-C16)-Naphthalene as per NEPM B1 Guideline on Investigation Levels for Soil and Groundwater (HSLs Tables 1A (3, 4)). Note Naphthalene is determined from the VOC analysis. Note, the Total +ve TRH PQL is reflective of the lowest individual PQL and is therefore "Total +ve TRH" is simply a sum of the positive individual TRH fractions (>C10-C40).
Org-006	Soil samples are extracted with dichloromethane/acetone and waters with dichloromethane and analysed by GC-ECD.
Org-006	Soil samples are extracted with dichloromethane/acetone and waters with dichloromethane and analysed by GC-ECD. Note, the Total +ve PCBs PQL is reflective of the lowest individual PQL and is therefore" Total +ve PCBs" is simply a sum of the positive individual PCBs.
Org-012/017	Soil samples are extracted with Dichloromethane/Acetone and waters with Dichloromethane and analysed by GC-MS and/or GC-MS/MS.

Method ID	Methodology Summary
Org-012/017	Soil samples are extracted with dichloromethane/acetone and waters with dichloromethane and analysed by GC-MS and/or GC-MS/MS. Note, the Total +ve reported DDD+DDE+DDT PQL is reflective of the lowest individual PQL and is therefore simply a sum of the positive individually report DDD+DDE+DDT.
Org-012/017	Soil samples are extracted with Dichloromethane/Acetone and waters with Dichloromethane and analysed by GC-MS and/or GC-MS/MS. Benzo(a)pyrene TEQ as per NEPM B1 Guideline on Investigation Levels for Soil and Groundwater - 2013. For soil results:- 1. 'EQ PQL'values are assuming all contributing PAHs reported as <PQL are actually at the PQL. This is the most conservative approach and can give false positive TEQs given that PAHs that contribute to the TEQ calculation may not be present. 2. 'EQ zero'values are assuming all contributing PAHs reported as <PQL are zero. This is the least conservative approach and is more susceptible to false negative TEQs when PAHs that contribute to the TEQ calculation are present but below PQL. 3. 'EQ half PQL'values are assuming all contributing PAHs reported as <PQL are half the stipulated PQL. Hence a mid-point between the most and least conservative approaches above. Note, the Total +ve PAHs PQL is reflective of the lowest individual PQL and is therefore "Total +ve PAHs" is simply a sum of the positive individual PAHs.
Org-014	Soil samples are extracted with methanol and spiked into water prior to analysing 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-016	Soil samples are extracted with methanol and spiked into water prior to analysing by purge and trap GC-MS. Water samples are analysed directly by purge and trap GC-MS. F1 = (C6-C10)-BTEX as per NEPM B1 Guideline on Investigation Levels for Soil and Groundwater. Note, the Total +ve Xylene PQL is reflective of the lowest individual PQL and is therefore "Total +ve Xylenes" is simply a sum of the positive individual Xylenes.

QUALITY CONTROL: vTRH(C6-C10)/BTEXN in Soil						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-1	235114-2
Date extracted	-			24/01/2020	1	24/01/2020	24/01/2020		24/01/2020	24/01/2020
Date analysed	-			25/01/2020	1	25/01/2020	25/01/2020		25/01/2020	25/01/2020
TRH C_6 - C_9	mg/kg	25	Org-016	<25	1	<25	<25	0	113	98
TRH C_6 - C_{10}	mg/kg	25	Org-016	<25	1	<25	<25	0	113	98
Benzene	mg/kg	0.2	Org-016	<0.2	1	<0.2	<0.2	0	96	85
Toluene	mg/kg	0.5	Org-016	<0.5	1	<0.5	<0.5	0	100	88
Ethylbenzene	mg/kg	1	Org-016	<1	1	<1	<1	0	123	105
m+p-xylene	mg/kg	2	Org-016	<2	1	<2	<2	0	123	105
o-Xylene	mg/kg	1	Org-016	<1	1	<1	<1	0	123	106
naphthalene	mg/kg	1	Org-014	<1	1	<1	<1	0	[NT]	[NT]
Surrogate aaa-Trifluorotoluene	%		Org-016	86	1	86	86	0	95	81

QUALITY CONTROL: svTRH (C10-C40) in Soil						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-1	235114-2
Date extracted	-			23/01/2020	1	24/01/2020	24/01/2020		23/01/2020	24/01/2020
Date analysed	-			24/01/2020	1	25/01/2020	25/01/2020		25/01/2020	25/01/2020
TRH C_{10} - C_{14}	mg/kg	50	Org-003	<50	1	<50	<50	0	74	70
TRH C_{15} - C_{28}	mg/kg	100	Org-003	<100	1	<100	<100	0	73	74
TRH C_{29} - C_{36}	mg/kg	100	Org-003	<100	1	<100	<100	0	118	108
TRH >C_{10} -C_{16}	mg/kg	50	Org-003	<50	1	<50	<50	0	74	70
TRH >C_{16} -C_{34}	mg/kg	100	Org-003	<100	1	<100	<100	0	73	74
TRH >C_{34} -C_{40}	mg/kg	100	Org-003	<100	1	<100	<100	0	118	108
Surrogate o-Terphenyl	%		Org-003	61	1	104	103	1	87	85

QUALITY CONTROL: PAHs in Soil						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-1	235114-2
Date extracted	-			24/01/2020	1	24/01/2020	24/01/2020		24/01/2020	24/01/2020
Date analysed	-			24/01/2020	1	24/01/2020	24/01/2020		24/01/2020	24/01/2020
Naphthalene	mg/kg	0.1	Org-012/017	<0.1	1	<0.1	<0.1	0	90	76
Acenaphthylene	mg/kg	0.1	Org-012/017	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Acenaphthene	mg/kg	0.1	Org-012/017	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Fluorene	mg/kg	0.1	Org-012/017	<0.1	1	<0.1	<0.1	0	92	94
Phenanthrene	mg/kg	0.1	Org-012/017	<0.1	1	<0.1	<0.1	0	92	#
Anthracene	mg/kg	0.1	Org-012/017	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Fluoranthene	mg/kg	0.1	Org-012/017	<0.1	1	<0.1	0.1	0	90	#
Pyrene	mg/kg	0.1	Org-012/017	<0.1	1	<0.1	0.1	0	88	#
Benzo(a)anthracene	mg/kg	0.1	Org-012/017	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Chrysene	mg/kg	0.1	Org-012/017	<0.1	1	<0.1	0.1	0	94	#
Benzo(b,j+k)fluoranthene	mg/kg	0.2	Org-012/017	<0.2	1	<0.2	<0.2	0	[NT]	[NT]
Benzo(a)pyrene	mg/kg	0.05	Org-012/017	<0.05	1	<0.05	0.06	18	90	#
Indeno(1,2,3-c,d)pyrene	mg/kg	0.1	Org-012/017	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Dibenzo(a,h)anthracene	mg/kg	0.1	Org-012/017	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Benzo(g,h,i)perylene	mg/kg	0.1	Org-012/017	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Surrogate p-Terphenyl-d14	%		Org-012/017	101	1	92	91	1	93	89

QUALITY CONTROL: Organochlorine Pesticides in soil						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-1	235114-2
Date extracted	-			24/01/2020	1	24/01/2020	24/01/2020		24/01/2020	24/01/2020
Date analysed	-			24/01/2020	1	24/01/2020	24/01/2020		24/01/2020	24/01/2020
alpha-BHC	mg/kg	0.1	Org-012/017	<0.1	1	<0.1	<0.1	0	102	91
HCB	mg/kg	0.1	Org-012/017	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
beta-BHC	mg/kg	0.1	Org-012/017	<0.1	1	<0.1	<0.1	0	96	91
gamma-BHC	mg/kg	0.1	Org-012/017	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Heptachlor	mg/kg	0.1	Org-012/017	<0.1	1	<0.1	<0.1	0	98	93
delta-BHC	mg/kg	0.1	Org-012/017	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Aldrin	mg/kg	0.1	Org-012/017	<0.1	1	<0.1	<0.1	0	108	82
Heptachlor Epoxide	mg/kg	0.1	Org-012/017	<0.1	1	<0.1	<0.1	0	102	91
gamma-Chlordane	mg/kg	0.1	Org-012/017	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
alpha-chlordane	mg/kg	0.1	Org-012/017	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Endosulfan I	mg/kg	0.1	Org-012/017	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
pp-DDE	mg/kg	0.1	Org-012/017	<0.1	1	<0.1	<0.1	0	104	96
Dieldrin	mg/kg	0.1	Org-012/017	<0.1	1	<0.1	<0.1	0	104	101
Endrin	mg/kg	0.1	Org-012/017	<0.1	1	<0.1	<0.1	0	104	98
Endosulfan II	mg/kg	0.1	Org-012/017	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
pp-DDD	mg/kg	0.1	Org-012/017	<0.1	1	<0.1	<0.1	0	100	96
Endrin Aldehyde	mg/kg	0.1	Org-012/017	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
pp-DDT	mg/kg	0.1	Org-012/017	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Endosulfan Sulphate	mg/kg	0.1	Org-012/017	<0.1	1	<0.1	<0.1	0	100	98
Methoxychlor	mg/kg	0.1	Org-012/017	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Surrogate TCMX	%		Org-012/017	91	1	89	86	3	88	81

QUALITY CONTROL: Organophosphorus Pesticides in Soil						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-1	235114-2
Date extracted	-			24/01/2020	1	24/01/2020	24/01/2020		24/01/2020	24/01/2020
Date analysed	-			24/01/2020	1	24/01/2020	24/01/2020		24/01/2020	24/01/2020
Dichlorvos	mg/kg	0.1	Org-012/017	<0.1	1	<0.1	<0.1	0	96	91
Dimethoate	mg/kg	0.1	Org-012/017	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Diazinon	mg/kg	0.1	Org-012/017	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Chlorpyriphos-methyl	mg/kg	0.1	Org-012/017	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Ronnel	mg/kg	0.1	Org-012/017	<0.1	1	<0.1	<0.1	0	100	93
Fenitrothion	mg/kg	0.1	Org-012/017	<0.1	1	<0.1	<0.1	0	100	98
Malathion	mg/kg	0.1	Org-012/017	<0.1	1	<0.1	<0.1	0	90	88
Chlorpyriphos	mg/kg	0.1	Org-012/017	<0.1	1	<0.1	<0.1	0	100	101
Parathion	mg/kg	0.1	Org-012/017	<0.1	1	<0.1	<0.1	0	98	104
Bromophos-ethyl	mg/kg	0.1	AT-008	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Ethion	mg/kg	0.1	Org-012/017	<0.1	1	<0.1	<0.1	0	92	91
Azinphos-methyl (Guthion)	mg/kg	0.1	Org-012/017	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Surrogate TCMX	%		Org-012/017	91	1	89	86	3	88	81

QUALITY CONTROL: PCBs in Soil						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-1	235114-2
Date extracted	-			24/01/2020	1	24/01/2020	24/01/2020		24/01/2020	24/01/2020
Date analysed	-			24/01/2020	1	24/01/2020	24/01/2020		24/01/2020	24/01/2020
Aroclor 1016	mg/kg	0.1	Org-006	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Aroclor 1221	mg/kg	0.1	Org-006	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Aroclor 1232	mg/kg	0.1	Org-006	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Aroclor 1242	mg/kg	0.1	Org-006	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Aroclor 1248	mg/kg	0.1	Org-006	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Aroclor 1254	mg/kg	0.1	Org-006	<0.1	1	<0.1	<0.1	0	97	87
Aroclor 1260	mg/kg	0.1	Org-006	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Surrogate TCMX	%		Org-006	91	1	89	86	3	88	81

QUALITY CONTROL: Acid Extractable metals in soil						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-1	235114-2
Date prepared	-			24/01/2020	1	24/01/2020	24/01/2020		24/01/2020	24/01/2020
Date analysed	-			24/01/2020	1	24/01/2020	24/01/2020		24/01/2020	24/01/2020
Arsenic	mg/kg	4	Metals-020	<4	1	5	<4	22	107	103
Cadmium	mg/kg	0.4	Metals-020	<0.4	1	<0.4	<0.4	0	102	93
Chromium	mg/kg	1	Metals-020	<1	1	18	11	48	111	100
Copper	mg/kg	1	Metals-020	<1	1	7	8	13	106	108
Lead	mg/kg	1	Metals-020	<1	1	11	11	0	116	93
Mercury	mg/kg	0.1	Metals-021	<0.1	1	<0.1	<0.1	0	98	97
Nickel	mg/kg	1	Metals-020	<1	1	<1	<1	0	104	98
Zinc	mg/kg	1	Metals-020	<1	1	5	5	0	109	#

QUALITY CONTROL: Misc Soil - Inorg					Duplicate				Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-1	[NT]
Date prepared	-			24/01/2020	[NT]	[NT]	[NT]	[NT]	24/01/2020	[NT]
Date analysed	-			24/01/2020	[NT]	[NT]	[NT]	[NT]	24/01/2020	[NT]
Total Phenolics (as Phenol)	mg/kg	5	Inorg-031	<5	[NT]	[NT]	[NT]	[NT]	98	[NT]

QUALITY CONTROL: Soil Aggressivity					Duplicate				Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-1	[NT]
pH 1:5 soil:water	pH Units		Inorg-001	[NT]	[NT]	[NT]	[NT]	[NT]	102	[NT]
Electrical Conductivity 1:5 soil:water	µS/cm	1	Inorg-002	<1	[NT]	[NT]	[NT]	[NT]	105	[NT]
Chloride, Cl 1:5 soil:water	mg/kg	10	Inorg-081	<10	[NT]	[NT]	[NT]	[NT]	94	[NT]
Sulphate, SO4 1:5 soil:water	mg/kg	10	Inorg-081	<10	[NT]	[NT]	[NT]	[NT]	104	[NT]

Result Definitions

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

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.

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

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: >10xPQL - RPD acceptance criteria will vary depending on the analytes and the analytical techniques but is typically in the range 20%-50% – see ELN-P05 QA/QC tables for details; <10xPQL - RPD are higher as the results approach PQL and the estimated measurement uncertainty will statistically increase.

Matrix Spikes, LCS and Surrogate recoveries: Generally 70-130% for inorganics/metals (not SPOCAS); 60-140% for organics/SPOCAS (+/-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.

Analysis of aqueous samples typically involves the extraction/digestion and/or analysis of the liquid phase only (i.e. NOT any settled sediment phase but inclusive of suspended particles if present), unless stipulated on the Envirolab COC and/or by correspondence. Notable exceptions include certain Physical Tests (pH/EC/BOD/COD/Apparent Colour etc.), Solids testing, total recoverable metals and PFAS where solids are included by default.

Samples for Microbiological analysis (not Amoeba forms) received outside of the 2-8°C temperature range do not meet the ideal cooling conditions as stated in AS2031-2012.

Report Comments

Acid Extractable Metals in Soil:
-The laboratory RPD acceptance criteria has been exceeded for 235114-1 for Cr. Therefore a triplicate result has been issued as laboratory sample number 235114-8.
-# Percent recovery is not possible to report due to the inhomogeneous nature of the element/s in the sample/s. However an acceptable recovery was obtained for the LCS.

PAHs in Soil
- Percent recovery for the matrix spike is not possible to report due to interference from analytes in sample 235114-2.

Asbestos: A portion of the supplied samples were sub-sampled for asbestos analysis according to Envirolab procedures.
We cannot guarantee that these sub-samples are indicative of the entire sample.
Envirolab recommends supplying 40-50g of sample in its own container.
Note: Samples requested for asbestos testing were sub-sampled from jars provided by the client.

Douglas Partners
Geotechnics | Environment | Groundwater

CHAIN OF CUSTODY DESPATCH SHEET

Project No:	85108.04	**Suburb:**	Riverview	**To:**	Envirolab Chatswood
Project Name:	Ignis Project Stage 2	**Order Number**			
Project Manager:	MB	**Sampler:**	IT		
Emails:	matthew.bennett@douglaspartners.com.au				
Date Required:	Standard				
Prior Storage:	☑ Esky	Do samples contain 'potential' HBM?	Yes ☐	No ☑	(If YES, then handle, transport and store in accordance with FPM HAZID)

Sample ID	Lab ID	Date Sampled	Sample Type (S - soil, W - water)	Container Type (G - glass, P - plastic)	Analytes: Combo 8a	Combo 3a		pH	EC	SO4	Cl			Notes/preservation
✓ BH1/0.4-0.5	1	20/01/20	S	G	X									
✓ BH2/0.25-0.35	2	21/01/21	S	G	X									
✓ BH2/2.4-2.5	3	21/01/21	S	G	X									
✓ BH3/0.9-1.0	4	20/01/20	S	G	X			X	X	X	X			
✓ BH3/1.9-2.0	5	20/01/20	S	G	X									
✓ BH3/2.4-2.5	6	20/01/20	S	G				X	X	X	X			
✓ BD2/200120	7	20/01/20	S	G		X								

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

Job No: 235114
Date Received: 23/1/20
Time Received: 1100
Received by: CM
Temp: Cool/Ambient
Cooling: Ice/Icepack
Security: Intact/Broken/None

ANZECC PQLs req'd for all water analytes ☐

Metals to Analyse: 8HM unless specified here: N/A

Lab Report/Reference No:

Total number of samples in container: 7 **Relinquished by:** MB **Transported to laboratory by:** Courier

Send Results to: Douglas Partners Pty Ltd **Address:** 96 Hermitage Rd, West Ryde, NSW, 2114 **Phone:** 9809 0666 **Fax:** 9809 4095

Signed: MB **Received by:** AS SYD CHAINE MCK **Date & Time:** 23/1/20 1100

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

CERTIFICATE OF ANALYSIS 235114-A

Client Details

Client	Douglas Partners Pty Ltd
Attention	Celine Li
Address	96 Hermitage Rd, West Ryde, NSW, 2114

Sample Details

Your Reference	**85108.04, Riverview**
Number of Samples	7 Soil
Date samples received	23/01/2020
Date completed instructions received	29/01/2020

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.

Report Details

Date results requested by	30/01/2020
Date of Issue	30/01/2020

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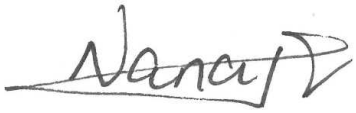
Accredited for compliance with ISO/IEC 17025 - Testing. **Tests not covered by NATA are denoted with ***

Results Approved By
Steven Luong, Organics Supervisor

Authorised By



Nancy Zhang, Laboratory Manager

PAHs in TCLP (USEPA 1311)			
Our Reference		235114-A-3	235114-A-4
Your Reference	UNITS	BH2/2.4-2.5	BH3/0.9-1.0
Date Sampled		21/01/2020	20/01/2020
Type of sample		Soil	Soil
pH of soil for fluid# determ.	pH units	9.7	7.0
pH of soil TCLP (after HCl)	pH units	1.8	1.7
Extraction fluid used	-	1	1
pH of final Leachate	pH units	5.2	5.0
Date extracted	-	30/01/2020	30/01/2020
Date analysed	-	30/01/2020	30/01/2020
Naphthalene in TCLP	mg/L	<0.001	<0.001
Acenaphthylene in TCLP	mg/L	<0.001	<0.001
Acenaphthene in TCLP	mg/L	<0.001	<0.001
Fluorene in TCLP	mg/L	<0.001	<0.001
Phenanthrene in TCLP	mg/L	<0.001	0.001
Anthracene in TCLP	mg/L	<0.001	<0.001
Fluoranthene in TCLP	mg/L	<0.001	<0.001
Pyrene in TCLP	mg/L	<0.001	<0.001
Benzo(a)anthracene in TCLP	mg/L	<0.001	<0.001
Chrysene in TCLP	mg/L	<0.001	<0.001
Benzo(bjk)fluoranthene in TCLP	mg/L	<0.002	<0.002
Benzo(a)pyrene in TCLP	mg/L	<0.001	<0.001
Indeno(1,2,3-c,d)pyrene - TCLP	mg/L	<0.001	<0.001
Dibenzo(a,h)anthracene in TCLP	mg/L	<0.001	<0.001
Benzo(g,h,i)perylene in TCLP	mg/L	<0.001	<0.001
Total +ve PAH's	mg/L	NIL (+)VE	0.0011
Surrogate p-Terphenyl-d14	%	80	71

Method ID	Methodology Summary
EXTRACT.7	Toxicity Characteristic Leaching Procedure (TCLP) using Zero Headspace Extraction (zHE) using AS4439 and USEPA 1311.
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-004	Toxicity Characteristic Leaching Procedure (TCLP) using in house method INORG-004. Please note that the mass used may be scaled down from the default based on sample mass available.
Org-012/017	Leachates are extracted with Dichloromethane and analysed by GC-MS and/or GC-MS/MS.

QUALITY CONTROL: PAHs in TCLP (USEPA 1311)						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W2	[NT]
Date extracted	-			30/01/2020	3	30/01/2020	30/01/2020		30/01/2020	[NT]
Date analysed	-			30/01/2020	3	30/01/2020	30/01/2020		30/01/2020	[NT]
Naphthalene in TCLP	mg/L	0.001	Org-012/017	<0.001	3	<0.001	<0.001	0	116	[NT]
Acenaphthylene in TCLP	mg/L	0.001	Org-012/017	<0.001	3	<0.001	<0.001	0	[NT]	[NT]
Acenaphthene in TCLP	mg/L	0.001	Org-012/017	<0.001	3	<0.001	<0.001	0	[NT]	[NT]
Fluorene in TCLP	mg/L	0.001	Org-012/017	<0.001	3	<0.001	<0.001	0	100	[NT]
Phenanthrene in TCLP	mg/L	0.001	Org-012/017	<0.001	3	<0.001	<0.001	0	102	[NT]
Anthracene in TCLP	mg/L	0.001	Org-012/017	<0.001	3	<0.001	<0.001	0	[NT]	[NT]
Fluoranthene in TCLP	mg/L	0.001	Org-012/017	<0.001	3	<0.001	<0.001	0	102	[NT]
Pyrene in TCLP	mg/L	0.001	Org-012/017	<0.001	3	<0.001	<0.001	0	106	[NT]
Benzo(a)anthracene in TCLP	mg/L	0.001	Org-012/017	<0.001	3	<0.001	<0.001	0	[NT]	[NT]
Chrysene in TCLP	mg/L	0.001	Org-012/017	<0.001	3	<0.001	<0.001	0	120	[NT]
Benzo(bjk)fluoranthene in TCLP	mg/L	0.002	Org-012/017	<0.002	3	<0.002	<0.002	0	[NT]	[NT]
Benzo(a)pyrene in TCLP	mg/L	0.001	Org-012/017	<0.001	3	<0.001	<0.001	0	116	[NT]
Indeno(1,2,3-c,d)pyrene - TCLP	mg/L	0.001	Org-012/017	<0.001	3	<0.001	<0.001	0	[NT]	[NT]
Dibenzo(a,h)anthracene in TCLP	mg/L	0.001	Org-012/017	<0.001	3	<0.001	<0.001	0	[NT]	[NT]
Benzo(g,h,i)perylene in TCLP	mg/L	0.001	Org-012/017	<0.001	3	<0.001	<0.001	0	[NT]	[NT]
Surrogate p-Terphenyl-d14	%		Org-012/017	118	3	80	74	8	87	[NT]

Result Definitions

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

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.

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

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: >10xPQL - RPD acceptance criteria will vary depending on the analytes and the analytical techniques but is typically in the range 20%-50% – see ELN-P05 QA/QC tables for details; <10xPQL - RPD are higher as the results approach PQL and the estimated measurement uncertainty will statistically increase.

Matrix Spikes, LCS and Surrogate recoveries: Generally 70-130% for inorganics/metals (not SPOCAS); 60-140% for organics/SPOCAS (+/-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.

Analysis of aqueous samples typically involves the extraction/digestion and/or analysis of the liquid phase only (i.e. NOT any settled sediment phase but inclusive of suspended particles if present), unless stipulated on the Envirolab COC and/or by correspondence. Notable exceptions include certain Physical Tests (pH/EC/BOD/COD/Apparent Colour etc.), Solids testing, total recoverable metals and PFAS where solids are included by default.

Samples for Microbiological analysis (not Amoeba forms) received outside of the 2-8°C temperature range do not meet the ideal cooling conditions as stated in AS2031-2012.

Aileen Hie

Ref: 235114-A
TAT: 1 day
Due: 30/1/20

From: Celine Li <Celine.Li@douglaspartners.com.au>
Sent: Wednesday, 29 January 2020 8:21 AM
To: Ken Nguyen
Cc: Aileen Hie; Matthew Bennett
Subject: FW: Results for Registration 235114 85108.04, Riverview
Attachments: 235114-[R00].pdf; 235114-COC.pdf; Douglas_235114.xlsx; 85108.04 Riverview.235114.header.xml; 85108.04 Riverview.235114.Sample26.csv; 85108.04 Riverview.235114.Chemistry26.csv; 235114.Excel.xlsx

Hi Ken/Aileen,

4 3

Could we please schedule TCLP on samples BH3/0.9-1.0 and BH2/2.4-2.5 for B(a)P? Fastest TAT please.

Thanks,

Celine Li | Environmental Engineer/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 | M: 0428 199 646 | E: Celine.Li@douglaspartners.com.au

From: Matthew Bennett
Sent: Wednesday, 29 January 2020 6:45 AM
To: Celine Li
Subject: Fwd: Results for Registration 235114 85108.04, Riverview

---------- Forwarded message ----------
From: Ken Nguyen <KNguyen@envirolab.com.au>
Date: 28 Jan. 2020 17:41
Subject: Results for Registration 235114 85108.04, Riverview
To: Matthew Bennett <Matthew.Bennett@douglaspartners.com.au>
Cc:

Please refer to attached for:
a copy of the Certificate of Analysis
a copy of the COC/paperwork received from you
ESDAT Extracts
an Excel or .csv file containing the results

Please note that a hard copy will not be posted.

Enquiries should be made directly to:
customerservice@envirolab.com.au

How did we do? Send Feedback