REPORT TO

NSW DEPARTMENT OF EDUCATION

ON

REMEDIATION ACTION PLAN

FOR

PARRAMATTA EAST PUBLIC SCHOOL (PEPS) UPGRADE

AT

30-32 BRABYN STREET, NORTH PARRAMATTA, NSW

Date: 3 March 2025

Ref: E35073BR2rpt3.Rev5-RAP

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Executive Summary

This Remediation Action Plan (RAP) has been prepared by JK Geotechnics (JKG) on behalf of NSW Department of Education to outline the strategy to mitigate the potential environmental impacts that could arise from the Parramatta East Public School (PEPS) upgrade (the proposal) at 30-32 Brabyn Street, North Parramatta, NSW. The works are proposed by the NSW Department of Education to meet the growth in educational demand in Collet Park precinct, and the broader North Parramatta area.

The RAP has been prepared to outline the remediation process for the proposed upgrades, with regards to Chapter 4 of State Environmental Planning Policy (Resilience and Hazards) 2021. It is understood that the RAP will support the Review of Environmental Factors (REF) for the proposed activity. JKE note that the south portion of the wider site shown on Figure 2 in Appendix A is not subject to the activity and hence not addressed in this RAP.

The activity comprises upgrades to PEPS to provide replacement teaching facilities in place of the existing temporary and permanent facilities that are no longer fit for purpose, involving the following works:

- Site preparation and required earthworks;
- Demolition of existing buildings C, D, E and F and associated structures including adjacent ramps and walkways;
- Construction of the following:
  - A new 3-storey school building (referred to as Block R) including teaching spaces, library/administration, and staff/student amenities;
  - Upgrade of soft and hard landscape and playground areas;
  - A new at-grade parking area;
  - Formalised waste area, with access being retained from Gaggin Street;
  - Public Domain Works with upgrades to pedestrian access south of the school, and new kiss and ride zone on Albert Street East;
  - Entrance and School logo signage along the Northern Albert Street East frontage of Block R;
- Refurbishment works to existing buildings;
- Removal of trees and retention where possible; and
- Installation and augmentation of services and infrastructure as required.

Refer to the REF prepared by Ethos Urban for a full description of works.

The site is located at Brabyn Street within the City of Parramatta Local Government Area. PEPS is located in the suburb of North Parramatta, within the City of Parramatta Local Government Area (LGA). The site is approximately 1.5km north-east of the Parramatta CBD, and 24km west of the Sydney CBD.

The site currently comprises a single lot to make up PEPS, referred to as Lot 100, DP1312418, and is owned by the Minister for Education and Early Learning.

The wider site has an area of approximately 1.782Ha, is of an irregular shape, and is bounded by Brabyn Street to the west, Albert Street East to the north, and Gaggin Street/Webb Street to the East. The project area is contained within the wider site and represents where the proposed works will be undertaken, with an area of approximately 1.492Ha. The project area boundaries are shown on Figure 2 attached in the appendices.

The goal of the remediation is to reduce contamination-related risks to human health and the environment, and to render the project area suitable for the proposed activity. The previous investigations identified fill soils impacted by asbestos (bonded/non-friable) and total recoverable hydrocarbons (TRH) at concentrations which trigger a need for remediation. The investigations also identified the potential for additional asbestos-related finds (in the form of bonded/non-friable and friable asbestos) and carcinogenic polycyclic aromatic hydrocarbons (PAHs) to be encountered in fill soils, and an elevated concentration of pesticides albeit below the adopted human health-based site assessment criteria (SAC), that warranted further investigation. Remediation is considered necessary to address the human health and ecological risks.

The previous investigations also identified elevated concentrations of perfluorooctanesulfonic acid (PFOS), copper, nickel and zinc and low pH levels in the groundwater. The PFOS concentrations and low pH levels were considered likely to be regional issues and did not require remediation for the proposed activity. However, further investigation was recommended to confirm this conclusion.

Based on the above, additional investigation of soil and groundwater was recommended to confirm the results and validate the assumptions made for the Tier 1 risk assessment. This RAP includes a detailed procedure for completing a Data Gap Investigation (DGI) and undertaking any necessary reporting that is triggered as part of that process. This must occur following demolition and prior to the construction of the upgrades as there is a potential that additional remediation may be necessary depending on the DGI results. Remediation of groundwater is not proposed at this stage.

The RAP applies to the boundaries of the project area as shown on the figures attached in Appendix A. The lateral extents of soil remediation will be informed via the pre-remediation (data gap) investigation process. Soil remediation, where required, will extend vertically to the base of the fill/top of the underlying natural soil (or bedrock, whichever is shallower). In the event that the natural soil (or bedrock) requires remediation, the remediation extent of remediation will be guided by the validation process.

The proposed remediation strategy for the impacted fill involves excavation and off-site disposal of contaminated fill and any asbestos containing material (ACM). A contingency has been included in the RAP for capping of contaminated fill in areas where fill cannot be removed such as beneath existing buildings to be retained on the site. The anticipated sequence of remediation works is outlined in Section 7 of this RAP. The buildings and structures in the project area will need to be demolished to allow site access for the DGI (specified in Section 5) and for remediation works to occur. It is acknowledged that the demolition may be undertaken in stages for site operational purposes. In this circumstance, the remediation and DGI may also be undertaken in stages.

JKG is of the opinion that the site can be made suitable for the proposed activity provided this RAP and any associated documentation (e.g. Asbestos Management Plan - AMP, Remediation Work Plan - RWP) are implemented. Contingency measures outlined in Section 9 of this RAP should be implemented during remediation works. An unexpected finds protocol (UFP) is outlined in Section 10 of this RAP. A site validation report is to be prepared on completion of remediation activities and must be reviewed by the site auditor and submitted to the determining authority to demonstrate that the project area is suitable for the proposed activity.

Mitigation measures are presented in Section 12 of this RAP. The conclusions and mitigation measures should be read in conjunction with the limitations presented in the body of this report.

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Abbreviations

Ambient Background Concentration	**ABC**
Australian Business Number	**ABN**
Asphaltic Concrete	**AC**
Added Contaminant Limit	**ACL**
Asbestos Containing Material	**ACM**
Australian Height Datum	**AHD**
Area of Environmental Concern	**AEC**
Asbestos Fines/Fibrous Asbestos	**AF/FA**
Asbestos Management Plan	**AMP**
Australian Standard	**AS**
Acid Sulfate Soils	**ASS**
ASS Management Plan	**ASSMP**
Benzo(a)pyrene Toxicity Equivalent Factor	**BaP TEQ**
Below Ground Level	**BGL**
Borehole	**BH**
Benzene, Toluene, Ethylbenzene, Xylene	**BTEX**
Before You Dig Australia	**BYDA**
Cation Exchange Capacity	**CEC**
Construction Environmental Management Plan	**CEMP**
Contaminated Land Management	**CLM**
Contaminant(s) of Potential Concern	**CoPC**
Chain of Custody	**COC**
Combined Risk Value	**CRV**
Conceptual Site Model	**CSM**
Development Application	**DA**
Densely Graded Base	**DGB**
Data Gap Investigation	**DGI**
Data Quality Indicator	**DQI**
Data Quality Objective	**DQO**
Detailed Site Investigation	**DSI**
Ecological Investigation Level	**EIL**
Excavated Natural material	**ENM**
Environment Protection Authority	**EPA**
Environment Protection Licence	**EPL**
Environmental Risk Assessment	**ERA**
Ecological Screening Level	**ESL**
Fibre Cement Fragment	**FCF**
Groundwater Investigation Level	**GIL**
Hazardous Building Materials	**HAZMAT**
Human Health Risk Assessment	**HHRA**
Health Investigation Level	**HIL**
Health Screening Level	**HSL**
JK Geotechnics	**JKG**
Licensed Asbestos Assessor	**LAA**
Light Non-Aqueous Phase Liquid	**LNAPL**
Long Term Environmental Management Plan	**LTEMP**
Map Grid of Australia	**MGA**
National Association of Testing Authorities	**NATA**
National Environmental Management Plan	**NEMP**
National Environmental Protection Measure	**NEPM**
National Occupational Health and Safety Commission	**NOHSC**
Organochlorine Pesticides	**OCP**
Organophosphate Pesticides	**OPP**
Polycyclic Aromatic Hydrocarbons	**PAH**
Polychlorinated Biphenyls	**PCB**

Per- and Polyfluoroalkyl Substances	**PFAS**
Perfluorooctanesulfonic Acid	**PFOS**
Photo-ionisation Detector	**PID**
Protection of the Environment Operations	**POEO**
Personal Protective Equipment	**PPE**
Practical Quantitation Limit	**PQL**
Preliminary Site Investigation	**PSI**
Quality Assurance	**QA**
Quality Control	**QC**
Remediation Action Plan	**RAP**
Remediation Work Plan	**RWP**
Site Assessment Criteria	**SAC**
Sampling, Analysis and Quality Plan	**SAQP**
State Environmental Planning Policy	**SEPP**
Salinity Management Plan	**SMP**
Source, Pathway, Receptor	**SPR**
Site-specific Asbestos Management Plan	**SSAMP**
Standing Water Level	**SWL**
Toxicity Characteristic Leaching Procedure	**TCLP**
Total Recoverable Hydrocarbons	**TRH**
Trip Spike	**TS**
Upper Confidence Limit	**UCL**
Unexpected Finds Protocol	**UFP**
Urban Residential and Public Open Space	**URPOS**
United States Environmental Protection Agency	**USEPA**
Underground Storage Tank	**UST**
Validation Assessment Criteria	**VAC**
Virgin Excavated Natural Material	**VENM**
Volatile Organic Compounds	**VOC**
Work Health and Safety	**WHS**

Units

Litres	**L**
Metres BGL	**mBGL**
Metres	**m**
Metres (cubic)	**m^3**
Micrograms per Litre	**µg/L**
Milligrams per Kilogram	**mg/kg**
Milligrams per Litre	**mg/L**
Millilitres	**ml or mL**
Millivolts	**mV**
Parts Per Million	**ppm**
Percentage	**%**

1 INTRODUCTION AND DECLARATION

1.1 Introduction

This Remediation Action Plan (RAP) has been prepared by JK Geotechnics (JKG) on behalf of NSW Department of Education to outline the strategy to mitigate the potential environmental impacts that could arise from the Parramatta East Public School (PEPS) upgrade (the proposal) at 30-32 Brabyn Street, North Parramatta. The works are proposed by the NSW Department of Education to meet the growth in educational demand in Collet Park precinct, and the broader North Parramatta area.

The RAP has been prepared to outline the remediation process for the proposed upgrades, with regards to Chapter 4 of State Environmental Planning Policy (Resilience and Hazards) 2021[1]. It is understood that the RAP will support the Review of Environmental Factors (REF) for the proposed activity.

The RAP applies to the land within the project area boundaries as shown on Figure 2 attached in Appendix A. JKE note that the south portion of the wider site shown on Figure 2 is not subject to the activity and hence not addressed in this RAP.

1.2 Summary of the Activity

The activity comprises upgrades to PEPS to provide replacement teaching facilities in place of the existing temporary and permanent facilities that are no longer fit for purpose, involving the following works:

- Site preparation and required earthworks;
- Demolition of existing buildings C, D, E and F and associated structures including adjacent ramps and walkways;
- Construction of the following:
    - A new 3-storey school building (referred to as Block R) including teaching spaces, library/administration, and staff/student amenities;
    - Upgrade of soft and hard landscape and playground areas;
    - A new at-grade parking area;
    - Formalised waste area, with access being retained from Gaggin Street;
    - Public Domain Works with upgrades to pedestrian access south of the school, and new kiss and ride zone on Albert Street East;
    - Entrance and School logo signage along the Northern Albert Street East frontage of Block R;
- Refurbishment works to existing buildings;
- Removal of trees and retention where possible; and
- Installation and augmentation of services and infrastructure as required.

Refer to the REF prepared by Ethos Urban for a full description of works.

[1] *State Environmental Planning Policy (Resilience and Hazards) 2021* (NSW) (referred to as SEPP Resilience and Hazards 2021)

1.3 Site Description

The wider site is located at Brabyn Street within the City of Parramatta Local Government Area. PEPS is located in the suburb of North Parramatta, within the City of Parramatta Local Government Area (LGA). The wider site is approximately 1.5km north-east of the Parramatta CBD, and 24km west of the Sydney CBD.

The wider site currently comprises a single lot to make up PEPS, referred to as Lot 100, DP1312418, and is owned by the Minister for Education and Early Learning.

The wider site has an area of approximately 1.782Ha, is of an irregular shape, and is bounded by Brabyn Street to the west, Albert Street East to the north, and Gaggin Street/Webb Street to the East. The project area is contained within the wider site and represents where the proposed works will be undertaken, with an area of approximately 1.492Ha. An aerial image of the site is shown at Figure 1-1 below.

Figure 1-1: Site Aerial

Source: Nearmap, Ethos Urban

1.4 Significance of Environmental Impacts

Based on the identification of potential issues, and an assessment of the nature and extent of the impacts of the proposed activity, it is determined that:

- The extent and nature of potential impacts are moderate and could have significant impact on the locality, community and/or the environment; and
- Potential impacts can be appropriately mitigated and managed to ensure that there is minimal impact on the locality, community and/or the environment.

1.5 Background

JKG has undertaken several contamination-related investigations at the wider site between 2022 and 2025. A summary of the relevant information is presented in Section 2 of this RAP.

The previous investigations identified fill soils impacted by asbestos (in the form of bonded/non-friable) and total recoverable hydrocarbons (TRH) at concentrations that trigger the need for remediation. The investigation also identified a potential for additional asbestos-related finds (in the forms of bonded/non-friable and friable asbestos) and carcinogenic polycyclic aromatic hydrocarbons (PAHs) to be encountered within the fill soils. This RAP includes a methodology to remediate and validate the project area so that it is suitable for the proposed activity (from a contamination viewpoint). A contingency plan for remediation is included together with site management procedures and an unexpected finds protocol (UFP) to be implemented during remediation.

JKG consider there is potential for other unidentified contamination in soils (primarily asbestos and carcinogenic PAHs) which may pose risk to receptors. Further investigation is recommended. A Data Gap Investigation (DGI) to better characterise the soil conditions is outlined in Section 5 of this RAP. The RAP includes additional requirements for reporting and for updating the remedial strategy, depending on the outcome of the DGI.

JKG understand that the RAP is subject to review by an NSW EPA accredited site auditor. The client has engaged Ms Melissa Porter of Senversa to complete the audit.

1.6 Remediation Goals, Aims and Objectives

The goal of the remediation is to reduce contamination-related risks to human health and the environment, and to render the project area suitable for the proposed activity from a contamination viewpoint. The primary aim of the remediation is to mitigate risks from asbestos (in the form of bonded/non-friable) and TRH impacts in fill soils and the potential occurrence of additional asbestos-related finds (in the form of bonded/non-friable and friable forms) and carcinogenic PAHs in soil.

The objectives of this RAP are to:

- Document the requirements for DGI;
- Provide a rationale to support the extent of the proposed remediation and the remedial/site validation approach based on the current dataset;
- Document a methodology that is to be implemented to remediate and validate the project area; and
- Document a strategy that can be implemented in the event of uncovering any unexpected, contamination-related finds, and provide other relevant contingency plans.

1.7 Scope of Work

The scope of work was undertaken with reference to the National Environmental Protection (Assessment of Site Contamination) Measure 1999 as amended (2013)[2], Consultants Reporting on Contaminated Land (2020)[3] guidelines, other guidelines made under or with regards to the CLM Act (1997) and SEPP Resilience and Hazards 2021. A list of reference documents/guidelines is included in Appendix G.

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

[3] NSW EPA, (2020). *Consultants reporting on contaminated land, Contaminated Land Guidelines.* (referred to as Consultants Reporting Guidelines)

2 SITE INFORMATION

2.1 Previous Investigations

JKG has undertaken several phases of investigations of the wider site, including within the project area. Relevant information is summarised in the table below. Reference can also be made to Figure 1 in Appendix A which shows the investigation boundaries, and to the Figures 2 and 3 for the investigation locations and notable contamination-related data.

Table 2-1: Summary of Previous Investigations and Relevant Findings

Investigation phase	Relevant findings to the site
PSI, JKG 2022[4]	JKG prepared a Preliminary Site Investigation (PSI) for the proposed school redevelopment of the wider property in 2022. The scope of work included a desktop review of historical information and a walkover inspection. The site history information indicated that the wider property was historically used for agricultural (grazing) purposes prior to the 1940s. Between the 1940s and 1970s, the property was subdivided and used for residential purposes and the construction of a primary school. By the 1990s, the wider property was occupied solely by the existing primary school. The PSI identified the following potential contamination sources/areas of environmental concern (AEC): • Historical filling of the wider property; • Historical use of the wider property for agricultural purposes; • Use of pesticides beneath the buildings and/or around the wider property; and • Hazardous building materials within current and former buildings and structures within the wider property. During the walkover inspection, fibre cement fragments (FCF) suspected to be asbestos containing material (ACM) was observed on the site surface and collected for analysis. The FCF (FCF1) was subsequently analysed with the soil samples collected during the Detailed Site Investigation (DSI) discussed below, and was confirmed to contain asbestos. JKG concluded that the historical land uses and potential sources of contamination identified would not preclude the proposed development. The following was recommended: • A DSI should be undertaken to characterise the site contamination conditions and establish whether the site is suitable for the proposed development, or whether remediation is required; and • A hazardous building materials (HAZMAT) survey be undertaken prior to demolition of the buildings.
DSI, JKG 2022[5]	A DSI was undertaken for the wider property by JKG in 2022. The scope of work included soil sampling from 30 locations (BH1 to BH5, BH7 and BH101 to BH124) and groundwater sampling from three groundwater monitoring wells (MW1, MW3 and MW6) installed at the site. The sampling locations are shown on the 2022 DSI figures attached in Appendix B. The JKG 2022 DSI identified shallow fill soils to depths of approximately 0.1m below ground level (BGL) to 0.75mBGL, underlain by residual silty clay and sandy clay soils. Sandstone bedrock was encountered beneath the residual soils in eight locations at depths of

[4] JKG (2022a). *Report to Schools Infrastructure on Preliminary (Stage 1) Site Contamination Investigation for Proposed School Redevelopment at Parramatta East Public School, Parramatta, NSW*. (Ref: E35073Brpt) (Referred to as JKG 2022 PSI)
[5] JKG, (2022b). *Report to Schools Infrastructure on Detailed (Stage 2) Site Contamination Investigation for Proposed School Development at Parramatta East Public School, Parramatta, NSW*. (Ref: E35073Brpt3) (referred to as JKG 2022 DSI)

Investigation phase	Relevant findings to the site
	approximately 0.95mBGL to 2.2mBGL. The fill typically comprised of silty and sandy clay, silty and gravelly sand, and sandy gravel. The fill contained inclusions of gravel, slag, ash and building rubble (brick, concrete, metal, ceramic, fibre cement, glass and plastic fragments). The standing water level (SWL) in the monitoring wells installed at the site ranged from approximately 3mBGL to 4.45mBGL. The JKG 2022 DSI identified asbestos in the form of bonded/non-friable and AF/FA in the fill in several locations, TRH F2 fraction in fill soils in one location, and carcinogenic PAHs in fill soils in another location, at concentrations above the human health-based site assessment criteria (SAC). The DSI also identified TRH F2 in fill soils in one location, zinc in fill soils in another location, and the TRH F4 in fill soils in four locations at concentrations which exceeded the ecological-based SAC. The JKG 2022 DSI identified that the pH of the groundwater was below the lower threshold for ecological receptors and recreational/incidental contact, and concentrations of nickel and zinc in the groundwater samples collected from two monitoring wells exceeded the ecological-based SAC. The pH and nickel and zinc concentrations were considered likely to be associated with ambient groundwater conditions within an urban setting and did not pose an unacceptable risk to receptors in the context of the proposed development. The SAC exceedances are shown on the JKG 2022 DSI Figure 3 attached in Appendix B. The JKG 2022 DSI also indicated that the site was not impacted by acid sulfate soils (ASS) or dryland salinity, and that an ASS Management Plan (ASSMP) and a Salinity Management Plan (SMP) were not required for the proposed development. JKG concluded that the wider property could be made suitable for the proposed development via remediation. The following was recommended: • Prepare a RAP to address the contamination issues identified in within the wider property; • Prepare and implement an Asbestos Management Plan (AMP). The AMP should be prepared by a SafeWork NSW Licensed Asbestos Assessor (LAA); • Undertake a HAZMAT survey of the existing buildings; and • Undertake a validation assessment and prepare a validation report documenting the remediation works. JKG note that the PFOS concentrations in groundwater exceeded the revised SAC adopted for the 2025 DSI, discussed in further detail below.
Revised DSI, JKG 2025[6]	JKG prepared a Revised DSI for the project area in 2025. The scope of work included a review of the JKG 2022 DSI in the context of the revised project plans and boundaries, and revised SAC, and changed planning pathway. The project area boundaries are shown on the figures attached in Appendix A. The investigation identified fill soils impacted by asbestos (in the form of bonded/non-friable) and TRH at concentrations that trigger the need for remediation. The investigation also identified a potential for additional asbestos-related finds (in the form of bonded/non-friable and friable asbestos) and carcinogenic PAHs to be encountered within the fill soils. The JKG 2025 DSI also identified that the pH of the groundwater was below the lower thresholds of the ecological and recreational-based SAC, and per-fluorooctanesulfonic acid (PFOS) was detected at concentrations above the revised ecological SAC. However, these

[6] JKG, (2025a). *Report to School Infrastructure NSW on Revised Detailed Site Contamination Investigation for Proposed School Redevelopment at Parramatta East Public School, Parramatta, NSW*. (Ref: E35073BR2rpt.Rev5) (referred to as JKG 2025 DSI)

Investigation phase	Relevant findings to the site
	exceedances were attributed to regional (ambient) conditions and were not considered to pose an unacceptable risk to receptors in the context of the proposed activity. The SAC exceedances are shown on Figure 3 attached in Appendix A. JKG concluded that the project area could be made suitable for the proposed activity by remediation. The following mitigation measures were outlined: • Prepare an AMP to outline the required measures to manage the risks associated with asbestos in soils. The AMP must be prepared by an LAA; and • Prepare a RAP to address the contamination issues identified within the project area and to provide a framework to address the data gaps following demolition and prior to proceeding with remediation.

A copy of the soil and groundwater laboratory data summary tables from the JKG 2025 DSI are attached in Appendix C. A copy of the borehole logs from the JKG 2025 DSI are attached in Appendix D.

2.2 Summary of Site History

A time line summary of the historical land uses and activities is presented in the table below. The information presented in the table is based on a weight of evidence assessment of the site history documentation and observations made by JKG during the previous investigations.

Table 2-2: Summary of Historical Land Uses / Activities

Years	On-site - Potential Land Use / Activities	Off-site - Potential Land Use / Activities
1930-1943	Agricultural (grazing), subdivision and construction of residential properties within the southern portion of the wider school property.	Agricultural (grazing) and residential subdivision.
1943-1970	Subdivision of the site with construction of both primary school buildings, and residential properties within the wider school property.	Large scale residential subdivision of area. An electrical substation (Endeavour Energy Parramatta Field) was located approximately 250m down-gradient and to the south-west of the site. There were three motor garage/service stations located greater than 100m down-gradient of the site.
1970-1991	Primary school, demolition and clearing of southern residential properties into school playground area.	Residential, substation (mentioned above) and motor garage/service stations (mentioned above).
1994-2002	Primary school with construction of several new buildings and a playground.	Residential and substation (mentioned above). Demolition of motor garages (mentioned above) with construction of commercial or high density residential.
2002-2025	As above	As above

2.3 Site Identification

Table 2-3: Site Identification

Site Address:	Parramatta East Public School, 30-32 Brabyn Street, North Parramatta, NSW
Lot & Deposited Plan:	Part of Lot 100 in DP1312418
Current Land Use:	Educational establishment
Proposed Land Use:	Educational establishment
Local Government Authority (LGA):	City of Parramatta
Current Zoning:	R3 – Medium Density Residential
Project Area (Ha) (approx.):	1.492
RL (AHD in m) (approx.):	16-25
Geographical Location – NW Corner of Project Area (decimal degrees) (approx.):	Latitude: -33.805186 Longitude: 151.01721
Site Plans:	Appendix A

2.4 Summary of Site Setting and Description

The wider site is located in a predominantly residential area of Parramatta and is bound by Albert Street East to the north, Gaggin Street to the east, and Brabyn Street to the west. The project area is located within the central and northern portions of the wider site and approximately 1km to the north of the Parramatta River. The regional topography is characterised by a south facing hillside that falls towards the Parramatta River. The wider site is located towards the peak of the hill and grades down to the south at approximately 4°. Parts of the wider site and project area appear to have been levelled to account for the slope and accommodation the existing development.

A walkover inspection of the wider school property (including the project area) was undertaken by JKG on 16 June 2022 for the PSI. At the time of the fieldworks for the DSI in July 2022, the wider property had remained generally unchanged since the PSI. JKG assume the site conditions remain generally unchanged since. A summary of the key observations is presented below:

- At the time of the inspection, the site was utilised as a primary school with associated buildings and outdoor play space;
- The buildings were constructed from a variety of materials, including concrete, brick, glass and fibre cement and appeared to be in good to average condition;
- Exposed fill was observed at the surface in some areas, with inclusions of gravel and concrete; and
- The southern portion of the wider property was predominantly vacant and grass covered. Some trees were observed in the south of the site and along the property boundaries and appeared to be generally in good health based on a cursory inspection.

During the site inspection for the PSI, JKG observed the following land uses in the immediate surrounds:

- North – Albert Street East, with residential (1-2 storey detached and semi-detached housing) beyond;
- South – The wider school property, with residential (1-2 storey detached and semi-detached housing) beyond;
- East – Gaggin Street and Webb Street, with residential (1-2 storey detached and semi-detached housing) and a public reserve (playground) beyond; and
- West – Brabyn Street, with residential (1-2 storey detached and semi-detached housing and townhouse/villa complexes) beyond.

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

3 SUMMARY OF GEOLOGY AND HYDROGEOLOGY

3.1 Regional Geology

Regional geological information reviewed for the PSI indicated that the site is underlain by Ashfield Shale of the Wianamatta Group, which typically consists of black to dark grey shale and laminite.

A summary of the subsurface conditions encountered during the JKG 2025 DSI are presented in the following table:

Table 3-1: Summary of Subsurface Conditions

Profile	Description
Pavement	Asphaltic Concrete (AC) pavement was encountered at the surface in BH2 to BH5, BH105, BH106, BH109 and BH110 and ranged in thickness from approximately 15mm to 40mm.
Fill	Fill was encountered at the surface or beneath the pavement in all boreholes and extended to depths of approximately 0.1m to 0.75mBGL. The fill typically comprised of sandy gravel and silty and sandy clay with inclusions of igneous and ironstone gravel, sand, ash, slag, building rubble (concrete, brick, metal, FCF, ceramic tile, plastic and glass) and root fibres. FCF was encountered in BH116, BH118, and BH120 to BH122. No stained or odorous fill was encountered during the investigation.
Natural Soil	Residual silty and/or sandy clay was encountered beneath the fill in all boreholes. BH101 to BH107, BH109 to BH114, and BH117 to BH124 were terminated in the residual silty clay soils at depths of approximately 0.45m to 1.5mBGL. No stained or odorous soils were encountered during the investigation.
Bedrock	Sandstone bedrock was encountered beneath the residual soils in BH1 to BH8, BH108, BH115 and BH116 and extended to the terminal depths of the boreholes at approximately 1mBGL to 8mBGL. The bedrock was extremely weathered on first contact, generally becoming highly to distinctly weathered within 1-2m.
Groundwater	Groundwater seepage was encountered in BH3, BH101 and BH103 at depths of approximately 0.3mBGL to 3.3mBGL. All remaining boreholes were dry on completion of auger drilling and a short time after. BH2 and BH5 were extended to depths of approximately 8mBGL using rock coring methods. Potable water is introduced during the coring process which inhibits meaningful groundwater observations on completion of these boreholes.

3.2 Hydrogeology and Surface Water Bodies

Hydrogeological information presented in the PSI indicated that:

- The subsurface conditions at the site were expected to consist of moderate to high permeability (alluvial) soils overlying shallow bedrock. The potential for viable groundwater abstraction and use of groundwater under these conditions is considered to be low. There is a reticulated water supply in the area and consumption of groundwater is not expected to occur. Use of groundwater within the site is not proposed as far as we are aware;

- The nearest registered bore was located approximately 520m to the south-west and down-gradient of the site and was registered for monitoring purposes;
- There were no nearby bores (i.e. within 1.2km of the site) registered for water supply uses; and
- Considering the local topography and surrounding land features, JKG anticipate groundwater flow towards the south-west.

A summary of the groundwater conditions during the JKG 2025 DSI is provided below:

Table 3-2: Summary of Groundwater Conditions

Aspect	Details
Groundwater Depth & Flow	The approximate surface levels of the monitoring wells were interpolated from spot heights and contours on the provided survey plan and are shown on the borehole logs in the appendices. SWLs measured in MW1, MW3 and MW6 measured during well development and sampling ranged from approximately 2.6mBGL to 3.65mBGL. Groundwater RLs calculated on these measurements ranged from approximately 17.5mAHD to 21.8mAHD. A contour plan was prepared for the groundwater levels, as shown on Figure 4 attached in the appendices. Groundwater flow generally occurs in a down-gradient direction perpendicular to the groundwater elevation contours. The contour plot infers that groundwater generally flows towards the south. An additional well was installed in MW7, though it is noted that this well was dry for the duration of the investigation.
Groundwater Field Parameters	Field measurements recorded during development and sampling were as follows: - pH ranged from 4.74 to 5.3; - EC ranged from 155µS/cm to 1,578µS/cm; - Eh ranged from 16.7 mV to 150.3mV; and - DO ranged from 0.8ppm to 5.1ppm. The PID readings in the monitoring well headspace recorded during development and sampling ranged from 0.9ppm to 41.5ppm. The maximum PID reading was recorded in MW6, located within the west of the site. JKG is of the opinion that the elevation could be a result of water vapour interfering with the PID sensor. We also note that potential hydrocarbon sources that may impact the groundwater were not identified at the site.
LNAPLs petroleum hydrocarbons	Phase separated product (i.e. light non-aqueous phase liquids - LNAPL) was not detected using the interphase probe during groundwater sampling.

The previous investigations indicated that surface water bodies were not identified in the immediate vicinity of the wider site. The nearest down-gradient surface water body was Parramatta River which is located approximately 1km to the south of the site. The PSI noted that the Parramatta River was unlikely to be a receptor that could be impacted by direct migration of groundwater due to the distance from the wider site.

4 CONCEPTUAL SITE MODEL

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

4.1 Review of CSM, Site Characterisation and Data Gap Assessment

A review of the CSM and data gap assessment is presented below:

Table 4-1: Review of CSM and Data Gap Assessment

Source/AEC	Review of CSM and Data Gap Assessment
Fill Material	TRH and asbestos (in the form of FCF/ACM) were detected in fill soils during the JKG 2025 DSI at concentrations which trigger a need for remediation. Carcinogenic PAHs and OCPs (as discussed below) were also identified at concentrations which warranted further consideration. Fill soils were encountered to depths of approximately 0.1mBGL to 0.75mBGL. Asbestos in the form of bonded/non-friable (FCF/ACM) and friable asbestos (AF/FA) was identified in fill soils in several locations within the project area and wider school property during the previous investigations. Due to the sporadic nature of asbestos in fill, there is considered to be potential for additional asbestos impacts (in the form of FCF/ACM and/or AF/FA) in fill soils to be encountered within the project area. Based on the existing data, it is likely that fill conditions beneath the buildings/structures will be consistent with those encountered throughout the project area. However, further investigation associated with this AEC is required to confirm these assumptions, discussed further in Section 5.
Historical Agricultural Use	The CSM identified historical agricultural use as a potential source of contamination/AEC. The historical agricultural use likely consisted of grazing. JKG note that the contaminants of potential concern (CoPC) identified for historical agricultural use are captured within the CoPC for fill material and consider the existing data and further investigation of the fill soils will adequately address the potential concerns associated with this AEC.
Use of Pesticides	A total aldrin and dieldrin (OCP) concentration of approximately 35% of the human health-based SAC was recorded in one surficial fill soil sample collected from BH115. Given the lack of other OCP detections, the spacing of the samples for the previous investigations, and that statistical analysis was not undertaken, further investigation of pesticides in soil in the vicinity of BH115 is warranted. It is also considered possible that pesticides may have been applied beneath/around the buildings and within crawl spaces. Further investigation associated with this AEC is required.
Hazardous Building Materials	The previous investigations identified inclusions in fill soils which were indicative of former demolition/construction activities (i.e. brick, concrete ceramic, metal, fibre cement, glass and plastic fragments). Further investigation associated with this AEC is required.

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

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

Table 4-2: CSM for RAP

Potential mechanism for contamination	The potential mechanisms for contamination are most likely to include 'top-down' impacts and spills. There is a potential for sub-surface releases to have occurred if deep fill (or other buried industrial infrastructure) is present, although this is considered to be the least likely mechanism for contamination.
Affected media	Fill Soil. The fill soil in the project area has been impacted by asbestos and TRH at concentrations that trigger the need for remediation. The investigation also identified a potential for additional asbestos-related finds (in the form of bonded/non-friable and friable asbestos) and carcinogenic PAHs to be encountered within the fill soils. A suspected isolated occurrence of pesticides in fill soils was also identified, albeit at a concentration below the human health SAC. Further investigation of the soils beneath the building footprints and across the project area is required. The RAP includes a procedure for the further soil investigation and to remediate the contaminated fill. The groundwater results indicate the presence of PFOS, copper, nickel and zinc at concentrations above the SAC, and the pH of the groundwater was outside of the acceptable SAC range. Trace concentrations of PAHs were also detected. The JKG 2025 DSI concluded that the PFOS, heavy metals, PAHs and pH were associated with background/regional conditions and did not require remediation for the proposed activity. However, further investigation was recommended to confirm this conclusion.
Receptor identification	Human receptors include site occupants/users (including adults and children) in an educational (primary school) setting, construction workers and intrusive maintenance workers. Off-site human receptors include adjacent land users in a residential setting. Ecological receptors include terrestrial organisms and plants within unpaved areas (including the proposed landscaped areas).
Potential exposure pathways and mechanisms	Potential exposure pathways relevant to the human receptors include ingestion, dermal absorption and inhalation of dust (all contaminants) and vapours (volatile TRHs, benzene, toluene ethylbenzene and xylenes [collectively referred to as BTEX] and naphthalene [a PAH compound]). The potential for exposure would typically be associated with the construction and excavation works, and current and future use of the project area. Potential exposure pathways for ecological receptors include primary contact and ingestion. Exposure during current and future site use could occur via direct contact with soil in unpaved areas such as gardens, inhalation of airborne asbestos fibres and dust during soil disturbance, or inhalation of vapours within enclosed spaces such as buildings. The following have been identified as potential exposure mechanisms for site contamination: • Vapour intrusion into buildings (from volatilisation of contaminants from soil); • Contact (dermal, ingestion or inhalation) with exposed soils in landscaped areas and/or unpaved areas; and

	• Contact (dermal, ingestion or inhalation) with exposed soils during construction.
Presence of preferential pathways for contaminant movement	Major services were not identified that would be expected to act as preferential pathways for contamination migration.

4.3 Extent of Remediation

The RAP applies to the boundaries of the project area shown on the figures attached in Appendix A. The lateral extents of soil remediation will be informed via the DGI process. Soil remediation, where required, will extend vertically to the base of the fill/top of the underlying natural soil (or bedrock, whichever is shallower), unless the DGI process identifies that the natural soils require remediation.

5 DATA GAP INVESTIGATION (DGI)

The previous investigations recommended further investigation to address the identified data gaps. In our opinion, the gaps cannot all be practicably closed out until after demolition occurs. The data gaps included the following:

- The existing building footprints were not assessed;
- The soil sampling density was below the minimum recommended sampling density;
- The OCP impacts in the vicinity of BH115 were not well-defined;
- The contamination conditions of the underlying residual soils were not assessed;
- The soils in the nominated tree protection zones (TPZs) shown in Figure 5 attached in Appendix A within the project area were not assessed;
- The waste classification of the soils was not confirmed; and
- The groundwater assessment was limited in scope.

The DGI will largely need to be undertaken post-demolition of the existing structures. The results of the DGI must also be considered in relation to potential risks to human health and ecological receptors, and to confirm the contaminants of concern for remediation purposes. It is acknowledged that due to the phases of demolition and construction work, the DGI may be required to be completed in stages.

The following sub-sections outline the plan to close out the data gaps. JKG consider adequate data will be obtained from the proposed locations to address the identified data gaps for the purpose of remediation of the project area.

At the request of the client, the following sampling plan was reduced in scope on the proviso that all fill material was deemed to be impacted by asbestos. On this basis, the soil sampling density was considered to be adequate for the purpose of preparing this RAP. However, the other data gaps outlined above are required to be addressed.

5.1 Additional Soil Sampling

Additional soil investigation is required to better characterise the contamination sources/AEC and potential risks to receptors. The following additional works are required to be undertaken:

- Following removal of the hardstand/concrete slabs, a walkover inspection is to be undertaken by the validation consultant to inspect the surface for indications of potential contamination (including but not limited to: stained or odorous soils; and indications of buried infrastructure). Any unexpected finds will need to be managed in accordance with the UFP outlined in Section 10;
- Soil sampling from 30 additional locations (BH201 to BH230 inclusive) as nominated on Figure 5 in Appendix A. The locations have been selected to address the following:
  - Soil sampling from 17 of the additional locations (BH201 to BH217 inclusive) targeted to the footprints of buildings, demountable school buildings and pavements which are proposed to be demolished;
  - Soil sampling from four locations (BH218 to BH221 inclusive) targeted to the suspected pesticide-impacted fill soils in the vicinity of BH115;

- Soil sampling from nine locations (BH222 to BH230 inclusive) targeted to TPZs located within the site (predominantly within the setback/perimeter areas); and
  - Additional locations are to be investigated if any visual or olfactory indicators of potential contamination are observed (subject to implementation of the UFP).
- A record of any additional potential point source/s of contamination identified after demolition is to be maintained.

If additional potential point source/s of contamination are identified, the UFP presented in Section 10 is to be implemented. Any deviation to the remediation strategy should be documented in a Remediation Works Plan (RWP).

Whilst the sampling plan identifies the proposed locations as boreholes (i.e. BH201, BH202 etc), the preferred approach for soil investigation is test pits. It is acknowledged that due to constraints, test pitting may not be feasible at all of the proposed locations. Therefore, it is recommended that test pitting is undertaken where it is reasonable and practicable to do so. Where boreholes are required, a large-diameter auger (at least 150mm diameter) should be used to facilitate the asbestos in soils screening. The DGI is to include a discussion on the selection of sampling equipment on a case-by-case basis.

For sampling locations BH222 to BH230, the investigation will likely be restricted to the use of hand tools and to the surficial fill soils. The extent of investigation and methodology is to be confirmed following consultation with the project arborist and the appointed site auditor.

5.2 Additional Groundwater Investigation

Additional groundwater investigation is required to better characterise the groundwater contaminant conditions, and potential risk to receptors. The following additional works are required to be undertaken:

- The existing monitoring wells (MW1, MW3 and MW6) are to be inspected to confirm they are accessible and have not been compromised. If they are no longer useable, replacement wells must be installed targeted to the immediate vicinity of the wells. The replacement wells are to be installed to a minimum depth of 6mBGL (or prior auger refusal) and screened to encounter the groundwater table;
- The surface levels of the monitoring wells (existing or replaced) are to be surveyed relative to AHD. The use of a GPS unit is considered acceptable provided an accuracy of ±30mm or better can be achieved;
- The monitoring wells (regardless of whether existing or replacement) are to be developed; and
- Groundwater samples (if encountered) are to be obtained using low-flow sampling equipment.

5.3 Decontamination, Sample Preservation and Analysis

Any re-usable equipment (other than the excavator bucket, if used) will be decontaminated using a scrubbing brush and potable water and phosphate-free detergent solution followed by rinsing with potable water. JKG note that decontamination of an excavator bucket using this method is not practicable. It is acceptable for samples to be collected from soils that have not been in direct contact with the excavator bucket.

Samples will be preserved by immediate storage in an insulated sample container with ice. Any additional sample preservation requirements for specific analytes should also be adopted as required. On completion of the fieldwork, the samples should be delivered in the insulated sample container to a National Association of Testing Authorities (NATA) registered laboratory for analysis under standard chain of custody (COC) procedures.

5.3.1 Analytical Schedule for Soil Samples

The minimum soil sampling and analysis requirements are outlined in the following table.

Table 5-1: DGI Sampling Frequency and Analysis

Locations	Minimum Sample Frequency	Analysis required
BH201 to BH217 inclusive and BH222 to BH230 inclusive.	One surface soil sample is to be collected and analysed from each location. A bulk (10L) sample from the surficial soils at each location is to be screened in the field for the presence of FCF/ACM. Additionally, a minimum of one soil sample per fill profile encountered (at each location) is to be collected and analysed. A bulk (10L) sample from each fill profile encountered (at each location) is to be screened in the field for the presence of FCF/ACM. Where deep fill profiles (>1m thickness) are encountered, additional sampling will be required at a rate of one sample per 1m thickness (or part thereof).	Heavy metals (arsenic, cadmium, chromium, copper, lead, mercury, nickel and zinc), TRH/BTEX, PAHs, OCPs, organophosphate pesticides (OPP), polychlorinated biphenyls (PCBs), per-and polyfluoroalkyl substances (PFAS) and asbestos (500mL quantification sample). Toxicity characteristic leaching procedures (TCLP) analysis is to be undertaken where there is an exceedance of the contaminant threshold (CT1) criterion, or PFAS concentrations recorded above the laboratory practical quantitation limit (PQL).
	One sample of the natural profile at each sampling locations is to be collected and analysed. This is primarily for waste classification purposes, in the eventuality that natural soils require off-site disposal to facilitate the consolidation of contaminated soils. However, the results must also be considered with regards to site suitability and the vertical delineation of any impacted overlying fill soils.	Heavy metals (as above), TRH/BTEX and PAHs. Additional CoPC, including OCPs and PFAS, may also be required where elevated concentrations are detected within the overlying fill soils. TCLP analysis is to be undertaken where there is an exceedance of the CT1 criterion, or PFAS concentrations recorded above the specific contaminant concentration (SCC1) criterion.
BH218 to BH221 inclusive.	One soil sample per fill profile encountered (at each location) is to be analysed.	Heavy metals (as above), OCPs and OPPs.
	One sample of the natural profile at each location is to be collected. The analysis will depend on the results of the overlying fill soils.	Heavy metals (as above), OCPs and OPPs. Analysis is required to be undertaken where heavy metal concentrations in the overlying fill exceed the SAC and/or pesticide concentrations in the fill are recorded above the PQL.

5.3.2 Analytical Schedule for Groundwater Samples

As a minimum, one groundwater sample is to be collected from each monitoring well and analysed for heavy metals, TRH/BTEX, PAHs, volatile organic compounds (VOCs), PFAS, pH and EC.

5.4 Quality Assurance/Quality Control (QA/QC)

Rinsate samples should be obtained during the decontamination process of re-usable equipment (except for the excavator bucket, if used) as part of the field QA/QC requirements. Inter and intra-laboratory duplicates should be collected and analysed for each sample matrix at a rate of 5% for inter-laboratory and 5% for intra-laboratory analysis. Trip spike and trip blank samples are also to be submitted and analysed with each batch of samples.

The analytical methods are to be appropriately sensitive to achieve PQLs lower than the respective SACs. Where this is not achievable, a discussion regarding the validity of the results must be included.

5.5 Data Assessment

Soil and groundwater data are to be compared the relevant Tier 1 screening criteria presented in the following sub-sections.

5.5.1 Soil Screening Criteria

The relevant Tier 1 soil screening criteria for the DGI are outlined in the following sub-sections.

5.5.1.1 Human Health

- Health Investigation Levels (HILs) for a 'residential with accessible soils' exposure scenario (HIL-A). These criteria are also applicable to primary schools;
- Health Screening Levels (HSLs) for a 'low-high density residential' exposure scenario (HSL-A & HSL-B). HSLs are to be calculated based on conservative assumptions including a 'sand' type and a depth interval of 0m to 1m;
- HIL-A criteria adopted for the PFAS assessment are to be based on Table 2 in The PFAS National Environmental Management Plan (NEMP) Version 2.0 2020[7];
- HSLs for direct contact presented in the CRC Care Technical Report No. 10 – Health screening levels for hydrocarbons in soil and groundwater Part 1: Technical development document (2011)[8]; and
- Asbestos was assessed against the HSL-A criteria. A summary of the asbestos criteria is provided in the following table:

[7] Heads of EPAs Australia and New Zealand (HEPA). PFAS National Environmental Management Plan Version 2.0 - January 2020 (referred to as NEMP 2020)

[8] Cooperative Research Centre for Contamination Assessment and Remediation of the Environment (CRC Care), (2011). Technical Report No. 10 - *Health screening levels for hydrocarbons in soil and groundwater Part 1: Technical development document*

Table 5-2: Details for Asbestos SAC

Guideline	Applicability
Asbestos in Soil	The HSL-A criteria are to be adopted for the assessment of asbestos in soil. The SAC adopted for asbestos are derived from the NEPM 2013 and are based on the WA DoH 2021. The SAC include the following: • No visible asbestos at the surface/in the top 10cm of soil; • <0.01% w/w bonded asbestos containing material (ACM) in soil; and • <0.001% w/w asbestos fines/fibrous asbestos (AF/FA) in soil. Concentrations for bonded ACM concentrations in soil are based on the following equation which is presented in Schedule B1 of NEPM (2013): $$\textbf{\% w/w asbestos in soil} = \frac{\textbf{\% asbestos content x bonded ACM (kg)}}{\text{Soil volume (L) x soil density (kg/L)}}$$ However, we are of the opinion that the actual soil volume in a 10L bucket varies considerably due to the presence of voids, particularly when assessing cohesive soils. Therefore, each bucket sample was weighed using electronic scales and the above equation was adjusted as follows (we note that the units have also converted to grams): $$\textbf{\% w/w asbestos in soil} = \frac{\textbf{\% asbestos content x bonded ACM (g)}}{\text{Soil weight (g)}}$$

5.5.1.2 Environment (Ecological – terrestrial ecosystems)

- Ecological Investigation Levels (EILs) and Ecological Screening Levels (ESLs) for an 'urban residential and public open space' (URPOS) exposure scenario. These are only to be applied to the top 2m of soil as outlined in NEPM (2013). The criterion for benzo(a)pyrene is to be increased from the value presented in NEPM (2013) based on the Canadian Soil Quality Guidelines[9];
- ESLs are to be adopted based on the soil type;
- The ecological (indirect exposure) guidelines for soil are to adopted for PFAS assessment based on Table 3 in NEMP 2020;
- EILs for selected metals are to be calculated based on the most conservative added contaminant limit (ACL) values presented in Schedule B(1) of NEPM (2013) and published ambient background concentration (ABC) values presented in the document titled Trace Element Concentrations in Soils from Rural and Urban Areas of Australia (1995)[10]. This method is considered to be adequate for the Tier 1 screening; and
- Where EIL exceedances for selected metals are identified, soil physiochemical parameters, including pH, cation exchange capacity (CEC) and clay content, may be analysed to select alternative ACLs and establish soil-specific EILs.

[9] Canadian Council of Ministers of the Environment, (1999). *Canadian soil quality guidelines for the protection of environmental and human health: Benzo(a)Pyrene (1997)* (referred to as the Canadian Soil Quality Guidelines)

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

5.5.1.3 Management limits for Petroleum Hydrocarbons

Management limits for petroleum hydrocarbons (as presented in Schedule B1 of NEPM 2013) were considered.

5.5.1.4 Waste Classification

Data for the waste classification assessment are to be assessed in accordance with the Waste Classification Guidelines, Part 1: Classifying Waste (2014)[11] as outlined in the following table:

Table 5-3: Waste Categories

Category	Description
General Solid Waste (non-putrescible)	• If SCC ≤ CT1 then TCLP not needed to classify the soil as general solid waste; and • If TCLP ≤ TCLP1 and SCC ≤ SCC1 then treat as general solid waste.
Restricted Solid Waste (non-putrescible)	• If SCC ≤ CT2 then TCLP not needed to classify the soil as restricted solid waste; and • If TCLP ≤ TCLP2 and SCC ≤ SCC2 then treat as restricted solid waste.
Hazardous Waste	• If SCC > CT2 then TCLP must be undertaken to classify the soil as hazardous waste; and • If TCLP > TCLP2 and/or SCC > SCC2 then treat as hazardous waste.
Virgin Excavated Natural Material (VENM)	Natural material (such as clay, gravel, sand, soil or rock fines) that meet the following: • That has been excavated or quarried from areas that are not contaminated with manufactured chemicals, or with process residues, as a result of industrial, commercial mining or agricultural activities; • That does not contain sulfidic ores or other waste; and • Includes excavated natural material that meets such criteria for virgin excavated natural material as may be approved from time to time by a notice published in the NSW Government Gazette.

The PFAS data are to be assessed against the NSW EPA Addendum to the Waste Classification Guidelines (2014) – Part 1: classifying waste[12]. JKG note that PFAS is classified based on the SCC and TCLP results. Therefore, samples will positive PFAS results must be analysed for TCLP PFAS.

5.5.2 Groundwater Screening Criteria

The relevant Tier 1 groundwater screening criteria are presented in the following sub-sections.

[11] NSW EPA, (2014). *Waste Classification Guidelines, Part 1: Classifying Waste.* (referred to as Waste Classification Guidelines 2014)
[12] NSW EPA, (2016). *Addendum to the Waste Classification Guidelines (2014) – Part 1: classifying waste*

5.5.2.1 Human Health

- HSLs for a 'low-high density residential' exposure scenario (HSL-A/HSL-B). HSLs are to be calculated based on the soil type and the observed depth to groundwater;
- The Australian Drinking Water Guidelines 2011 (updated 2021)[13] will be multiplied by a factor of 10 to assess potential risks associated with incidental/recreational-type exposure to groundwater (e.g. within down-gradient water bodies, or with bore water used for irrigation). These are deemed as 'recreational' SAC; and
- The recreational water quality guideline value is to be adopted for PFAS assessment based on Table 1 in NEMP 2020.

5.5.2.2 Environment (Ecological – aquatic ecosystems)

Groundwater Investigation Levels (GILs) for 95% protection of marine species are to be adopted based on the Default Guideline Values in the Australian and New Zealand Guidelines for Fresh and Marine Water Quality (2018)[14]. The 99% trigger values will be adopted where required to account for bioaccumulation. Low and moderate reliability trigger values will also be adopted for some contaminants where high-reliability trigger values don't exist. The protection values for marine species are considered appropriate as the down-gradient waterbody (the Parramatta River) is an estuarine environment.

The ecological (freshwater) water quality guidelines for PFAS assessment will be based on NEMP 2020, based on 99% protection (to account for bioaccumulation of PFAS in slightly to moderately disturbed systems).

5.6 DGI Reporting

On completion of the DGI, a stand-alone report must be prepared in accordance with the Consultants Reporting on Contaminated Land (2020)[15] guidelines. Where reasonable to do so, the DGI report is to include figures depicting the extent of any hotspots requiring remediation. JKG note that the asbestos impacts within the south of the wider site are widespread and all fill across the wider site and project area is considered to be asbestos impacted fill. Nevertheless, it may be practicable and appropriate to identify hotspots of other CoPC, such as TRH-impacted fill soils, which may limit the extent of validation sampling required. The DGI must also consider the results of all subsequent asbestos fibre monitoring programs/events undertaken at the wider site and project area (regardless of the activity which triggered the need for monitoring). The DGI must also consider the potential for contamination to exist beneath the existing buildings, structures and pavements to be retained throughout the activity, and whether this poses an unacceptable risk to receptors. The DGI report must be reviewed by the appointed site auditor.

If the remediation approach varies from this RAP, a RWP is to be prepared to detail the remediation and validation requirements. The RWP must be reviewed by the appointed site auditor. In the event that the

[13] National Health and Medical Research Council (NHMRC), (2021). *National Water Quality Management Strategy, Australian Drinking Water Guidelines 2011* (referred to as ADWG 2011)

[14] Australian and New Zealand Governments (ANZG), (2018). *Australian and New Zealand Guidelines for Fresh and Marine Water Quality.* Australian and New Zealand Governments and Australian state and territory governments, Canberra ACT, Australia (referred to as ANZG 2018)

[15] NSW EPA, (2020). *Consultants reporting on contaminated land, Contaminated Land Guidelines.* (referred to as Consultants Reporting Guidelines)

remedial strategy is revised, the client's expert planner must assess the requirement to notify the determining authority and/or whether a Development Application (DA) must be lodged.

On completion of the DGI, a waste classification assessment report should be prepared presenting the results of the investigation and with regards to the reporting requirements specified by the NSW EPA (see Section 7.9.1). The waste classification assessment must also consider the previous soil data presented in the previous JKG reports. The waste classification assessment may be included within the DGI report or as a stand-alone report.

As noted previously, the staging of the demolition/construction works may necessitate the DGI to be completed in stages. In this event, stand-alone DGI reports would need to be prepared for each stage of work.

6 REMEDIATION OPTIONS

6.1 Soil Remediation

The NSW EPA follows the hierarchy set out in NEPM (2013) for the remediation of contaminated sites. The preferred order for soil remediation and management is as follows:

1. On-site treatment of soil so that the contaminant is either destroyed or the associated hazard is reduced to an acceptable level;
2. Off-site treatment of excavated material so that the contaminant is either destroyed or the associated hazard is reduced to an acceptable level, after which the soil is returned to the site;

Or if the above are not practicable:

3. Consolidation and isolation of the soil by on-site containment within a properly designed barrier; and
4. Removal of contaminated material to an approved site or facility, followed where necessary by replacement with clean material; or
5. Where the assessment indicates that remediation would have no net environmental benefit or would have a net adverse environmental effect, implementation of an appropriate management strategy.

For simplicity herein, the above hierarchy are respectively referred to as Option 1, Option 2, Option 3 etc.

The NEPM (2013) and WA DoH 2021 require consideration of the following in assessing remediation options:

1. Minimisation of public risk;
2. Minimisation of contaminated soil disturbance; and
3. Minimisation of contaminated material/soil moved to landfill, including minimisation of risks associated with transportation.

The Guidelines for the NSW Site Auditor Scheme, 3rd Edition (2017)[16] provides the following additional requirements to be taken into consideration:

- Remediation should not proceed in the event that it is likely to cause a greater adverse effect than leaving the site undisturbed; and
- Where there are large quantities of soil with low levels of contamination, alternative strategies should be considered or developed.

[16] NSW EPA (2017). *Guidelines for the NSW Site Auditor Scheme, 3rd ed.* (referred to as Site Auditor Guidelines 2017)

6.2 Consideration of Remediation Options

The following table discusses a range of remediation options for contaminated fill:

Table 6-1: Consideration of Remediation Options

Option	Discussion	Applicability
Option 1 **On-site treatment of contaminated soil**	On-site treatment can provide a mechanism to reuse the processed material, and in some instances, avoid the need for large scale earthworks. Treatment options are contaminant-specific and can include bio-remediation, soil washing, air sparging and soil vapour extraction, thermal desorption and physical removal of bonded ACM. Depending on the treatment option, licences may be necessary for specific individual waste streams due to the potential for air pollution and the formation of harmful by-products during incineration processes. Licences for re-use of treated material/waste may also be required.	Treatment of soil for asbestos is not a valid approach when friable asbestos has been identified in the fill in the south of the project area with potentially similar conditions in the project area. It is also not valid for soils with mixtures of contaminants including friable asbestos. As all fill is considered to be asbestos impacted, this option is not considered to be applicable.
Option 2 **Off-site treatment of contaminated soil**	Contaminated soils are excavated, transported to an approved/licensed treatment facility, treated to remove/stabilise the contaminants then returned to the subject site, transported to an alternative site or disposed to an approved landfill facility. This option is also contaminant-specific. The cost per tonne for transport to and from the site and for treatment is considered to be relatively high. The material would also have to be assessed in terms of suitability for reuse as part of the proposed activity works under the waste and resource recovery regulatory framework.	Not applicable as per above and is not supported by the NSW EPA[17].
Option 3 **Consolidation and isolation of impacted soil by cap and containment**	This would include capping of impacted soil in-situ, followed by placement of an appropriate barrier over the material to reduce the potential for future disturbance and/or exposure. The capping must be appropriate for the specific contaminants of concern and protection for the relevant receptors (i.e. human health and ecological). A Long-Term Environmental Management Plan (LTEMP) will be required and will need to be publicly notified and made to be legally enforceable (e.g. via listings in the Section 10.7 planning certificate and on the land title).	This option is applicable and well suited for non-volatile contaminants where the exposure pathways are identified as via direct contact, and inhalation (asbestos only). Semi-volatile and volatile contaminants where the exposure pathways include vapour intrusion, and inhalation, can also be managed via consolidation and capping. However, additional mitigation measures are required in the design of the capping systems.

[17]https://www.epa.nsw.gov.au/your-environment/contaminated-land/other-contamination-issues/managing-asbestos-in-and-on-land/position-statement-wa-managment-of-asbestos-sites/draft-position-statement

Option	Discussion	Applicability
		It is noted that this option requires on-going management of the capping system and procedures in place for future works within and/or beneath the capping layers. JKG note that this method of remediation is considered to be Category 1 remediation by the City of Parramatta. Therefore, development consent would need to be obtained before this option could be undertaken. Council should be contacted prior to adopting this option.
<u>Option 4</u> **Removal of contaminated material to an appropriate facility and reinstatement with clean material**	Contaminated soils would be classified in accordance with NSW EPA guidelines for waste disposal, excavated and disposed of off-site to a licensed landfill. The material would have to meet the requirements for landfill disposal. Landfill gate fees (which may be significant) would apply in addition to transport costs.	This option is applicable for the remediation of contaminated fill soils given the shallow depth of filling encountered, the extent of the proposed activity and earthworks. JKG note that the bulk earthwork plans indicate a surplus of soil which will need to be disposed off-site.
<u>Option 5</u> **Implementation of management strategy**	Contaminated soils would be managed in such a way to reduce risks to the receptors and monitor the conditions over time so that there is an on-going minimisation of risk. This may occur via the implementation of monitoring programs.	Applicable for the long-term management of contamination, if capping occurs in accordance with Option 3. A passive management system is anticipated for the activity.

6.3 Preferred Remediation Option and Rationale

The preferred soil remediation approach is Option 4 (Excavation and Off-site Disposal). JKE has include a contingency for Option 3 (Consolidation and Isolation) in the event all of the impacted fill cannot be removed from the site due to existing buildings and hardstands to be retained. However, we note that Option 3 is not permitted under the REF framework within the City of Parramatta LGA and would require development consent to be obtained.

The preferred options for remediation are considered to be appropriate on the basis that:

- The contamination is considered to be widespread in fill;
- Minimising disturbance of asbestos impacted soils aligns with the asbestos remediation hierarchy and reduces the potential for exposure to asbestos;
- Excavating and disposing of surplus contaminated soil necessary for the installation of the capping system reduces unnecessary disturbance and disposal of material to landfill;
- Capping the project area will result in an incomplete exposure pathway to asbestos and carcinogenic PAH during day-to-day use of the area, hence mitigating the risks from exposure;
- Excavating and disposing of light fraction TRH impacted fill (TRH F2) removes the potential vapour intrusion pathway to receptors; and

- The strategy is sustainable, economically viable, commensurate with the level of risk posed by the contaminant and technically achievable to implement concurrently with the proposed upgrade works.

6.4 Exclusion Area

The fill soil in the south section of the wider site is impacted by friable and bonded asbestos as shown on the figures attached in Appendix A. At the request of the client, the south section of the wider site has been excluded from this RAP as it doesn't form part of the activity area.

JKE note that a final survey of the project area and exclusion area will be undertaken prior to the commencement of remediation works in order to delineate the excluded area from the DGI, validation and site audit.

JKG note that a Site-Specific AMP (SSAMP) for the management of asbestos in grounds was prepared for the site by WSP in 2024[18]. The exclusion area is to be managed in the interim in accordance with the requirements of the SSAMP. JKE has recommended that the SSAMP be updated to include mitigation measures for both bonded and friable asbestos in soil.

[18] WSP, (2024). *Parramatta East Public School Asbestos in Grounds Management Plan* (Project No. PS212906-131, Revision 3, dated 30 September 2024)

7 REMEDIATION DETAILS

Prior to commencement of any demolition, site preparation or remediation work within the project area, a suitably qualified contaminated land consultant[19] must be engaged as the validation consultant to validate the implementation of the RAP.

JKG anticipate the following general sequence of work for the project (in the context of the remediation):

1. Site establishment, demolition and removal of structures and pavement;
2. **Hold Point** – Completion of survey of the project area and exclusion area;
3. **Hold Point** - Completion of DGI and associated reports, including an RWP (as required, outlined in Section 5 of this report);
4. **Hold Point** – Obtain DA consent for remediation works (if the DGI and RWP require remediation via on-site containment of contaminated material);
5. **Hold Point** – An inspection of the project area must be completed by the validation consultant on completion of demolition to identify any additional sources of contamination (such as underground storage tanks - USTs, areas of staining and odours, tanks, etc). Any such areas identified should be managed in accordance with the unexpected finds protocol outlined in Section 10;
6. General earthworks and site preparations, followed by remediation of the project area concurrently with the proposed upgrade works;
7. Excavation and off-site disposal of contaminated soil from excavation areas. If required, implement the capping contingency for installation of capping systems and/or mitigation of risks associated with contamination; and
8. Validation of imported soil materials. This includes engineering material such as sub-base and drainage materials (e.g. recovered aggregate etc), capping materials, or any other materials such as landscaping soil, material imported for service trenches etc, to the point in time that the validation report is issued.

Validation of the works will occur progressively throughout the remediation program.

Details in relation to the above are outlined in the following subsections.

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[19] The consultant must be a certified practitioner (specialising in site contamination), under one of the NSW EPA endorsed certification schemes

7.1 Roles and Responsibilities

Table 7-1: Roles and Responsibilities

Role	Responsibility
Client/Developer	NSW Department of Education The client/developer is required to appoint the project team for the remediation and must provide all investigation reports and this RAP to the project manager, remediation contractor, consent authority and any other relevant parties involved in the project.
Project Manager	Johnstaff Pty Ltd The project manager is required to review all documents prepared for the project and manage the implementation of the procedures outlined in this RAP. The project manager is to take reasonable steps so that the remediation contractor and others have understood the RAP, including any associated RWP where applicable, and will implement it in its totality. The project manager will review the RAP and other documents and will update the parties involved of any changes to the activity or remediation sequence (in consultation with the validation consultant).
Remediation Contractor	To be appointed. The remediation contractor is required to review all documents prepared for the project, apply for or submit any relevant asbestos removal notifications or permits and implement the remediation requirements outlined in this RAP, and any associated RWP. The remediation contractor may also be the construction contractor. The remediation contractor is required to collect all necessary documentation associated with the remediation activities and forward this documentation onto the client, project manager and validation consultant as it becomes available. The remediation contractor is required to advise the validation consultant at key points in the remediation and validation program, and implement various aspects of the validation plan assigned to them. The remediation contractor must hold a Class A licensed asbestos removalist licence, or be in a position to sub-contract these services.
Validation Consultant	To be appointed. The validation consultant provides consulting advice and validation services in relation to the remediation, and prepares the site validation report, and any other associated documentation such as the AMP, DGI report, RWP etc. The validation is required to review any deviation to this RAP or in the event of unexpected finds if and when encountered during the site work. It is recommended that the validation consultant has a LAA on staff. The validation consultant is required to liaise with the client, project manager and remediation contractor on all matters pertaining to the site contamination, remediation and validation, carry out the required site inspections, and collect validation samples for imported materials.
Site Auditor	Melissa Porter (Senversa).

Role	Responsibility
	The site auditor would review all previous JKG reports including this RAP and any additional information provided by the validation consultant, including (but not limited to) the site validation report. The developer, project manager and validation consultant are to consult with the auditor in the event of unexpected finds and/or deviations to the RAP.

7.2 Pre-commencement Meeting

The project team is to have a pre-commencement meeting to discuss the sequence of remediation, and the remediation and validation tasks. The site management plan for remediation works (see Section 11) must be reviewed by project manager and remediation contractor, and appropriate steps are to be taken to ensure the adequate implementation of the plan.

7.3 Asbestos Management Plan (AMP)

An AMP has been prepared for the remediation works in the project area by JKG in 2025[20] and must be implemented for the demolition, remediation and activity works (involving asbestos). The AMP details the minimum personal protective equipment (PPE), work health and safety (WHS) and other requirements outlined in the documents published by Safe Work Australia, SafeWork NSW, National Occupational Health and Safety Commission, and other relevant authorities as applicable.

A SSAMP has been prepared by WSP in 2024 for the management of asbestos in the school grounds. The SSAMP must be updated to include management measures for bonded and friable asbestos encountered in the south section of the wider site (exclusion area).

7.4 Site Establishment and Demolition

The remediation contractor is to establish on the project area as required to facilitate the remediation. Consideration must be given to the work sequence and extent of remediation so that the site establishment (e.g. site sheds, fencing, access points etc) does not inhibit the remediation works.

The hazardous building materials in the existing structures should be removed in accordance with the relevant codes and standards.

Works are to be undertaken in accordance with the AMP (as discussed in Section 7.3). Following demolition works an ‘emu pick’ of the demolition areas for any visible surface fragments of FCF/ACM should be undertaken by a licensed Class A asbestos contractor.

On completion of the pick, an LAA is to undertake a surface clearance inspection for ACM and prepare a clearance certificate.

[20] JKG, (2025b). *Report to School Infrastructure NSW on Construction Asbestos Management Plan for School Redevelopment at Parramatta East Public School, Parramatta, NSW*. (Ref: E35073BRrpt2.Rev6-AMP)

All waste from the demolition is to be disposed to facilities that are licenced by the NSW EPA to accept the waste. The demolition contractor is to maintain adequate records and retain all documentation for such activities including:

- A summary register including details such as waste disposal dates, waste materials descriptions, disposal locations (i.e. facility details) and reconciliation of this information with waste disposal docket numbers;
- Waste tracking records and transport certificates (where waste is required to be tracked/transported in accordance with the regulations); and
- Disposal dockets for the waste. Legible dockets are to be provided for all waste materials so they can be reconciled with the register.

The above information is to be supplied to the validation consultant for assessment and inclusion in the site validation report.

7.5 Completion of DGI

The details for the DGI are outlined in Section 5 of this RAP. This work must be completed prior to the commencement of earthworks and construction for any underground services or the new buildings etc.

7.6 Remedial Actions - Excavation and Off-site Disposal of Contaminated Fill

Excavation and off-site disposal of fill which may present a vapour intrusion risk (i.e. impacted by light fraction TRHs or other volatile CoPC) is required. Excavation and off-site disposal of contaminated fill soil may be required to facilitate the installation of capping layers and sub-surface infrastructure, and to address surplus contaminated fill soil that cannot be consolidated/accommodated beneath the capping system. The procedure for excavation and disposal of contaminated soil is outlined in the following table:

Table 7-2: Remediation Details – Excavate and Dispose Contaminated Fill

Step	Primary Role / Responsibility	Procedure
1.	Remediation contractor	<u>Address Stability Issues and Underground Services:</u> Geotechnical advice must be sought regarding the stability of adjacent structures and/or adjacent areas prior to commencing remediation (as required). Stability issues are to be addressed to the satisfaction of a suitably qualified geotechnical engineer. This may require the installation of temporary shoring, if specified by the engineer. All underground services are to be appropriately disconnected or rerouted to facilitate the works.
2.	Remediation contractor (or nominated licenced sub-contractor)	<u>Establish Asbestos Related Controls and Arrange Licenses and Tracking Requirements:</u> Prior to the commencement of any excavation of asbestos impacted fill soil, asbestos related controls, licences and tracking requirements must be implemented as outlined in the AMP.
3.	Remediation contractor (or nominated Class A	<u>Excavation and Disposal of Contaminated Fill:</u>

Step	Primary Role / Responsibility	Procedure
	licensed sub-contractor) Validation consultant (inspections)	Remediation will be undertaken as follows: • Submit an application to dispose of the fill (in accordance with the assigned waste classification to be confirmed via the DGI process outlined in Section 5) to a facility that is appropriately licensed by the NSW EPA to receive the waste, and obtain authorisation to dispose. Noting the presence of asbestos in the waste stream where applicable, making the material Special Waste for off-site disposal; • Register with the NSW EPA-endorsed waste tracking system to comply with the legislation in regards to transporting/movement of asbestos waste; • A water system will need to be in place to spray the excavated soil during excavation/ remediation works and to decontaminate trucks entering the work area. The general site area should be kept damp during remediation works to minimise the generation of dust; • Asbestos related controls including air monitoring for asbestos removal works are to be implemented as per the AMP; • Load the fill onto trucks and dispose in accordance with the assigned waste classification. The receiving landfill facility should be contacted prior to disposal and should be licensed to accept the waste stream; • The occurrence of unexpected finds (staining/odours, underground infrastructure) during the soil removal are to be documented and addressed with regards to Section 9; and • All documents including landfill disposal dockets must be retained by the remediation contractor and forwarded to the client and validation consultant. This documentation forms a key part of the validation process and is to be included in the validation report.
4.	Validation consultant	Validation of Excavation: Once the fill is removed to required levels, the base and walls of the remedial excavation are to be validated in accordance with the validation plan outlined in Section 8, which includes bulk field screening and completion of a surface asbestos clearance by a LAA. Where excavation is undertaken to facilitate the installation of the capping system, validation of the remaining soils and excavation will not be required as the capping layer and LTEMP requirements will be applicable.
5.	Remediation contractor and validation consultant	Backfilling/Reinstatement of Excavation: Where required, the remedial excavation is to be reinstated with clean (validated) materials, to meet the geotechnical and landscape requirements of the project. Imported materials must be validated in accordance with the validation plan outlined in Section 8.

7.7 Remediation Contingency – Cap and Contain

This contingency is based around capping the fill/soil beneath appropriate (clean) capping layers in areas where fill cannot be excavated and removed from the site. JKG note that this contingency constitutes Category 1 remediation, and that development consent must be obtained prior to proceeding with this remediation approach.

The proposed capping system requires consideration during the design of the pavements, in-ground structures and landscaping/planting areas. JKG had not been provided with detailed landscape and drainage (stormwater retention) drawings for 'for-construction' at the time of preparing this RAP. Hence some assumptions have been made in designing the capping specification based on the provided architectural drawings titled 'TD 100% issued for tender'. Consequently, these requirements must be reviewed and discussed by the project team well in advance of construction commencing. In the event that the capping specification needs to be altered (which is to be expected due to the inclusion of TPZ), the specification must be included within a RWP to be prepared by the validation consultant, and must be approved by the client, consent authority and site auditor, prior to commencement.

A summary of the proposed capping strategy is provided in the following table:

Table 7-3: Capping Specification

Area	Capping Specification^
Continuous hardstand (concrete pavement, new buildings) and in-ground fixed features (OSD tank).	Installation of: • Geotextile marker[21] layer over the impacted fill; • Clean imported (validated) basecourse, only as required based on the engineering specification; and • Pavement material (i.e. concrete) as per engineering specification, or construction of the above ground feature.
Service Trenches. This includes new in-ground services installed within the contaminated soils.	Installation of: • Geotextile marker over the impacted fill (walls and base of services trench); • Backfill of the trench with clean imported and validated capping material; and • Pavement material (i.e. concrete) as per engineering specification, or construction of the above ground feature. The marker layer must be overlapped or appropriately fixed to the marker layer material in the areas adjoining the trench.
Soft/flexible pavement (including soft-fall, such as synthetic turf).	Installation of: • Geotextile marker over the impacted fill; • At least 200mm clean imported and validated capping material; and • Surface finish to required design levels. Where the pavement extends into a TPZ, the flexible pavement (i.e. rubber soft-fall, resin bound gravel) is to be designed and installed to be permeable to water and air flow in accordance with the advice of the project arborist and installation specialist for the soft-fall. The flexible pavement can form part or all of the capping layer (i.e. at least 200mm thickness including pavement), subject to the design/installation requirements of the pavement. The flexible pavement may be mounded within the structural root zones (SRZ), as required, and dished towards to the base of the trees within close proximity of the tree base. However, these must still be designed to prevent access to the underlying contaminated soils.
Landscaped areas (including TPZs).	Installation of: • Geotextile marker over the impacted fill; • Geogrid over the marker; • At least 500mm clean imported (validated) capping material; and • Surface finish to required design levels (i.e. mulch cover). Within TPZs, the capping material should not be placed in direct contact with the tree trunk. It is anticipated that the capping layer will taper towards the base of the

[21] The purpose of the geotextile marker is to provide visual demarcation to the underlying contaminated fill, should the overlying capping layers be disturbed. The client/project manager, remediation contractor and validation consultant are to agree on appropriate materials based on the project requirements. From a contamination and future/long-term management perspective, an orange geotextile would be suitable.

Area	Capping Specification^
	trunk within an approximate 1m radius of the tree trunk. The capping layer at the base of the tree trunk should be sufficient to ensure adequate capping above the geotextile marker and geogrid and may include mulch cover to obtain a suitable thickness of clean material[22]. A reduction of capping material thickness to at least 200mm would be considered acceptable within TPZs.

^ The capping specification relates to the remediation only and has not considered engineering design or landscape requirements for the site. Engineering design and landscape requirements must be assessed by others in the context of the RAP requirements and the validation consultant must be advised if any aspects of the capping are not achievable or require alternative solutions.

The remediation steps for capping in the project area are provided below. The detailed validation plan relevant to this aspect of the remediation is provided in Section 8.

Table 7-4: Remediation Contingency – Areas to be Capped

Step	Primary Role/ Responsibility	Procedure
1.	Remediation contractor	Earthworks/site preparations: The remediation contractor is to complete the earthworks required to facilitate the proposed capping of the site. It would be preferable for this to occur for all areas concurrently, rather than some areas being left until late in the construction program. Where piling is required, it would also be preferable for the piling area to be stripped of fill soils and the piling platform created adjacent to the alignment of the piles, to minimise the potential for cross-contamination between fill and natural soils. It is expected that piling spoil will be required to be disposed off-site.
	Validation Consultant	Any imported materials used (including materials used for site preparation, including a piling platform) are to be validated by the validation consultant in accordance with Section 8.
2.	Remediation contractor (or the nominated construction contractor)	Survey of site levels: A pre-capping levels survey is to be completed by the relevant contractor. This should occur after the installation of the geotextile marker layer, but before the installation of any overlying capping layers. The purpose of the survey is to provide a record of the site levels across the top of the geotextile marker layer. Survey points are to be recorded with a spacing of not more than 10m between adjacent points. Additional survey points will be required in the vicinity of changes in surface slope and for specific features such as service trenches. A post-capping levels survey is to be completed by the relevant contractor. This is to occur after the installation of all overlying capping layers, and the survey points should generally align with the pre-capping survey points. The purpose of the survey is to provide a record of the thickness of the capping layers installed above the geotextile marker layer. Survey of existing buildings and pavements: A survey of the building footprints of all buildings and pavements which are to be retained as part of the proposed activity must be completed by the relevant

[22] The capping specification within the immediate vicinity of the existing tree trunks is to be agreed upon with the client/contractor, validation consultant and arborist and must be endorsed by the site auditor. Preference should be given to extending the geofabric to the required height up the trunk and installation of capping to the geofabric material. The capping layer is not to be compromised by providing a gap which would allow for contact with the impacted fill.

Step	Primary Role/ Responsibility	Procedure
		contractor. Survey points are to be recorded with a spacing of not more than 10m between adjacent points. Additional survey points will be required in the vicinity of changes in surface slope and at the corners of each building.
3.	Remediation contractor (or the nominated construction contractor) Validation consultant	Capping: The cap is to be constructed in accordance with the capping specification. Any variations to the specifications should be discussed with and approved by the validation consultant and site auditor. Any imported materials used are to be validated by the validation consultant in accordance with Section 8. The validation consultant is required to inspect the capping works and imported materials in accordance with the validation plan.
4.	Validation consultant Project Manager/Client	Long Term Environmental Management Plan (LTEMP): The capping of contaminated fill on-site will require a LTEMP to be prepared for the site in accordance with the Consultants Reporting Guidelines and with reference to the NSW EPA guidelines on Preparing Environmental Management Plans for Contaminated Land (January 2022)[23]. The LTEMP will require public notification and must be legally enforceable. This may include listings in the Section 10.7 planning certificate and on the land title, and/or a modification to the consent conditions. JKG recommend obtaining legal advice on the legal enforceability of the LTEMP

The detailed validation plan relevant to the above items is provided in Section 8.

7.8 Disposal Requirements

Any material removed from the project area must be disposed of to a waste facility licensed by the NSW EPA to receive the waste stream. The waste classification report (as outlined in Section 5.6, to be finalised as part of the DGI process) must be used to facilitate the lawful disposal of the waste. Refer also to Section 7.9.1 below.

7.9 Remediation Documentation

The remediation contractor must keep records and retain all documentation associated with the remediation, including but not limited to:

- Asbestos management documentation, including all relevant notifications and monitoring reports, and clearance certificates where applicable. Additional details in this regard are outlined in the AMP;
- Photographs of remediation works;
- Waste disposal dockets and waste tracking documentation; and
- Imported materials documentation.

Copies of the documents must be forwarded to the validation consultant on completion of the remediation for inclusion in the validation report.

[23] NSW EPA (2022), Preparing environmental management plans for contaminated land (January 2022)

Any waste movements should be documented. Copies of the documents must be forwarded to the validation consultant on completion of the remediation for inclusion in the validation report. Further information is provided below in the sections below.

7.9.1 Waste

All waste removed from the site is to be appropriately tracked and managed in accordance with the relevant regulations. The remediation contractor (and/or their nominated licensed asbestos removalist) is to maintain adequate records and retain all documentation for waste disposal activities including:

- A summary register (in Microsoft Excel format) including details such as waste disposal dates, waste materials descriptions, disposal locations (i.e. facility details) and reconciliation of this information with the associated waste classification documentation and the waste disposal docket numbers;
- Waste tracking records and transport certificates (where waste is required to be tracked/transported in accordance with the regulations). This includes consignment details via the NSW EPA-endorsed waste tracking system for asbestos waste; and
- Disposal dockets for the waste (i.e. weighbridge dockets for each load).

Any soil waste classification documentation is to be prepared in accordance with the reporting requirements specified by the NSW EPA.

A review of the disposal facility's Environment Protection Licence (EPL) issued under the Protection of the Environment Operations (POEO) Act (1997)[24] is to be undertaken to assess whether the facility is appropriately licensed to receive the waste.

The above information is to be provided to the validation consultant for inclusion in the validation report. The register must be set up at the beginning of the project and provided to the validation consultant regularly (i.e. weekly) so the details can be checked and any rectification of the record keeping process can occur in a timely manner.

A soil volume analysis must be undertaken and reconciled with the actual quantities shown on the soil disposal dockets. This information is to be reviewed by the validation consultant on completion of the works and an assessment of the quantities of soil disposed off-site (e.g. comparison with the estimated and actual volumes).

An example of a waste tracking register is attached in Appendix E.

7.9.2 Imported Materials

The remediation contractor (and/or their nominated construction contractor) is to maintain for the duration of the project an imported material register. This must include a register (preferably in Microsoft Excel format) with details of each imported material type, supplier details, summary record of where the imported

[24] NSW Government, (1997). *Protection of Environment Operations Act.* (referred to as POEO Act 1997)

materials were placed in the project area, and importation docket numbers and a tally of quantities (separated for each import stream). Dockets for imported materials are to be provided electronically so these can be reconciled with the register.

Examples of imported materials for this project may include but would not be limited to: site preparation materials (e.g. Densely Graded Base (DGB), 40/70, material to create the pavement base or piling platforms etc); backfill material such as virgin excavated natural material (VENM); and landscaping materials such as topsoil garden mixes, mulches etc.

The above information is to be provided to the validation consultant for inclusion in the validation report. The register be set up at the beginning of the project and provided to the validation consultant at regular intervals, such as weekly (frequency and intervals are to be agreed to between the contractor and validation consultant prior to commencement of remediation) so the details can be checked and any rectification of the record keeping process can occur in a timely manner.

An example of an imported materials tracking spreadsheet is attached in Appendix E.

8 VALIDATION PLAN

Validation is necessary to demonstrate that remedial measures described in this RAP have been successful and that the site is suitable for the intended land use. The validation can be staged if required, depending on the sequence of excavation.

The sampling and documentation requirements for the validation are outlined in the following sub-sections. These are the minimum requirements based on conditions anticipated to exist in the project area. Additional validation sampling may be required based on the DGI results site observations made during remediation. Site observations will also be used as a validation tool to assess the extent of contamination.

8.1 Validation Sampling and Documentation

The validation requirements for the excavation of contaminated fill are outlined below:

Table 8-1: Validation Requirements

Aspect	Sampling	Analysis	Observations and Documentation
Capping Contingency			
Survey of existing buildings/structures and pavements.	NA	NA	Remediation contractor to obtain the surveys as required in Section 7.7.
Survey of site levels.	NA	NA	Remediation contractor to obtain the surveys as required in Section 7.7. It is also expected that the remediation contractor or their nominated construction contractor will provide as-built drawings for the project which document the capping layers.
Inspections.	NA	NA	Validation consultant to carry out inspections to document the installation of the cap. Key hold points for inspections include: - Geotextile marker and geogrid installation; - During importation of materials used to construct the cap; and - Finished surface levels. A photographic record is to be maintained by the remediation contractor and validation consultant.
Validation of imported materials.	As indicated below.	As indicated below.	As indicated below.

Aspect	Sampling	Analysis	Observations and Documentation
Excavations			
Validation sampling for contaminated fill following removal of fill, base of excavation	Sampling should occur based on the area of the remedial excavation. As a minimum, sampling for asbestos validation at twice the sampling density recommended in Table 2 of the EPA Sampling Design Guidelines 2022 should be adopted. Bulk sampling (10L field screening) for asbestos is not proposed as the base of remedial excavations are to extent into the natural soil/ bedrock. As a minimum, validation sampling for contaminants of concern (other than asbestos) identified in the DGI process at the sampling density recommended in Table 2 of the EPA Sampling Design Guidelines 2022 should be adopted. The sampling must be undertaken on a grid-based plan.	Any ACM encountered during the screening is to be analysed for asbestos. The natural soil/bedrock remaining in the base of remedial excavation area is to be sampled and analysed for TRH, carcinogenic PAHs and asbestos at the laboratory (500ml NEPM 2013 analysis). The natural soil/bedrock profile exposed at the base of the excavation is to be analysed for the relevant contaminants of concern identified via the DGI process.	Observations to be recorded by the validation consultant to document fill/soil lithology on the base and walls of the excavation. Each bulk sample is to be weighed (in kg) using an accurate scale to two decimal places. A sample location plan is to be prepared by the validation consultant, documenting the sample locations and final extent of the remediation area. Photographs are to be taken by the validation consultant. LAA to provide asbestos surface clearance for the base of the remedial excavation. A copy of the clearance certificate is to be forwarded to validation consultant for inclusion in the validation report. Air monitoring results to be reviewed. Disposal dockets to be retained by the remediation contractor and forwarded to validation consultant for inclusion in the validation report.
Validation sampling for contaminated fill following removal of fill, exposed walls of excavation	One sample per exposed fill profile along the/each excavation wall (minimum one sample per 10m lineal), and per vertical metre where a single fill profile extends beyond 1m deep. One sample per exposed natural soil and rock profile along the/each excavation wall (minimum one sample per 10m lineal), and per vertical metre where a single profile extends beyond 1m deep.	Any ACM encountered during the screening is to be analysed for asbestos. The fill remaining at the walls of the validation area is to be sampled and analysed for TRH, carcinogenic PAHs, PFAS and asbestos at the laboratory (500ml NEPM 2013 analysis) and a visual surface clearance for asbestos undertaken.	Observations to be recorded by the validation consultant to document fill/soil lithology on the base and walls of the excavation. Each bulk sample is to be weighed (in kg) using an accurate scale to two decimal places. A sample location plan is to be prepared by the validation consultant, documenting the sample locations and final extent of the remediation area. Photographs are to be taken by the validation consultant.

Aspect	Sampling	Analysis	Observations and Documentation
	Sampling of fill is to include bulk sampling (10L field screening) for asbestos. However, in areas where the DGI has confirmed AF/FA, field screening should not be undertaken due to WHS.	The fill remaining at the walls of the validation area is to be analysed for the relevant contaminants of concern identified via the DGI process.	LAA to provide asbestos surface clearance for the walls of the remedial excavation. A copy of the clearance certificate is to be forwarded to validation consultant for inclusion in the validation report. Air monitoring results to be reviewed. Disposal dockets to be retained by the remediation contractor and forwarded to validation consultant for inclusion in the validation report.
Imported Materials			
Imported VENM backfill (if required), or piling platform material etc	Minimum of three samples per $75m^3$, with one sample per additional $25m^3$.	Heavy metals (arsenic, cadmium, chromium, copper, lead, mercury, nickel and zinc), TRHs, BTEX, PAHs, OCPs & OPPs, PCBs and asbestos (500ml NEPM 2013 analysis). Additional analysis, such as PFAS, may be required depending on the site history of the source property.	Remediation contractor to supply existing VENM documentation/report (report to be prepared in accordance with the NSW EPA waste classification reporting requirements). A hold point remains until the validation consultant approves the material for importation or advises on the next steps. Material is to be inspected upon importation by the validation consultant to confirm it is free of visible/olfactory indicators of contamination and is consistent with documentation. Photographic documentation and an inspection log are to be maintained. Where check sampling occurs by the validation consultant due to deficiencies or irregularities in existing VENM documentation, the following is required: - Date of sampling and description of material sampled; - An estimate of the volume of material imported at the time of sampling; - Sample location plan; and - Analytical reports and tabulated results with comparison to the Validation Assessment Criteria (VAC).

Aspect	Sampling	Analysis	Observations and Documentation
Imported engineering materials such as recycled aggregate, road base etc	Minimum of three samples per 75m^3, with one sample per additional 25m^3. Except for coarse 40/70 materials which will only be visually inspected for FCF and other indicators of contamination.	Heavy metals (as above), TRHs, BTEX, PAHs, OCPs & OPPs, PCBs and asbestos (500ml NEPM 2013 analysis).	Remediation contractor to provide product specification and documentation to confirm the material has been classified with reference to a relevant Resource Recovery Order/Exemption. A hold point remains until the validation consultant approves the material for importation or advises on the next steps.
Excavated Natural Material (ENM)	ENM testing must meet the specification within the ENM Order. If the analysis is not compliant, the validation consultant must carry out an ENM assessment and prepare a report in accordance with the ENM Order/Exemption prior to material being imported.	As required in the ENM Order.	Review of the facility's EPL, where applicable. Material is to be inspected by the validation consultant upon importation to confirm it is free of visible/olfactory indicators of contamination and is consistent with documentation. Where check sampling occurs by the validation consultant due to deficiencies or irregularities in existing documentation, the following is required: - Date of sampling and description of material sampled; - An estimate of the volume of material imported at the time of sampling; - Sample location plan; and - Analytical reports and tabulated results with comparison to the VAC.
Imported engineering materials comprising only natural quarried products.	At the validation consultant's discretion based on robustness of supplier documentation.	At the validation consultant's discretion based on robustness of supplier documentation.	Remediation contractor to provide documentation from the supplier confirming the material is a product comprising only natural quarried material. A hold point remains until the validation consultant approves the material for importation or advises on the next steps. Review of the quarry's EPL where relevant. Material is to be inspected by the validation consultant upon importation to confirm it is free of anthropogenic materials, visible and olfactory indicators of

Aspect	Sampling	Analysis	Observations and Documentation
			contamination, and is consistent with documentation. Where check sampling occurs by the validation consultant due to deficiencies or irregularities in existing documentation, the following is required: - Date of sampling and description of material sampled; - An estimate of the volume of material imported at the time of sampling; - Sample location plan; and - Analytical reports and tabulated results with comparison to the VAC.
Imported mulch, garden mix/turf and underlay/topsoil	Minimum of three samples per 75m^3, with one sample per additional 25m^3. Bulk sampling (10L field screening) for asbestos is to occur along with the collection of samples for laboratory analysis.	Heavy metals (as above), TRHs, BTEX, PAHs, OCPs & OPPs, PCBs, PFAS and asbestos (500ml NEPM 2013 analysis). Analysis of mulch can be limited to asbestos (500ml) and visual observations to confirm there are no anthropogenic materials. Any observed FCF to be analysed for asbestos.	Remediation contractor to provide documentation from the supplier confirming the product specification. This must include a description of the Australian Standard or other relevant product specification under which the material is produced, and the components. A hold point remains until the validation consultant approves the material for importation or advises on the next steps. Material is to be inspected by the validation consultant upon importation to confirm it is free of anthropogenic materials, visible and olfactory indicators of contamination, and is consistent with documentation. The validation consultant is to review any existing/available analysis results for the materials. A minimum of one batch for each imported material type (from each individual supplier) must be inspected by the validation consultant. This inspection must be repeated for each material type from each supplier, a minimum of once per month thereafter. Where check sampling occurs by the validation consultant due to

Aspect	Sampling	Analysis	Observations and Documentation
			deficiencies or irregularities in existing documentation, the following is required: - Date of sampling and description of material sampled; - An estimate of the volume of material imported at the time of sampling; - Sample location plan; and - Analytical reports and tabulated results with comparison to the VAC.

8.2 Validation Assessment Criteria and Data Assessment

The VAC to be adopted for the validation assessment are outlined in the following table:

Table 8-2: VAC

Validation Aspect	Criteria
Waste classification	In accordance with the procedures and criteria outlined in the NSW EPA Waste Classification Guidelines 2014 and any other exemptions/approvals as required.
Validation of capping	Validation of capping will occur via a review of survey information, as-built drawings and via the inspection process. The validation report is to include cross-sections documenting the completed capping details for the various areas of the site.
Soil validation	The VAC for soil validation are as follows: • Analytical results for contaminants of concern to be below the respective HILs for a 'residential with accessible soils' exposure scenario (HIL-A) presented in Schedule B1 of NEPM 2013 and Table 2 of the NEMP 2020; • Analytical results for contaminants of concern to be below the respective HSLs for a 'low-high density residential' exposure scenario (HSL-A & HSL-B). The criteria for 'sand' type soils and a depth interval of 0m to <1m, as presented in Schedule B1 of NEPM 2013; • Analytical results for contaminants of concern to be below the respective EILs and ESLs for an 'urban residential and public open space (URPOS) scenario as presented in Schedule B1 of NEPM 2013. The EILs for selected metals may be adjusted based on soil-specific parameters in accordance with Schedule B1 of NEPM 2013; • Analytical results for PFAS to be below the indirect exposure criteria based on Table 3 of the NEMP 2020; • Analytical results for asbestos fines/fibrous asbestos (AF/FA) in soil <0.001%w/w, based on the HSL-A criterion for soils presented in Schedule B1 (Table 7) of NEPM 2013; • Analytical results for ACM in soil <0.01%w/w, based on the HSL-A&B criterion for soils presented in Schedule B1 (Table 7) of NEPM 2013; and • No visible FCF at the site surface and/or within base of exposed excavations.

Validation Aspect	Criteria
Imported materials	Material imported as general fill must only be VENM or ENM. VENM is defined in the POEO Act 1997 as material: • That has been excavated or quarried from areas that are not contaminated with manufactured chemicals, or with process residues, as a result of industrial, commercial mining or agricultural activities; • That does not contain sulfidic ores or other waste; and • Includes excavated natural material that meets such criteria for virgin excavated natural material as may be approved from time to time by a notice published in the NSW Government Gazette. ENM and recycled materials are to meet the criteria of the relevant exemption/order under which they are produced. Analytical results for VENM and other imported materials will need to be consistent with expectations for those materials. For VENM, it is expected that: - Heavy metal concentrations are to be less than the most conservative ACL concentrations for an URPOS exposure setting presented in Schedule B1 of the NEPM (2013), except for lead which should nominally be less than 100mg/kg; and - Organic compounds are to be less than the laboratory PQLs and asbestos to be absent. All materials imported onto the site must also be adequately assessed as being appropriate for the final use of the site, including ecological considerations. A risk-based assessment approach is to be adopted with regards to the tier 1 screening criteria presented in Schedule B1 of NEPM (2013). Aesthetics: all imported materials are to be free of staining and odours.

For imported materials, further assessment of risk can be considered in relation to site specific circumstances/application and available documentation for each material type, although such assessment and importation/use of materials on site should not be contrary to waste exemptions/orders or waste definitions.

8.3 Data Quality

Data Quality Objectives (DQOs) and Data Quality Indicators (DQIs) must be clearly outlined and assessed as part of the validation process. A framework for the DQO and DQI process is outlined below and should be reflected in the validation report. DQOs should be established for the validation with regards to the seven-step process outlined in the NEPM (2013). The seven steps include the following:

- State the problem;
- Identify the decisions/goal of the study;
- Identify information inputs;
- Define the study boundary;
- Develop the analytical approach/decision rule;
- Specify the performance/acceptance criteria; and
- Optimise the design for obtaining the data.

DQIs are to be assessed based on field and laboratory considerations for precision, accuracy, representativeness, completeness and comparability.

8.3.1 Step 1 - State the Problem

Validation data is required to demonstrate that the remediation is successful and that the project area is suitable for the proposed land use described in Section 1.2.

8.3.2 Step 2 - Identify the Decisions of the Study

The remediation goal, aims and objectives are defined in Section 1.6. The decisions to be made reflect these objectives and are as follows:

- Was the remediation undertaken in accordance with the RAP?
- If there were any deviations, what were these and how do they impact the outcome of the validation?
- Are any of the validation results above/outside of the VAC?
- Is the site suitable for the proposed activity from a contamination viewpoint?

8.3.3 Step 3 - Identify Information Inputs

The primary information inputs required to address the decisions outlined in Step 2 include the following:

- Existing relevant data from previous reports;
- DGI information, together with any additional reports such as the RWP etc;
- Site information, including site observations, inspections and survey records;
- Validation sampling of soil following fill removal, and of imported materials;
- Laboratory analysis; and
- Field and laboratory QA/QC data.

8.3.4 Step 4 - Define the Study Boundary

The remediation and validation will be confined to the boundaries of the project area as shown in Figure 2 in Appendix A and will be limited vertically to the depth of fill across the site (unless the DGI process identifies that natural soils are impacted and require remediation, in which case the vertical extent will be guided by the validation process). JKE note the exclusion area identified in Section 6.4 of the RAP.

8.3.5 Step 5 - Develop an Analytical Approach (or Decision Rule)

8.3.5.1 VAC

The validation data will be collected and assessed in accordance with Sections 8.1 and 8.2. The following decision rules will apply:

- If all concentrations of the contaminants of concern are below the VAC, then the data will be compared directly to the VAC without statistical analysis;
- If the concentration of a contaminant of concern exceeds the VAC (except for asbestos or within landscaped areas), then statistical analysis may be undertaken. This will include calculation of the 95%

upper confidence limit (UCL) value for the data set, with regards to the NEPM (2013) framework and other relevant guidelines made under the CLM Act 1997. The UCL will be considered acceptable where the UCL is below the VAC, the standard deviation of the data is less than 50% of the VAC and none of the individual concentrations are more than 250% of the VAC;

- Data for non-VENM imported materials (i.e., ENM, engineered products) will be assessed in accordance with the appropriate resource recovery order;
- Data for material placed in landscaped areas will be assessed directly against the VAC. Statistical analysis is not proposed for landscaped areas; and
- Asbestos data will be assessed directly against the VAC. Statistical analysis is not proposed for asbestos data.

8.3.5.2 Field and Laboratory QA/QC

Appropriate QA/QC samples must be obtained during the validation (where applicable) and analysed for the contaminants of concern. As a minimum, QA/QC sampling must include duplicates (5% inter-laboratory and 5% intra-laboratory (with the exception of asbestos)), and one trip blank, one trip spike and one rinsate sample per batch.

DQIs for field and laboratory QA/QC samples are defined below:

Field Duplicates

Acceptable targets for precision of field duplicates will be 30% or less, consistent with NEPM (2013). Relative Percentage Difference (RPD) failures will be considered qualitatively on a case-by-case basis taking into account factors such as the concentrations used to calculate the RPD (i.e. RPD exceedance where concentrations are close to the PQL are typically not as significant as those where concentrations are reported at least five or 10 times the PQL), sample type, collection methods and the specific analyte where the RPD exceedance was reported.

Trip Blanks, Trip Spikes and Rinsates

Acceptable targets for trip blank and rinsate samples will be less than the PQL for organic analytes. Metals will be considered on a case-by-case basis with regards to the reference material used as the blank medium.

Acceptable targets for the trip spike samples will be 70-130% recovery.

Laboratory QA/QC

The suitability of the laboratory data will be assessed against the laboratory QA/QC criteria. These criteria are developed and implemented in accordance with the laboratory's NATA accreditation and align with the acceptable limits for QA/QC samples as outlined in NEPM (2013) and other relevant guidelines.

A summary of the typical limits is provided below:

RPDs

- Results that are <5 times the PQL, any RPD is acceptable; and

- Results >5 times the PQL, RPDs between 0-50% are acceptable.

Laboratory Control Samples (LCS) and Matrix Spikes
- 70-130% recovery acceptable for metals and inorganics; and
- 60-140% recovery acceptable for organics.

Surrogate Spikes
- 60-140% recovery acceptable for general organics.

Method Blanks
- All results less than PQL.

In the event that acceptable limits are not met by the laboratory analysis, other lines of evidence will be reviewed (e.g. field observations of samples, preservation, handling etc) and, where required, consultation with the laboratory is to be undertaken in an effort to establish the cause of the non-conformance. Where uncertainty exists, the validation consultant is to adopt the most conservative concentration reported.

8.3.5.3 Appropriateness of PQLs

The PQLs of the analytical methods are to be considered in relation to the VAC to confirm that the PQLs are less than the VAC. In cases where the PQLs are greater than the VAC, a discussion of this is to be provided.

8.3.6 Step 6 – Specify Limits on Decision Errors

To limit the potential for decision errors, a range of quality assurance processes are adopted. A quantitative assessment of the potential for false positives and false negatives in the analytical results is to be undertaken with reference to Schedule B(3) of NEPM (2013) using the data quality assurance information collected.

Decision errors can be controlled through the use of hypothesis testing. The test can be used to show either that the baseline condition is false or that there is insufficient evidence to indicate that the baseline condition is false. The null hypothesis is an assumption that is assumed to be true in the absence of contrary evidence. For the validation assessment, the null hypothesis (H_0) is that the 95% UCL for the contaminant of concern is greater than the VAC. The alternative hypothesis (H_A) is that the 95% UCL for the contaminant of concern is less than the VAC.

Potential outcomes include Type I and Type II errors as follows:
- Type I error of determining that the soil is acceptable for the proposed land use when it is not (wrongly rejects true H_0), includes an alpha (α) risk of 0.05; and
- Type II error of determining that the soil is unacceptable for the proposed land use when it is (wrongly accepts false H_0), includes beta (β) risk of 0.2.

Where statistical analysis is applied in accordance with Step 5 via the calculation of UCL values, the potential for decision errors to occur will also be evaluated using the Combined Risk Value (CRV) method as outlined in Appendix E of the EPA Sampling Design Guidelines 2022. The CRV method will be used retrospectively to establish whether there is sufficient statistical power in the UCL.

8.3.7 Step 7 - Optimise the Design for Obtaining Data

The design is to be optimised via the collection of validation data to demonstrate the success of the key aspects of the remediation.

8.4 Validation Report

As part of the site validation process, a validation report will be prepared by the validation consultant. The report will present the results of the validation assessment and will be prepared in accordance with the Consultants Reporting guidelines. The validation report must also include a summary of the findings of the DGI process. The validation report must be submitted to the appointed site auditor for review.

It should also be noted that any material changes to the remediation or validation strategy will require an addendum or revision of the RAP, which in turn must be approved by the client, the appointed site auditor, and the consent authority.

9 CONTINGENCY PLAN

A review of the proposed remediation works has indicated that the greatest risks that may affect the success of the remediation include identification of unexpected finds. Contingency plans to address these risks are outlined below, in conjunction with a selection of other contingencies that may apply to this project.

9.1 Contingency for Failure of Remediation Strategy

In the event of a soil validation failure when validating fill removal, the client should be advised then the excavation should be extended in the direction of the failure (in consultation with the validation consultant, client and other relevant stakeholders) and the area re-validated. Alternatively, where applicable and able to be accommodated within the activity, the cap and contain remedial approach outlined in this RAP may be adopted.

A site-specific human health risk assessment (HHRA) and/or an ecological risk assessment (ERA) (as required) could also be considered to establish whether the risks warrant further remediation and/or long-term management, and inform alternative remediation strategies as necessary. Any alternative remediation strategy must be documented in an RWP and approved by the site owner, appointed site auditor and the relevant consent authority.

9.2 Importation Failure for Imported Materials

Where material to be imported onto the site does not meet the importation acceptance criteria detailed in Section 8, the only option is to not accept the material. Alternative material must be sourced that meets the importation requirements.

10 UNEXPECTED FINDS PROTOCOL

Unexpected, contamination-related finds in-ground at this site may include (but would not necessarily be limited to) the following:

- Underground storage tanks (USTs);
- Stained soils or soils impacted by hydrocarbon/hydrocarbon-like odours;
- Buried waste/drums; and
- The occurrence of additional contaminants of concern during the DGI.

The procedure to be followed in the event of an unexpected, contamination-related find is presented below:

- In the event of an unexpected find, all work in the immediate vicinity must cease and the construction contractor must contact the client (or their representative such as their project manager) and the environmental consultant;
- Temporary barricades should be erected to isolate the area from access to workers;
- The environmental consultant is to attend the site, adequately characterise the conditions and any contamination-related impacts, and provide advice in relation to site management/remediation. Any relevant reports or associated documentation must be prepared; and
- The find must be managed in accordance with the environmental consultant's advice. In the event that contamination is identified that warrants additional remediation outside the scope/intent of this RAP, notification/approval of such work must occur with regards to Chapter 4 of SEPP Resilience and Hazards 2021. Where remediation is required that is not captured within the RAP, an addendum to the RAP or RWP must be prepared by the validation consultant and submitted to the appointed site auditor and the consent authority. The remediation work must be validated in accordance with the RAP and the RAP addendum/RWP to demonstrate that contamination risks are low and acceptable in the context of the proposed activity.

Reference is to be made to the UFP attached in Appendix F.

11 SITE MANAGEMENT PLAN FOR REMEDIATION WORKS

The information outlined in this section of the RAP is for the remediation work only. The client should make reference to the REF documentation for specific site management requirements for the overall upgrade works at the site.

11.1 Asbestos Management Plan

Prior to the commencement of any soil disturbance, the AMP is to be reviewed by the contractors. The AMP is to be implemented by the remediation contractor (and their nominated subcontractors where relevant) throughout the remediation unless the licensed asbestos removalist prepares another AMP that is tailored to their activities and is deemed appropriate by the validation consultant.

11.2 Interim Site Management

Asbestos, in the form of bonded and friable (AF/FA) was identified in surficial fill soils within the project area and wider site. It is also noted that additional asbestos-related finds were considered likely to occur. JKG have been informed by the client that emu-picks and clearance inspections have been undertaken on several occasions since the JKG 2022 DSI. As the site is operational, interim management of the site for the potential occurrence of asbestos is required. The existing SSAMP is to be updated to include mitigation measures for friable asbestos in soil.

In addition to implementing and maintaining the requirements of the SSAMP, air monitoring for airborne asbestos is to be undertaken to establish baseline concentrations of airborne asbestos fibres during day-to-day activities associated with the use of the site as a primary school. The air monitoring is to be undertaken to the satisfaction of an occupational hygienist/LAA. Based on the results of the air monitoring, additional interim measures may be required. The air monitoring action criteria are presented in Section 11.9.

Any soil disturbance works must be undertaken in accordance with the AMP.

11.3 Project Contacts

Emergency procedures and contact telephone numbers should be displayed in a prominent position at the site entrance gate and within the main site working areas. The contact details of key project personnel are summarised in the following table:

Table 11-1: Project Contacts

Role	Company	Contact Details
Project Manager	Johnstaff Pty Ltd	Luke Jacobs (0432 397 485) luke.jacobs@johnstaff.com.au
Remediation Contractor	To be appointed	-

Role	Company	Contact Details
Validation Consultant	To be appointed	-
Site Auditor	Melissa Porter (Senversa)	Melissa Porter (0402 537 759) Melissa.Porter@senversa.com.au
Certifier	To be appointed	-
NSW EPA	Pollution Line	131 555
Emergency Services	Ambulance, Police, Fire	000

11.4 Security

Prior to the commencement of site works, fencing should be installed as required to secure the remediation areas. Warning signs should be erected, which outline the PPE required for remediation work.

11.5 Timing and Sequencing of Remediation Works

The anticipated sequence of remediation works is outlined in Section 7. The buildings and structures at the site will need to be demolished to allow site access for the DGI and for remediation works to occur.

11.6 Site Soil and Water Management Plan

The remediation contractor should prepare a detailed soil and water management plan prior to the commencement of site works and this should consider the requirements of the AMP. Silt fences should be used to control the surface water runoff at all appropriate locations of the site and appropriate measures are to be implemented to manage soil/water disturbance. Sediment and erosion controls must be installed and maintained in accordance with the Erosion and Sediment Control Plans prepared for the site. Refer to the REF documentation for further details.

All stockpiled materials should be placed within an erosion containment boundary with silt fences and sandbags employed to limit sediment movement. The containment area should be located away from drainage lines/low-points, gutters, stormwater pits and inlets and the site boundary. No liquid waste or runoff should be discharged to the stormwater or sewerage system without the approval of the appropriate authorities.

11.7 Noise and Vibration Control Plan

The guidelines for minimisation of noise on construction sites outlined in AS-2460 (2002)[25] should be adopted. All practicable measures should be taken to reduce the generation of noise and vibration to within acceptable limits. In the event that short-term noisy operations are necessary, and where these are likely to affect residences, notifications should be provided to the relevant authorities and the residents by the project manager, specifying the expected duration of the noisy works.

11.8 Dust Control Plan

All practicable measures should be taken to reduce dust emanating from the site. Factors that contribute to dust production are:

- Wind over a cleared surface;
- Wind over stockpiled material; and
- Movement of machinery in unpaved areas.

Visible dust should not be present at the site boundaries. Measures to minimise the potential for dust generation include:

- Use of water sprays on unsealed or exposed soil surfaces;
- Covering of stockpiled materials and excavation faces (particularly during periods of site inactivity and/or during windy conditions) or alternatively the erection of hessian fences around stockpiled soil or large exposed areas of soil;
- Establishment of dust screens consisting of a 2m high shade cloth or similar material secured to a chain wire fence;
- Real-time monitoring of dust generation;
- Maintenance of dust control measures to keep the facilities in good operating condition;
- Concrete surfaces brushed or washed to remove dust;
- Stopping work during strong winds;
- Loading or unloading of dry soil as close as possible to stockpiles to prevent spreading of loose material around the site; and
- The expanse of cleared land should be kept to a minimum to achieve a clean and economical working environment.

If excessive dust is generated all site activities should cease until either wind conditions are more acceptable or a revised method of excavation/remediation is developed. Reference is also to be made to the AMP in this regard.

Dust is also produced during the transfer of material to and from the site. All material should be covered during transport and should be properly disposed of on delivery. No material is to be left in an exposed, un-monitored condition.

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[25] Australian Standard, (2002). *AS2460: Acoustics - Measurement of the Reverberation Time in Rooms.*

All equipment and machinery should be brushed or washed down before leaving the site to limit dust and sediment movement off-site. In the event of prolonged rain and lack of paved areas all vehicles should be washed down prior to exit from the site, and any soil or dirt on the wheels of the vehicles removed. Water used to clean the vehicles should be collected and tested prior to appropriate disposal under the relevant waste classification guidelines.

Reference must also be made to the AMP in this regard.

11.9 Air Monitoring

Reference is to be made to the AMP for details regarding asbestos air fibre monitoring. Air monitoring must only be carried out by personnel registered and accredited by NATA. Filter analysis must only be carried out within a NATA certified laboratory. The monitoring results must conform to the requirements of the National Occupational Health and Safety Commission (NOHSC) Guidance note on the Membrane Filter Method for Estimating Airborne Asbestos Fibres 2nd Edition [NOHSC:3003 (2005)][26].

The monitoring program will be used to assess whether the control procedures being applied are satisfactory and that criteria for airborne asbestos fibre levels are not being exceeded. The following levels will be used as action criteria during the air monitoring:

- <0.01 Fibres/ml: Work procedures deemed to be successful;
- 0.01 to 0.02 Fibres/ml: Inspection of the site and review of procedures; and
- >0.02 Fibres/ml: Stop work, inspection of the site, review of procedures, clean-up, rectification works where required and notify the relevant regulator.

11.10 Odour Control Plan

All activities undertaken at the site should be completed in a manner that minimises emissions of smoke, fumes and vapour into the atmosphere and any odours arising from the works or stockpiled material should be controlled. Control measures may include:

- Maintenance of construction equipment so that exhaust emissions comply with the Clean Air Regulations issued under the POEO Act 1997;
- Demolition materials and other combustible waste should not be burnt on site;
- The spraying of a suitable proprietary product to suppress any odours that may be generated by excavated materials; and
- Use of protective covers (e.g. builder's plastic).

All practicable measures should be taken to reduce fugitive emissions emanating from the site so that associated odours do not constitute a nuisance and that the ambient air quality is not adversely impacted.

The following odour management plan should be implemented to limit the exposure of site personnel and surrounding residents to unpleasant odours:

[26] National Occupational Health and Safety Commission, (2005). *Guidance Note on the Membrane Filter Method for Estimating Airborne Asbestos Fibres. 2nd Edition [NOHSC:3003(2005)]*

- Excavation and stockpiling of material should be scheduled during periods with low winds if possible;
- A suitable proprietary product could be sprayed on material during excavation and following stockpiling to reduce odours (subject to an appropriate assessment of the product by the validation consultant);
- All complaints from workers and neighbours should be logged and a response provided. Work should be rescheduled as necessary to minimise odour problems;
- The site foreman should consider the following odour control measures as outlined in NEPM:
  - reduce the exposed surface of the odorous materials;
  - time excavation activities to reduce off-site nuisance (particularly during strong winds); and
  - cover exposed excavation faces overnight or during periods of low excavation activity.
- If continued complaints are received, alternative odour management strategies should be considered and implemented.

11.11 Dewatering

Temporary dewatering is not anticipated to be required as part of the remediation works. If a rain event occurs during the remediation, this water should be managed appropriately on site in accordance with the remediation contractor's soil and water management plan. This water should not be pumped to stormwater or sewer unless a prior application is made and this is approved by the relevant authorities.

11.12 Health and Safety Plan

A site specific WHS plan should be prepared by the contractor for all work to be undertaken at the site. The WHS plan should meet all the requirements outlined in SafeWork NSW WHS regulations.

As a minimum requirement, personnel must wear appropriate protective clothing, including long sleeve shirts, dust masks/respirators, long trousers, steel cap boots and hard hats. Additional asbestos-related PPE will be required for asbestos-related works and are specified in the AMP. Washroom and lunchroom facilities should also be provided to allow workers to remove potential contamination from their hands and clothing prior to eating or drinking.

11.13 Waste Management

Prior to commencement of remedial works and excavation for the proposed activity, the remediation contractor should develop a waste management or recycling plan to minimise the amount of waste produced by the site. This should, as a minimum, include measures to recycle and re-use natural excavated material wherever possible.

11.14 Incident Management Contingency

The validation consultant should be contacted if any unexpected conditions are encountered at the site. This should enable the scope of remedial/validation works to be adjusted as required. Similarly, if any incident occurs on site, the validation consultant should be advised to assess potential impacts on site contamination conditions and the remediation/validation timetable.

11.15 Hours of Operation

Hours of operation should be between those outlined in the REF documentation (or other consent authority approval processes, as required).

11.16 Community Consultation and Complaints

The remediation contractor should provide details for managing community consultation and complaints within their Construction Environmental Management Plan (CEMP).

12 CONCLUSION

The previous investigations identified fill soils impacted by asbestos (bonded/non-friable) and TRH at concentrations which trigger a need for remediation. The investigations also identified the potential for additional asbestos-related finds (in the form of bonded/non-friable and friable asbestos) and carcinogenic PAHs to be encountered in fill soils, and an elevated concentration of pesticides albeit below the human health SAC, that warranted further investigation. Remediation is considered necessary to address the human health and ecological risks.

The previous investigations also identified elevated concentrations of PFOS, copper, nickel and zinc and low pH levels in the groundwater. The PFOS concentrations and low pH levels were considered likely to be regional issues and did not require remediation for the proposed activity. However, further investigation was recommended to confirm this conclusion.

Based on the above, additional investigation of soil was recommended to confirm the results and validate the assumptions made for the Tier 1 risk assessment. This RAP includes a detailed procedure for completing a DGI and undertaking any necessary reporting that is triggered as part of that process. This must occur following demolition and prior to the construction as there is a potential that additional remediation may be necessary depending on the DGI results.

The proposed soil remediation strategy for the impacted fill involves excavation and off-site disposal of contaminated fill and ACM. The RAP includes a contingency for capping of contaminated fill in areas where excavation and off-site removal cannot be undertaken such as beneath existing buildings and hardstand areas to be retained.

JKG is of the opinion that the project area can be made suitable for the proposed activity provided this RAP and any associated documentation (e.g. AMP, RWP etc) are implemented. A site validation report is to be prepared on completion of remediation activities and must be reviewed by the site auditor and submitted to the determining authority to demonstrate that the project area is suitable for the proposed activity.

The RAP has met the objectives outlined in Section 1.6.

12.1 Regulatory Requirements

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

Table 12-1: Regulatory Requirement

Guideline / Legislation / Policy	Applicability
SEPP Resilience and Hazards 2021	Under the SEPP Resilience and Hazards 2021, site remediation can fall under Category 1 or Category 2 remediation works. Remediation via excavation and off-site disposal is considered to be Category 2 remediation works. Prior notification to the determining authority may be required prior to the commencement of remediation work.

Guideline / Legislation / Policy	Applicability
	Under the Parramatta City Council (2014) Contaminated Land Policy and Procedure[27], any remediation involving on-site capping or containment is Category 1 remediation works. Therefore, should the on-site capping contingency outlined in this RAP be required to be implemented, the remediation category would change to Category 1 and development consent must be obtained. JKG note that the Contaminated Land Policy and Procedure is overdue for review and the client's planning team should confirm the validity and currency of the policy, should on-site containment of contaminated material be required. Under Clause 4.14 of Resilience and Hazards SEPP, a notice of completion of remediation work is to be given to council within 30 days of completion of the work. The notice of completion of remediation works must be in accordance with Clause 4.15 of Resilience and Hazards SEPP.
Duty to Report Contamination (2015)[28]	At this stage, JKG consider that there is no requirement to notify the NSW EPA of the site contamination, though this should be confirmed by the client's appropriate legal consultants. This requirement should be reassessed following review of the DGI and validation results.
POEO Act 1997	Section 143 of the POEO Act 1997 states that if waste is transported to a place that cannot lawfully be used as a waste facility for that waste, then the transporter and owner of the waste are each guilty of an offence. The transporter and owner of the waste have a duty to ensure that the waste is disposed of in an appropriate manner. Appropriate waste tracking is required for all waste that is disposed off-site. Activities should be carried out in a manner which does not result in the pollution of waters.
POEO (Waste) Regulation 2014	Part 7 of the POEO Waste Regulation 2014 set outs the requirements for the transportation and management of asbestos waste and Clause 79 of the POEO Waste Regulation requires waste transporters to provide information to the NSW EPA regarding the movement of any load in NSW of more than 10 square meters of asbestos sheeting, or 100 kilograms of asbestos waste. To fulfil these legal obligations, asbestos waste transporters must use the NSW EPA-endorsed tracking system. Clause 78 of the POEO Waste Regulation requires that a person who transport asbestos waste must ensure that: • Any part of any vehicle in which the person transports the waste is covered, and leak-proof, during the transportation; and • If the waste consists of bonded asbestos material—it is securely packaged during the transportation; and • If the waste consists of friable asbestos material—it is kept in a sealed container during transportation; and • If the waste consists of asbestos-contaminated soils—it is wetted down. Asbestos waste in any form cannot be re-used or recycled.

[27] Parramatta City Council, (2014). *Contaminated Land Policy & Procedure*

[28] NSW EPA, (2015). *Guidelines on the Duty to Report Contamination under the Contamination Land Management Act 1997.* (referred to as Duty to Report Contamination 2015)

Guideline / Legislation / Policy	Applicability
SafeWork NSW Code of Practice: How to manage and control asbestos in the workplace (2019)	Sites with asbestos become a 'workplace' when work is carried out there and require a register and AMP. Appropriate SafeWork NSW notification will be required for asbestos removal works or handling. Contractors are also required to be appropriately licensed for the asbestos works undertaken (i.e. Class A licence for friable asbestos work).

12.2 Mitigation Measures

Table 12-2: Mitigation Measures

Project Stage Design (D) Construction (C) Operation (O)	Mitigation Measure	Reason for Mitigation Measure
C	The project area is to be remediated in accordance with this RAP and any associated documents (RWP, AMP etc). The remediation strategy includes a combination of excavation and off-site disposal of contaminated soil, and on-site containment. It is noted that the RAP includes a DGI process, which will also inform the extent of remediation required. A site validation report must be prepared documenting the remediation works undertaken at the site. All remediation work shall be carried out in accordance with the guidelines made or approved under Section 105 of the CLM Act 1997.	To reduce the risks posed to human health and the environment to an acceptable level and ensuring that the project area is suitable for ongoing use as a primary school.
C	The remediation and construction works are to be managed in accordance with the Construction Phase AMP[29] prepared by JKG.	To reduce the risks posed by asbestos to human health during remediation and construction-related activities.
O	The project area is to be managed in accordance with an operational AMP, should asbestos remain (i.e. in/on soils and/or in structures) and any LTEMP if other CoPC are capped as part of the remediation works. The SSAMP is to be updated to include mitigation measures associated with friable asbestos in the wider site area to the south.	To manage the potential risks posed by asbestos and other CoPC to human health during the day-to-day use of the project area and the wider site.
D and C	Soil and groundwater aggression conditions to be incorporated into design and construction.	To account for the aggressive conditions encountered during the dryland salinity investigation.

[29] JKG, (2025b). *Report to NSW Department of Education on Construction Phase Asbestos Management Plan (AMP) for Parramatta East Public School (PEPS) Upgrade, Brabyn Street, North Parramatta, NSW.* (Ref: E35073BR2rpt2.Rev4-AMP)

13 LIMITATIONS

The report limitations are outlined below:

- JKG accepts no responsibility for any unidentified contamination issues at the site. Any unexpected problems/subsurface features that may be encountered during works should be inspected by an environmental consultant as soon as possible;
- Previous use of this site may have involved excavation for the foundations of buildings, services, and similar facilities. In addition, unrecorded excavation and burial of material may have occurred on the site. Backfilling of excavations could have been undertaken with potentially contaminated material that may be discovered in discrete, isolated locations across the site during construction work;
- This report has been prepared based on site conditions which existed at the time of the investigation; scope of work and limitation outlined in the JKG proposal; and terms of contract between JKG and the client (as applicable);
- The conclusions presented in this report are based on investigation of conditions at specific locations, chosen to be as representative as possible under the given circumstances, visual observations of the site and immediate surrounds and documents reviewed as described in the report;
- Subsurface soil and rock conditions encountered between investigation locations may be found to be different from those expected. Groundwater conditions may also vary, especially after climatic changes;
- The investigation and preparation of this report have been undertaken in accordance with accepted practice for environmental consultants, with reference to applicable environmental regulatory authority and industry standards, guidelines and the assessment criteria outlined in the report;
- Where information has been provided by third parties, JKG has not undertaken any verification process, except where specifically stated in the report;
- JKG has not undertaken any assessment of off-site areas that may be potential contamination sources or may have been impacted by site contamination, except where specifically stated in the report;
- JKG accept no responsibility for potentially asbestos containing materials that may exist at the site. These materials may be associated with demolition of pre-1990 constructed buildings or fill material at the site;
- JKG have not and will not make any determination regarding finances associated with the site;
- Additional investigation work may be required in the event of changes to the proposed activity or land use. JKG should be contacted immediately in such circumstances;
- Material considered to be suitable from a geotechnical point of view may be unsatisfactory from a soil contamination viewpoint, and vice versa; and
- This report has been prepared for the particular project described and no responsibility is accepted for the use of any part of this report in any other context or for any other purpose.

Important Information About This Report

These notes have been prepared by JKG to assist with the assessment and interpretation of this report.

The Report is based on a Unique Set of Project Specific Factors

This report has been prepared in response to specific project requirements as stated in the JKG proposal document which may have been limited by instructions from the client. This report should be reviewed, and if necessary, revised if any of the following occur:

- The proposed land use is altered;
- The defined subject site is increased or sub-divided;
- The proposed activity details including size, configuration, location, orientation of the structures or landscaped areas are modified;
- The proposed design levels are altered, eg addition of basement levels; or
- Ownership of the site changes.

JKG will not accept any responsibility whatsoever for situations where one or more of the above factors have changed since completion of the assessment. If the subject site is sold, ownership of the assessment report should be transferred by JKG to the new site owners who will be informed of the conditions and limitations under which the assessment was undertaken. No person should apply an assessment for any purpose other than that originally intended without first conferring with the consultant.

Changes in Subsurface Conditions

Subsurface conditions are influenced by natural geological and hydrogeological process and human activities. Groundwater conditions are likely to vary over time with changes in climatic conditions and human activities within the catchment (e.g. water extraction for irrigation or industrial uses, subsurface waste water disposal, construction related dewatering). Soil and groundwater contaminant concentrations may also vary over time through contaminant migration, natural attenuation of organic contaminants, ongoing contaminating activities and placement or removal of fill material. The conclusions of an assessment report may have been affected by the above factors if a significant period of time has elapsed prior to commencement of the proposed activity.

This Report is based on Professional Interpretations of Factual Data

Site assessments identify actual subsurface conditions at the actual sampling locations at the time of the investigation. Data obtained from the sampling and subsequent laboratory analyses, available site history information and published regional information is interpreted by geologists, engineers or environmental scientists and opinions are drawn about the overall subsurface conditions, the nature and extent of contamination, the likely impact on the proposed activity and appropriate remediation measures.

Actual conditions may differ from those inferred, because no professional, no matter how qualified, and no subsurface exploration program, no matter how comprehensive, can reveal what is hidden by earth, rock and time. The actual interface between materials may be far more gradual or abrupt than an assessment indicates. Actual conditions in areas not sampled may differ from predictions. Nothing can be done to prevent the unanticipated, but steps can be taken to help minimise the impact. For this reason, site owners should retain the services of their consultants throughout the construction stage of the project, to identify variances, conduct additional tests which may be needed, and to recommend solutions to problems encountered on site.

Assessment Limitations

Although information provided by a site assessment can reduce exposure to the risk of the presence of contamination, no environmental site assessment can eliminate the risk. Even a rigorous professional assessment may not detect all contamination on a site. Contaminants may be present in areas that were not surveyed or sampled, or may migrate to areas which showed no signs of contamination when sampled. Contaminant analysis cannot possibly cover every type of contaminant which may occur; only the most likely contaminants are screened.

Misinterpretation of Site Assessments by Design Professionals
Costly problems can occur when other design professionals develop plans based on misinterpretation of an assessment report. To minimise problems associated with misinterpretations, the environmental consultant should be retained to work with appropriate professionals to explain relevant findings and to review the adequacy of plans and specifications relevant to contamination issues.

Logs Should not be Separated from the Assessment Report
Borehole and test pit logs are prepared by environmental scientists, engineers or geologists based upon interpretation of field conditions and laboratory evaluation of field samples. Logs are normally provided in our reports and these should not be re-drawn for inclusion in site remediation or other design drawings, as subtle but significant drafting errors or omissions may occur in the transfer process. Photographic reproduction can eliminate this problem, however contractors can still misinterpret the logs during bid preparation if separated from the text of the assessment. If this occurs, delays, disputes and unanticipated costs may result. In all cases it is necessary to refer to the rest of the report to obtain a proper understanding of the assessment. Please note that logs with the 'Environmental Log' header are not suitable for geotechnical purposes as they have not been peer reviewed by a Senior Geotechnical Engineer.

To reduce the likelihood of borehole and test pit log misinterpretation, the complete assessment should be available to persons or organisations involved in the project, such as contractors, for their use. Denial of such access and disclaiming responsibility for the accuracy of subsurface information does not insulate an owner from the attendant liability. It is critical that the site owner provides all available site information to persons and organisations such as contractors.

Read Responsibility Clauses Closely
Because an environmental site assessment is based extensively on judgement and opinion, it is necessarily less exact than other disciplines. This situation has resulted in wholly unwarranted claims being lodged against consultants. To help prevent this problem, model clauses have been developed for use in written transmittals. These are definitive clauses designed to indicate consultant responsibility. Their use helps all parties involved recognise individual responsibilities and formulate appropriate action. Some of these definitive clauses are likely to appear in the environmental site assessment, and you are encouraged to read them closely. Your consultant will be pleased to give full and frank answers to any questions.

Appendix A: Report Figures

AERIAL IMAGE SOURCE: MAPS.AU.NEARMAP.COM

This plan should be read in conjunction with the report.

Title:	**SITE LOCATION PLAN**
Location:	PARRAMATTA EAST PUBLIC SCHOOL, NORTH PARRAMATTA, NSW
Report No: E35073BR2	Figure No: 1

JKGeotechnics

PLOT DATE: 27/09/2024 1:48:40 PM DWG FILE: K:\5C EIS JOBS\35000's\E35073B PARRAMATTA\CAD\BR2\E35073BR2.DWG

LEGEND

Symbol	Description
(red dashed line)	APPROXIMATE PROJECT AREA BOUNDARY
(yellow line)	APPROXIMATE OUTLINE OF WIDER SCHOOL BOUNDARY
FCF(Surface)	FIBRE CEMENT FRAGMENT LOCATION, NUMBER AND DEPTH (Surface/m)
BH(Fill Depth)	BOREHOLE LOCATION, NUMBER AND DEPTH OF FILL (m)
BH/MW(Fill Depth)	BOREHOLE AND GROUNDWATER MONITORING WELL LOCATION, NUMBER AND DEPTH OF FILL (m)

0 10 20 30 40 50

SCALE 1:1000 @A3 METRES

This plan should be read in conjunction with the report.

Title: **SAMPLE LOCATION PLAN**

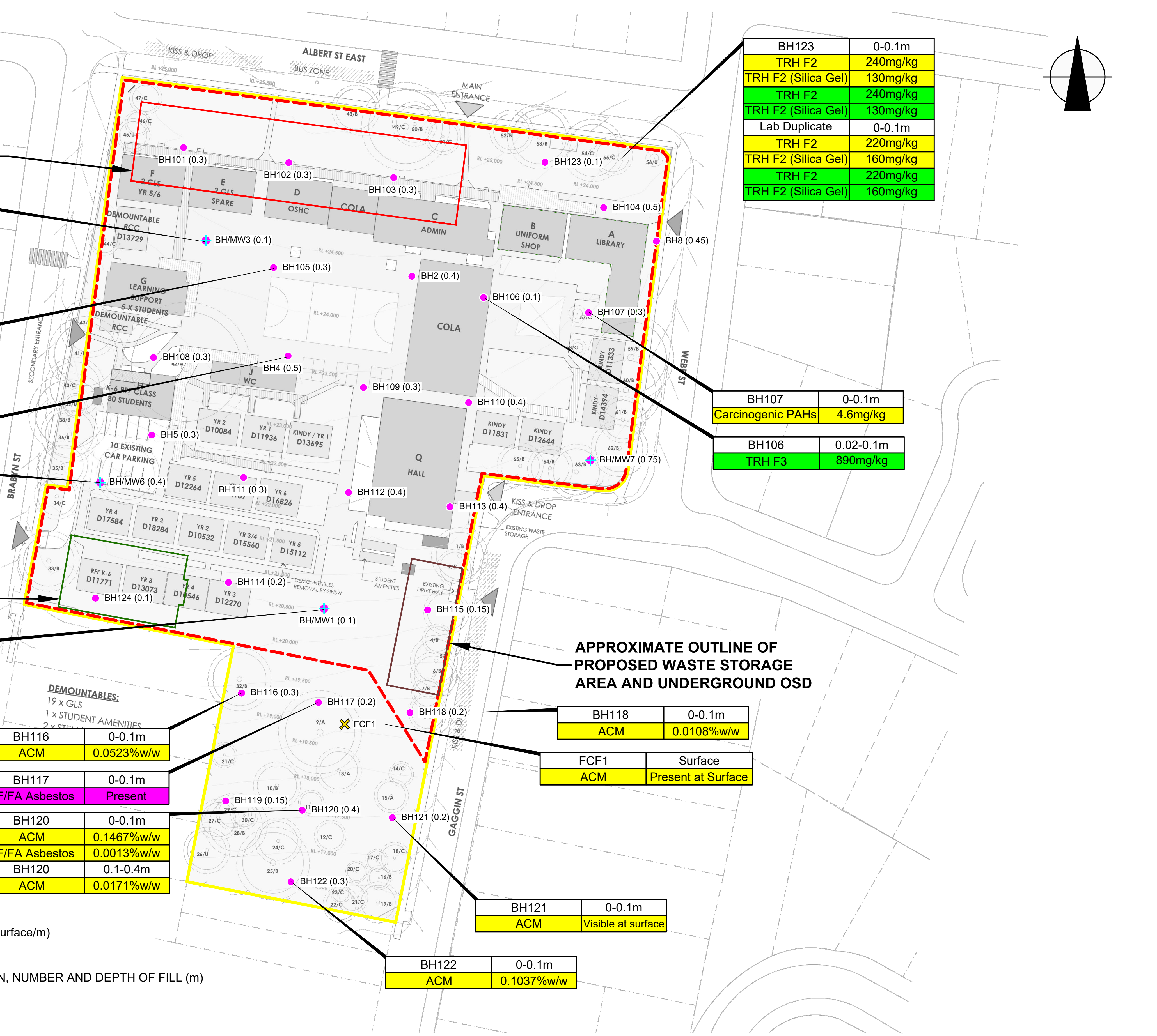
Location: PARRAMATTA EAST PUBLIC SCHOOL, NORTH PARRAMATTA, NSW

Report No: E35073BR2

Figure No: 2

JKGeotechnics

PLOT DATE: 31/01/2025 11:55:37 AM DWG FILE: K:\5C EIS JOBS\35000'S\E35073B PARRAMATTA\CAD\BR2\E35073BR2.DWG



BH123	0-0.1m
TRH F2	240mg/kg
TRH F2 (Silica Gel)	130mg/kg
TRH F2	240mg/kg
TRH F2 (Silica Gel)	130mg/kg
Lab Duplicate	0-0.1m
TRH F2	220mg/kg
TRH F2 (Silica Gel)	160mg/kg
TRH F2	220mg/kg
TRH F2 (Silica Gel)	160mg/kg

BH3	0.04-0.1m
TRH F3	600mg/kg
MW3	
pH	5.2
PFOS	0.001µg/L

BH105	0.02-0.1m
TRH F3	420mg/kg

BH4	0.04-0.3m
TRH F3	360mg/kg

MW6	
pH	5.2
Nickel	13µg/L
Zinc	71µg/L
PFOS	0.0047µg/L

BH1	0-0.1m
ACM	0.0184%w/w
MW1	
pH	5.3
Copper	2µg/L
Zinc	14µg/L
PFOS	0.002µg/L

BH107	0-0.1m
Carcinogenic PAHs	4.6mg/kg

BH106	0.02-0.1m
TRH F3	890mg/kg

BH116	0-0.1m
ACM	0.0523%w/w

BH117	0-0.1m
AF/FA Asbestos	Present

BH120	0-0.1m
ACM	0.1467%w/w
AF/FA Asbestos	0.0013%w/w
BH120	0.1-0.4m
ACM	0.0171%w/w

BH118	0-0.1m
ACM	0.0108%w/w

FCF1	Surface
ACM	Present at Surface

BH121	0-0.1m
ACM	Visible at surface

BH122	0-0.1m
ACM	0.1037%w/w

LEGEND

- (red dashed line) APPROXIMATE PROJECT AREA BOUNDARY
- (yellow line) APPROXIMATE OUTLINE OF WIDER SCHOOL BOUNDARY
- ACM(Surface) FIBRE CEMENT FRAGMENT LOCATION, NUMBER AND DEPTH (Surface/m)
- BH(Fill Depth) BOREHOLE LOCATION, NUMBER AND DEPTH OF FILL (m)
- BH/MW(Fill Depth) BOREHOLE AND GROUNDWATER MONITORING WELL LOCATION, NUMBER AND DEPTH OF FILL (m)

SAMPLE ID	DEPTH (metres)
CHEMICAL	CONCENTRATION

SOIL/SURFACE SAMPLE EXCEEDANCE

SAMPLE ID	-
CHEMICAL	CONCENTRATION (µg/L)

GROUNDWATER SAMPLE EXCEEDANCE

- (yellow) SOIL/SURFACE CONTAMINATION ABOVE SAC FOR HUMAN HEALTH RISK
- (green) SOIL/SURFACE CONTAMINATION ABOVE SAC FOR ECOLOGICAL RISK
- (cyan) GROUNDWATER CONTAMINATION ABOVE SAC
- (magenta) ASBESTOS DETECTED

0 10 20 30 40 50
SCALE 1:1000 @A3 METRES

This plan should be read in conjunction with the report.

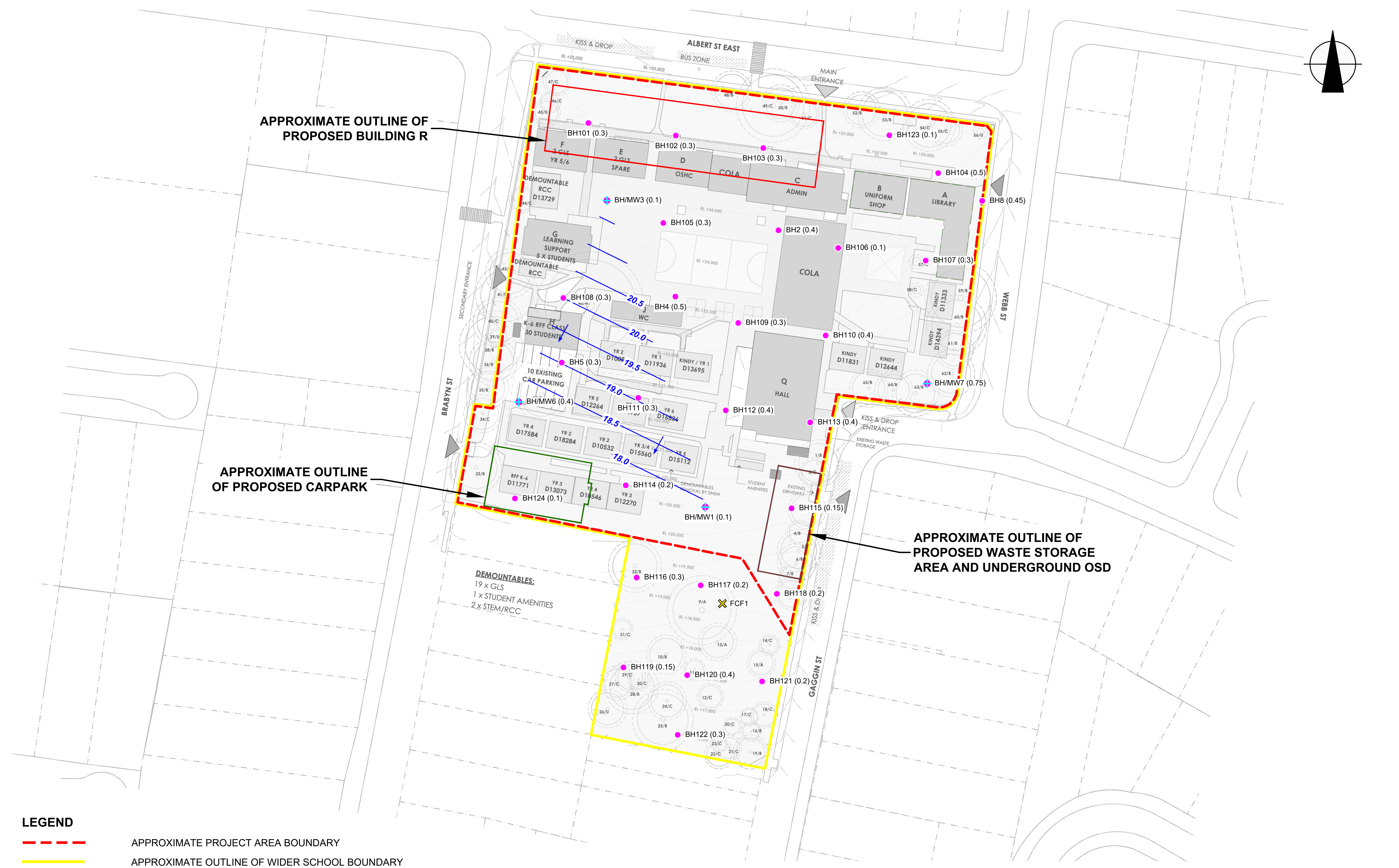
Title: **SAC EXCEEDANCES PLAN**

Location: PARRAMATTA EAST PUBLIC SCHOOL, NORTH PARRAMATTA, NSW

Report No: E35073BR2 | Figure No: 3

JKGeotechnics

PLOT DATE: 31/01/2025 11:55:56 AM DWG FILE: K:\5C EIS JOBS\35000'S\E35073B PARRAMATTA\CAD\BR2\E35073BR2.DWG



LEGEND

(red dashed line)	APPROXIMATE PROJECT AREA BOUNDARY
(yellow line)	APPROXIMATE OUTLINE OF WIDER SCHOOL BOUNDARY
FCF(Surface)	FIBRE CEMENT FRAGMENT LOCATION, NUMBER AND DEPTH (Surface/m)
BH(Fill Depth)	BOREHOLE LOCATION, NUMBER AND DEPTH OF FILL (m)
BH/MW(Fill Depth)	BOREHOLE AND GROUNDWATER MONITORING WELL LOCATION, NUMBER AND DEPTH OF FILL (m)
18.5	GROUNDWATER CONTOUR INTERVALS (m)
(arrow)	INFERRED GROUNDWATER FLOW DIRECTION

SCALE 0 10 20 30 40 50 METRES 1:1000 @A3

This plan should be read in conjunction with the report.

Title: **INFERRED GROUNDWATER CONTOUR PLAN**

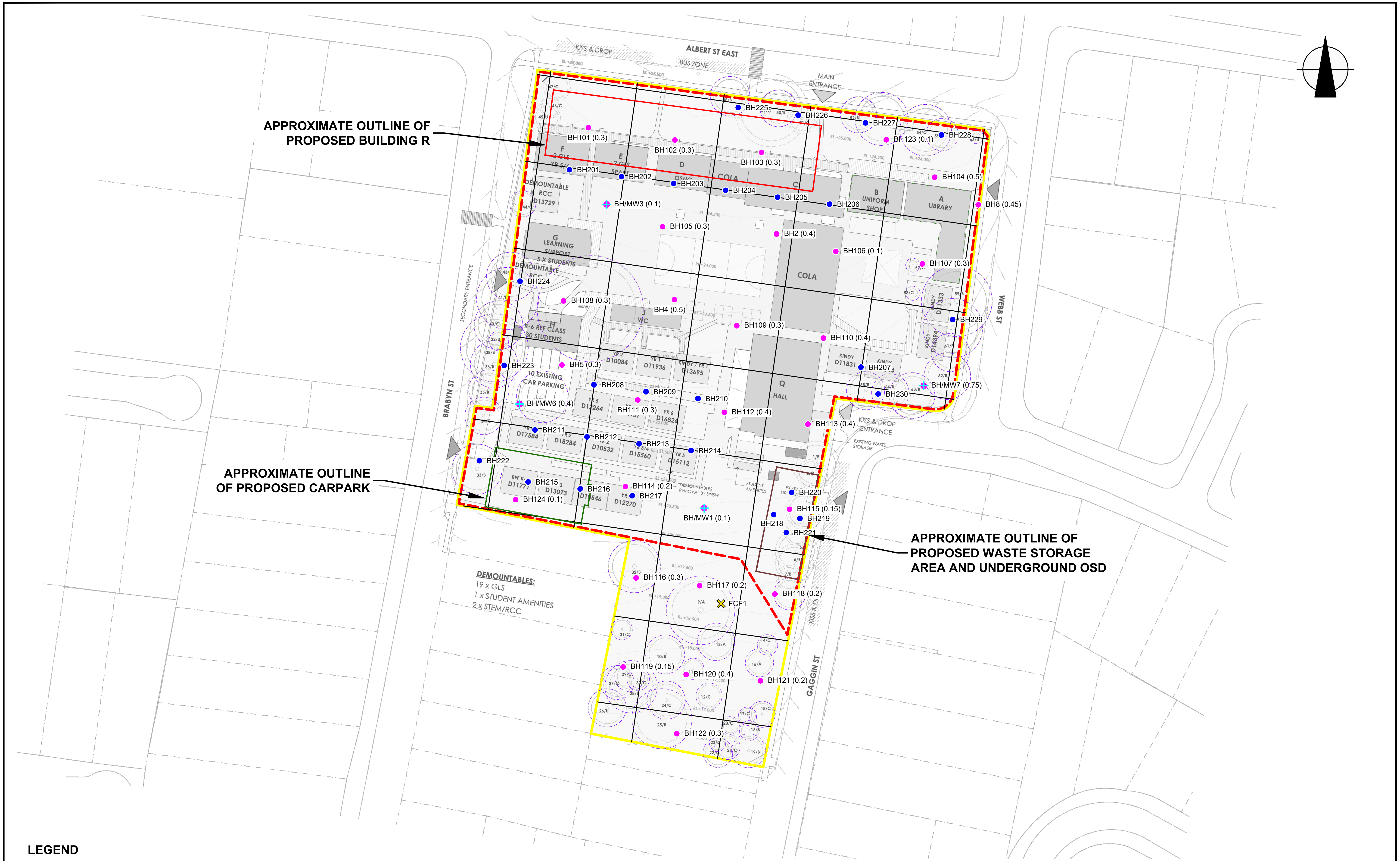
Location: PARRAMATTA EAST PUBLIC SCHOOL, NORTH PARRAMATTA, NSW

Report No: E35073BR2

Figure No: 4

JKGeotechnics

PLOT DATE: 31/01/2025 11:56:13 AM DWG FILE: K:\5C EIS JOBS\35000'S\E35073B PARRAMATTA\CAD\BR2\E35073BR2.DWG



LEGEND

(red dashed line)	APPROXIMATE SITE BOUNDARY
(yellow line)	APPROXIMATE OUTLINE OF WIDER SCHOOL BOUNDARY
FCF(Surface)	FIBRE CEMENT FRAGMENT LOCATION, NUMBER AND DEPTH (Surface/m)
BH(Fill Depth)	BOREHOLE LOCATION, NUMBER AND DEPTH OF FILL (m)
BH/MW(Fill Depth)	BOREHOLE AND GROUNDWATER MONITORING WELL LOCATION, NUMBER AND DEPTH OF FILL (m)
(purple dashed line)	TREE PROTECTION ZONE (TPZ)

0 10 20 30 40 50

SCALE 1:1000 @A3 METRES

This plan should be read in conjunction with the report.

Title: **PROPOSED DGI LOCATIONS**

Location: PARRAMATTA EAST PUBLIC SCHOOL, PARRAMATTA, NSW

Report No: E35073BR2

Figure No: 5

JKGeotechnics

PLOT DATE: 6/02/2025 2:05:35 PM DWG FILE: K:\5C EIS JOBS\35000'S\E35073B PARRAMATTA\CAD\BR2\E35073BR2.DWG

Appendix B: Site Information

Selected Project Plans

JDH ARCHITECTS

Suite 301/249 Pitt Street
Sydney NSW 2000
Telephone: 02 9281 8697
www.jdharchitects.com.au

LEGEND

- EXISTING BUILDING/STRUCTURE
- PROPOSED BUILDING
- REFURBISHMENT
- DEMOUNTABLE
- TO BE DEMOLISHED/REMOVED
- EXISTING AWNING/ COVERED WALKWAY
- PROPOSED AWNING/ COVERED WALKWAY
- GARDEN
- TURF
- EXISTING WALKWAY
- PROPOSED WALKWAY
- KISS AND DROP AREA
- WOMBAT CROSSING
- VEHICLE ENTRY POINT
- PEDESTRIAN ENTRY POINT
- SITE BOUNDARY
- METAL FENCE
- EXISTING TREE TO BE RETAINED (NUMBER & CATEGORY REFER TO ARBORIST)
- EXISTING TREE TO BE DEMOLISHED
- PROPOSED TREE
- TREE PROTECTION ZONE
- STRUCTURAL ROOT ZONE

MECHANICAL ENGINEER — STEENSEN VARMING
HYDRAULIC / FIRE ENGINEER — erbas
ELECTRICAL ENGINEER — STEENSEN VARMING
CIVIL ENGINEER — Woolacotts
STRUCTURAL ENGINEER — Woolacotts
ESD — STEENSEN VARMING
CLIENT — NSW

REV	DESCRIPTION	DATE	INIT.
K	SD 90% ISSUED FOR INFORMATION	6/09/2024	FT/ KS
J	SD 87% ISSUED FOR INFORMATION	21/08/2024	FT/ KS
I	SD 85% ISSUED FOR INFORMATION	9/08/2024	FT/ KS
H	SD 80% ISSUED FOR INFORMATION	22/07/2024	FT/ KS
G	SD 70% ISSUED FOR INFORMATION	17/07/2024	KS
F	SD 55% ISSUED FOR INFORMATION	9/07/2024	KS

AMENDMENTS

PROJECT:
PARRAMATTA EAST PUBLIC SCHOOL
CLIENT:
SINSW
ADDRESS:
BRABYN STREET PARRAMATTA NSW 2150 AUS

DRAWING:
SITE PLAN EXISTING

N

PROJECT PHASE:	SCALE:	DESIGNED/DRAWN:	CHECKED:	SHEET SIZE:
SD	1:500	KS/FT	JT	A1

JOB NO:	SHEET NO:	REVISION:
1291	PEPS-JDH-ZZ-XX-DR-A-0010	**K**

Suite 301/249 Pitt Street
Sydney NSW 2000
Telephone: 02 9281 8697
www.jdharchitects.com.au

LEGEND

- EXISTING BUILDING/STRUCTURE
- PROPOSED BUILDING
- REFURBISHMENT WORKS
- DEMOUNTABLE
- TO BE DEMOLISHED/REMOVED
- EXISTING AWNING/ COVERED WALKWAY
- PROPOSED AWNING/ COVERED WALKWAY
- PROPOSED SOFT SOIL
- EXISTING SOFT SOIL
- EXISTING WALKWAY
- PROPOSED FOOTPATH
- EXISTING KISS AND DROP AREA
- PROPOSED KISS AND DROP AREA
- CUT/FILL
- RAISED CROSSING
- VEHICLE ENTRY POINT
- PEDESTRIAN ENTRY POINT
- SITE BOUNDARY
- METAL FENCE
- EXISTING TREE TO BE RETAINED (NUMBER & CATEGORY REFER TO ARBORIST)
- EXISTING TREE TO BE DEMOLISHED UNDER EXEMPT DEVELOPMENT
- PROPOSED TREE
- TREE PROTECTION ZONE
- STRUCTURAL ROOT ZONE

MECHANICAL ENGINEER	STEENSEN VARMING
HYDRAULIC / FIRE ENGINEER	erbas
ELECTRICAL ENGINEER	STEENSEN VARMING
CIVIL ENGINEER	Woolacotts
STRUCTURAL ENGINEER	Woolacotts
ESD	STEENSEN VARMING
CLIENT	NSW

REV	DESCRIPTION	DATE	INIT.
A	TD 100% ISSUED FOR TENDER	28/11/2024	KS

AMENDMENTS

PROJECT:
PARRAMATTA EAST PUBLIC SCHOOL
CLIENT:
SINSW
ADDRESS:
BRABYN STREET PARRAMATTA NSW 2150 AUS

DRAWING:
SITE PLAN PROPOSED

N

PROJECT PHASE:	SCALE:	DESIGNED/DRAWN:	CHECKED:	SHEET SIZE:
P5 - TENDER	1:500	KS/FT	JT	A1

JOB NO:	SHEET NO:	REVISION:
1291	PEPS-JDH-ZZ-XX-DR-A-0012	A

TOTAL PROPOSED PLAY SPACE AREA: 8,572.85m²

JDH ARCHITECTS
Suite 301/249 Pitt Street
Sydney NSW 2000
Telephone: 02 9281 8697
www.jdharchitects.com.au

MECHANICAL ENGINEER	STEENSEN VARMING
HYDRAULIC / FIRE ENGINEER	erbas
ELECTRICAL ENGINEER	STEENSEN VARMING
CIVIL ENGINEER	Woolacotts.
STRUCTURAL ENGINEER	Woolacotts.
ESD	STEENSEN VARMING
CLIENT	NSW Government

REV	DESCRIPTION	DATE	INIT.
A	SD 90% ISSUED FOR INFORMATION	6/09/2024	FT/ KS

AMENDMENTS

PROJECT:
PARRAMATTA EAST PUBLIC SCHOOL
CLIENT:
SINSW
ADDRESS:
BRABYN STREET PARRAMATTA NSW 2150 AUS

DRAWING:
PROPOSED PLAY SPACE AREA

N

PROJECT PHASE:	SCALE:	DESIGNED/DRAWN:	CHECKED:	SHEET SIZE:
SD	1:400	KS/FT	JT	A1

JOB NO:	SHEET NO:	REVISION:
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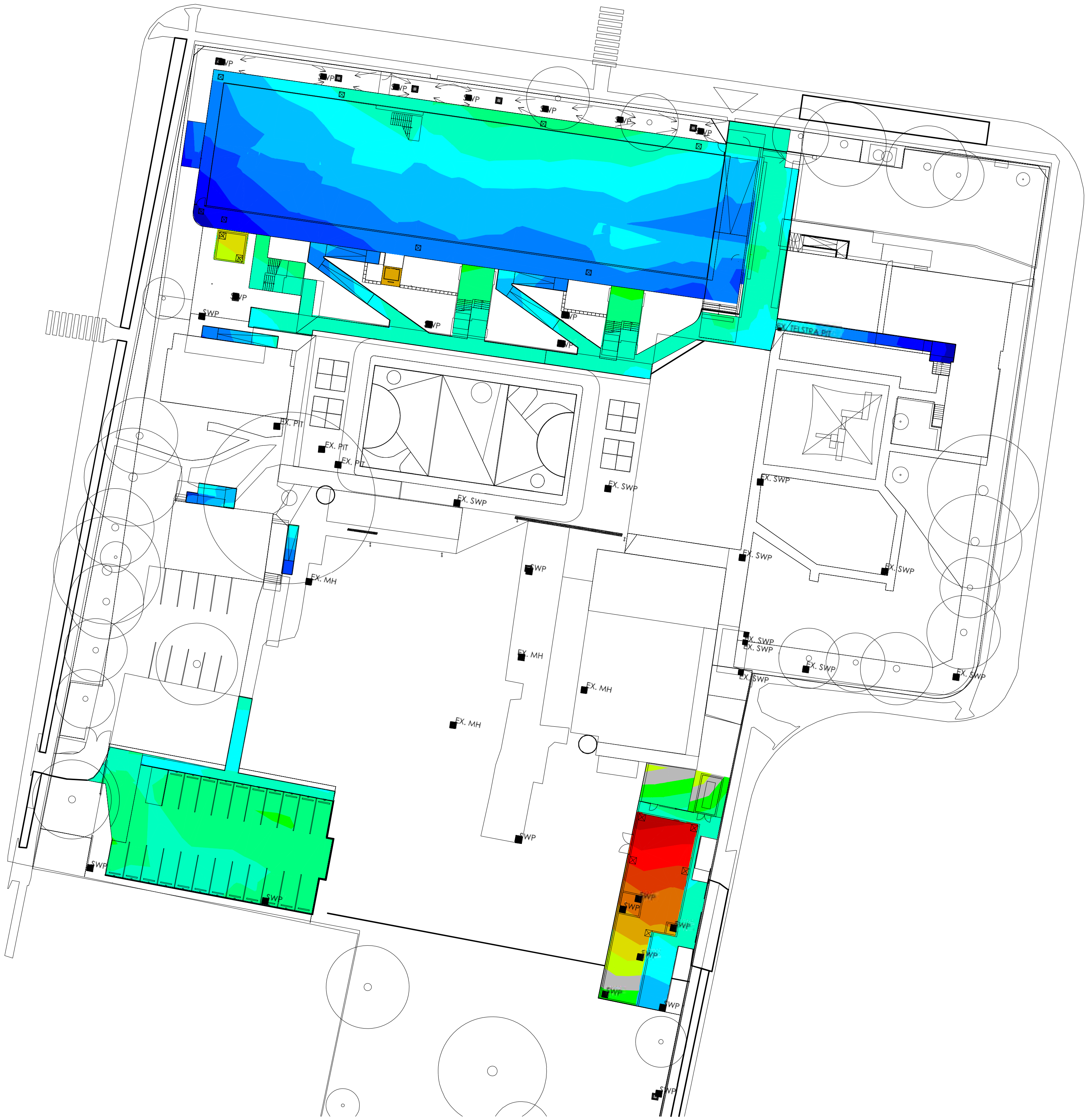

Levels Table

No.	Min. Level	Max. Level	Colour
1	-3.000	-2.800	
2	-2.800	-2.600	
3	-2.600	-2.400	
4	-2.400	-2.200	
5	-2.200	-2.000	
6	-2.000	-1.800	
7	-1.800	-1.600	
8	-1.600	-1.400	
9	-1.400	-1.200	
10	-1.200	-1.000	
11	-1.000	-0.800	
12	-0.800	-0.600	
13	-0.600	-0.400	
14	-0.400	-0.200	
15	-0.200	0.000	
16	0.000	0.200	
17	0.200	0.400	
18	0.400	0.600	
19	0.600	0.800	
20	0.800	1.000	

CUT AND FILL SUMMARY

CUT FACTOR	FILL FACTOR	CUT VOLUME	FILL VOLUME	NET VOLUME
1.1	1.0	1164.37m³	348.60m³	815.77m³ (CUT)

No.	Date	Description	Ver.	Appr.
P1	02.10.24	100% SCHEMATIC DESIGN RE-ISSUE		
P2	04.11.24	100% SCHEMATIC DESIGN RE-ISSUE		

NOT FOR CONSTRUCTION

N

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PARRAMATTA EAST PUBLIC SCHOOL
BRABYN STREET, PARRAMATTA
NSW 2150

CUT AND FILL PLAN

Date: OCTOBER 2024
Scale @ A1: 1:400
Approved | Verified | Prepared
Job number: 22-107
Drawing number: PEPS-WCE-00-00-DR-C-0401
Amendment: P2

JKG 2022 DSI Report Figures

AERIAL IMAGE SOURCE: MAPS.AU.NEARMAP.COM

This plan should be read in conjunction with the report.

Title:	**SITE LOCATION PLAN**
Location:	PARRAMATTA EAST PUBLIC SCHOOL, PARRAMATTA, NSW
Report No: E35073B	Figure No: 1

JKGeotechnics

PLOT DATE: 11/07/2022 1:47:07 PM DWG FILE: S:\5 EIS\5C EIS JOBS\35000'S\E35073B PARRAMATTA\CAD\E35073B.DWG

LEGEND

(red dashed line)	APPROXIMATE SITE BOUNDARY
FCF(Surface)	FIBRE CEMENT FRAGMENT LOCATION, NUMBER AND DEPTH (Surface/m)
BH(Fill Depth)	BOREHOLE LOCATION, NUMBER AND DEPTH OF FILL (m)
BH/MW(Fill Depth)	BOREHOLE AND GROUNDWATER MONITORING WELL LOCATION, NUMBER AND DEPTH OF FILL (m)

AERIAL IMAGE SOURCE: MAPS.AU.NEARMAP.COM

0 10 20 30 40 50
SCALE 1:1000 @A3 METRES

This plan should be read in conjunction with the report.

Title: **SAMPLE LOCATION PLAN**

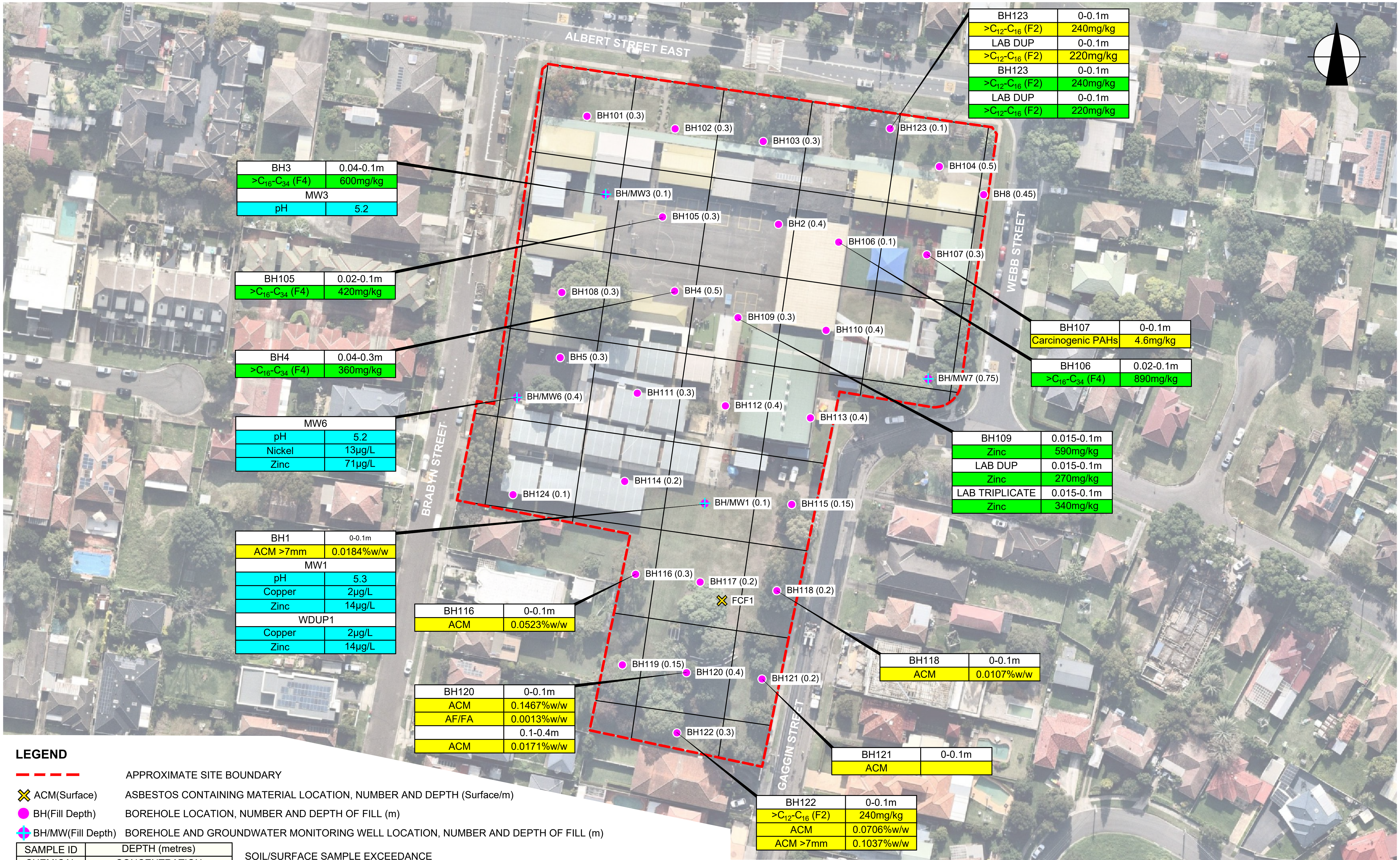
Location: PARRAMATTA EAST PUBLIC SCHOOL, PARRAMATTA, NSW

Report No: E35073B

Figure No: 2

JKGeotechnics

PLOT DATE: 22/08/2022 12:19:09 PM DWG FILE: K:\5C EIS JOBS\35000'S\E35073B PARRAMATTA\CAD\E35073B.DWG



LEGEND

Symbol	Description
(red dashed line)	APPROXIMATE SITE BOUNDARY
ACM(Surface)	ASBESTOS CONTAINING MATERIAL LOCATION, NUMBER AND DEPTH (Surface/m)
BH(Fill Depth)	BOREHOLE LOCATION, NUMBER AND DEPTH OF FILL (m)
BH/MW(Fill Depth)	BOREHOLE AND GROUNDWATER MONITORING WELL LOCATION, NUMBER AND DEPTH OF FILL (m)
SAMPLE ID / DEPTH (metres); CHEMICAL / CONCENTRATION	SOIL/SURFACE SAMPLE EXCEEDANCE
SAMPLE ID / -; CHEMICAL / CONCENTRATION (µg/L)	GROUNDWATER SAMPLE EXCEEDANCE
(yellow)	SOIL/SURFACE CONTAMINATION ABOVE SAC FOR HUMAN HEALTH RISK
(green)	SOIL/SURFACE CONTAMINATION ABOVE SAC FOR ECOLOGICAL RISK
(cyan)	GROUNDWATER CONTAMINATION ABOVE SAC

AERIAL IMAGE SOURCE: MAPS.AU.NEARMAP.COM

SCALE 0 10 20 30 40 50 METRES 1:1000 @A3

This plan should be read in conjunction with the report.

Title: **SAC EXCEEDANCES PLAN**

Location: PARRAMATTA EAST PUBLIC SCHOOL, PARRAMATTA, NSW

Report No: E35073B

Figure No: 3

JKGeotechnics

PLOT DATE: 23/08/2022 2:20:20 PM DWG FILE: K:\5C EIS JOBS\35000'S\E35073B PARRAMATTA\CAD\E35073B.DWG

Appendix C: Data Summary Tables

ABBREVIATIONS AND EXPLANATIONS

Abbreviations used in the Tables:

ABC:	Ambient Background Concentration
ACM:	Asbestos Containing Material
ADWG:	AustralianDrinking Water Guidelines
AF:	Asbestos Fines
ANC_{BT}	Acid Neutralising Capacity - Back Titration
ANCE:	Excess Acid Neutralising Capacity
ANZG:	Australian and New Zealand Guidelines
B(a)P:	Benzo(a)pyrene
Ca:	Calcium
$CaCO_3$:	Calcium Carbonate
CEC:	Cation Exchange Capacity
CRC:	Cooperative Research Centre
CT:	Contaminant Threshold
DO:	Dissolved Oxygen
EC:	Electrical Conductivity
Ece:	Extract Electrical Conductivity
Eh:	Redox Potential
EILs:	Ecological Investigation Levels
ESLs:	Ecological Screening Levels
ESP	Exchangeable Sodium Percentage (Each Na/CEC)
FA:	Fibrous Asbestos
FTS:	Fluorotelomer sulfonic acid
GIL:	Groundwater Investigation Levels
GSW:	General Solid Waste
HILs:	Health Investigation Levels
HSLs:	Health Screening Levels
HSL-SSA:	Health Screening Level-SiteSpecific Assessment
K:	Potassium
Mg:	Magnesium
NA:	Sodium
NA:	Not Analysed
NC:	Not Calculated
NEPM:	National Environmental Protection Measure
NHMRC:	National Health and Medical Research Council
NL:	Not Limiting
NSL:	No Set Limit

OCP:	Organochlorine Pesticides
OPP:	Organophosphorus Pesticides
PAHs:	Polycyclic Aromatic Hydrocarbons
ppm:	Parts per million
PCBs:	Polychlorinated Biphenyls
PCE:	Perchloroethylene (Tetrachloroethylene or Teterachloroethene)
PFAS:	Per- and polyfluoroalkyl substances
PFHxS:	Perfluorohexanesulfonic acid
PFOA:	Perfluorooctanoic acid
PFOS:	Perfluorooctanesulfonic acid
pHF:	Field pH
pHFOX:	Field peroxide pH
pH_{KCL} :	pH of filtered 1:20, 1M KCL extract, shaken overnight
PQL:	Practical Quantitation Limit
RS:	Rinsate Sample
RSL:	Regional Screening Levels
RSW:	Restricted Solid Waste
S:	Sulfur
SAC:	Site Assessment Criteria
SCC:	Specific Contaminant Concentration
S_{Cr}:	Chromium reducible sulfur
S_{NAS}:	Net Acid Soluble Sulfur
SSA:	Site Specific Assessment
SSHSLs:	Site Specific Health Screening Levels
SWL	Standing Water Level
TAA:	Total Actual Acidity in 1M KCL extract titrated to pH6.5
TB:	Trip Blank
TCA:	1,1,1 Trichloroethane (methyl chloroform)
TCE:	Trichloroethylene (Trichloroethene)
TCLP:	Toxicity Characteristics Leaching Procedure
TPA:	Total Potential Acidity, 1M KCL peroxide digest
TRH:	Total Recoverable Hydrocarbons
TS:	Trip Spike
USEPA:	United States Environmental Protection Agency
VOCC:	Volatile Organic Chlorinated Compounds
WHO:	World Health Organisation

Units used in the Tables

°C	Degrees Celsius
dS/m	deciSiemens per metre
m	meters
meq/100g	milliequivalents per 100 grams
mg/kg	milligrams per kilogram
mg/L	milligrams per litre
mV	millivolts
µg/kg	micrograms per kilogram
µg/L	micrograms per litre
µS/cm	microSiemens per centimetre
mol H^+/t	moles hydrogen per tonne
ohm.cm	ohm centimetre
%w/w	weight per weight

Table Specific Explanations:

HIL Tables:

- The chromium results are for Total Chromium which includes Chromium III and VI. For initial screening purposes, we have assumed that the samples contain only Chromium VI unless demonstrated otherwise by additional analysis.
- Carcinogenic PAHs is a toxicity weighted sum of analyte concentrations for a specific list of PAH compounds relative to B(a)P. It is also refered to as the B(a)P Toxic Equivalence Quotient (TEQ).

EIL/ESL Table:

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

Waste Classification and TCLP Table:

- Data assessed using the NSW EPA Waste Classification Guidelines, Part 1: Classifying Waste (2014).
- The assessment of Total Moderately Harmful pesticides includes: Dichlorovos, Dimethoate, Fenitrothion, Ethion, Malathion and Parathion.
- Assessment of Total Scheduled pesticides include: HBC, alpha-BHC, gamma-BHC, beta-BHC, Heptachlor, Aldrin, Heptachlor Epoxide, gamma-Chlordane, alpha-chlordane, pp-DDE, Dieldrin, Endrin, pp-DDD, pp-DDT, Endrin Aldehyde.
- PFAS data assessed using the Addendum to the NSW EPA Waste Classification Guidelines, Part 1: Classifying Waste (2014) -October 2016

QA/QC Table:

- Field blank, Inter and Intra laboratory duplicate results are reported in mg/kg.
- Trip spike results are reported as percentage recovery.
- Field rinsate results are reported in µg/L.

Groundwater Ecology Tables:

- 95% refers to a concentration that has been derived to protect 95% of aquatic species

ASS Tables

- Results have been assessed against the criteria specified in Table 1.1 of National Acid sulfate Soil Guidance - National acid sulfate soil identification and laboratory method manual. Water Quality Australia. June 2018

Summary of Soil Laboratory Results - EC and Ece

- The salinity Class has been adopted from 'Site Investigations for Urban Salinity' DLWC 2002.
- The chart function assumes an ECe value of 1.9 for values that are less than the practical quatitation limit.

Summary of Resistivity Calculation on Soil EC Results

- The resistivity values have been calculated on the laboratory EC values.
- The classification has been derived from the Australian Standard 2159-2009 Piling Design and Installation (Table 6.5.2 [A] & [C])
- Table 6.5.2 [A] of Australian Standard 2159-2009 recommends using a Moderate Exposure Classification for Steel Piles in Fresh Water - Soft Running Water

Summary of Soil Laboratory Results - pH

- The pH Classification has been derived from the Australian Standard 2159-2009 Piling Design and Installation (Tables 6.4.2 [C] & 6.5.2 [C])
- Table 6.5.2 [A] of Australian Standard 2159-2009 recommends using a Moderate Exposure Classification for Steel Piles in Fresh Water - Soft Running Water

Summary of Soil Laboratory Results - Sulphate and Chlorides

- The classification has been derived from the Australian Standard 2159-2009 Piling Design and Installation (Table 6.5.2 [A] & [C])
- The chart function assumes an concentration of 0.5mg/kg for values that are less than the practical quatitation limit.

Summary of Soil Laboratory Results - CEC and ESP

- The Sodicity rating has been adopted from the publication 'Site Investigations for Urban Salinity' DLWC 2002.

Summary of Groundwater Laboratory Results

- The classification has been derived from the Australian Standard 2159-2009 Piling Design and Installation (Table 6.5.2 [A] & [C]) .
- Table 6.4.2 [A] recommends using a Mild Exposure Classification for Concrete Piles in Fresh Water - Treat as in Soil Condition 'A'.
- Table 6.5.2 [A] recommends using a Moderate Exposure Classification for Steel Piles in Fresh Water - Soft Running Water.

TABLE S1
SOIL LABORATORY RESULTS COMPARED TO NEPM 2013.
HIL-A: 'Residential with garden/accessible soils; children's day care centers; preschools; and primary schools'

All data in mg/kg unless stated otherwise			HEAVY METALS								PAHs		ORGANOCHLORINE PESTICIDES (OCPs)							OP PESTICIDES (OPPs)	TOTAL PCBs	ASBESTOS FIBRES
			Arsenic	Cadmium	Chromium	Copper	Lead	Mercury	Nickel	Zinc	Total PAHs	Carcinogenic PAHs	HCB	Endosulfan	Methoxychlor	Aldrin & Dieldrin	Chlordane	DDT, DDD & DDE	Heptachlor	Chlorpyrifos		
PQL - Envirolab Services			4	0.4	1	1	1	0.1	1	1	-	0.5	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	100
Site Assessment Criteria (SAC)			100	20	100	6000	300	40	400	7400	300	3	10	270	300	6	50	240	6	160	1	Detected/Not Detected
Sample Reference	**Sample Depth**	**Sample Description**																				
BH1	0-0.1	Fill: Sandy Gravel	<4	<0.4	**26**	**26**	**41**	<0.1	**9**	**61**	**1.9**	<0.5	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	Detected
BH1 - [LAB_DUP]	0-0.1	Laboratory Duplicate	**6**	<0.4	**20**	**25**	**27**	<0.1	**10**	**52**	**1.4**	<0.5	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	NA
BH1 - [LAB_TRIP]	0-0.1	Laboratory Triplicate	**4**	<0.4	**15**	**23**	**28**	<0.1	**11**	**88**	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
BH2	0.1-0.4	Fill: Gravelly Sand	**4**	<0.4	**10**	**16**	**7**	<0.1	**9**	**9**	<0.05	<0.5	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	Not Detected
BH3	0.04-0.1	Fill: Sandy Gravel	**5**	<0.4	**12**	**34**	**6**	<0.1	**16**	**15**	<0.05	<0.5	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	Not Detected
BH4	0.04-0.3	Fill: Gravelly Sand	<4	<0.4	**6**	**76**	**3**	<0.1	**34**	**24**	<0.05	<0.5	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	Not Detected
BH5	0.04-0.3	Fill: Gravelly Sand	<4	<0.4	**10**	**13**	**23**	<0.1	**4**	**47**	**1.2**	<0.5	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	Not Detected
BH7	0-0.1	Fill: Silty Clay	**9**	<0.4	**22**	**14**	**22**	<0.1	**7**	**41**	**31**	**2.7**	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	Not Detected
BH101	0-0.1	Fill: Silty Clay	**5**	<0.4	**14**	**2**	**12**	<0.1	**1**	**8**	**0.3**	<0.5	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	Not Detected
BH102	0-0.1	Fill: Sandy Clay	**4**	<0.4	**14**	**13**	**43**	<0.1	**3**	**61**	**0.64**	<0.5	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	Not Detected
BH103	0-0.1	Fill: Sandy Clay	<4	<0.4	**9**	**10**	**29**	<0.1	**3**	**52**	**0.3**	<0.5	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	Not Detected
BH104	0-0.2	Fill: Sandy Clay	**5**	<0.4	**16**	**8**	**32**	<0.1	**2**	**30**	**2.1**	**0.5**	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	Not Detected
BH105	0.02-0.1	Fill: Sandy Gravel	<4	<0.4	**16**	**29**	**6**	<0.1	**24**	**22**	**0.4**	<0.5	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	Not Detected
BH106	0.02-0.1	Fill: Sandy Gravel	**4**	<0.4	**17**	**27**	**10**	<0.1	**23**	**42**	<0.05	<0.5	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	Not Detected
BH107	0-0.1	Fill: Sandy Clay	**10**	**0.5**	**19**	**27**	**58**	<0.1	**10**	**120**	**60**	**4.6**	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	Not Detected
BH107	0.3-0.45	Silty Clay	NA	NA	NA	NA	NA	NA	NA	NA	<0.05	<0.5	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
BH108	0-0.1	Fill: Silty Sandy Clay	<4	<0.4	**20**	**10**	**36**	<0.1	**13**	**130**	**0.3**	<0.5	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	Not Detected
BH109	0.015-0.1	Fill: Sandy Gravel	**5**	<0.4	**17**	**28**	**13**	<0.1	**18**	**590**	<0.05	<0.5	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	Not Detected
BH109 - [LAB_DUP]	0.015-0.1	Laboratory Duplicate	**5**	<0.4	**19**	**35**	**16**	<0.1	**22**	**270**	<0.05	<0.5	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	NA
BH109 - [LAB_TRIP]	0.015-0.1	Laboratory Triplicate	**6**	<0.4	**17**	**22**	**15**	<0.1	**14**	**340**	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
BH110	0.04-0.1	Fill: Sandy Gravel	<4	<0.4	**8**	**91**	**16**	<0.1	**8**	**41**	**0.5**	<0.5	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	Not Detected
BH111	0-0.1	Fill: Silty Clay	**7**	<0.4	**18**	**8**	**29**	<0.1	**5**	**32**	**1.6**	<0.5	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	Not Detected
BH112	0-0.1	Fill: Clayey Sand	<4	<0.4	**14**	**34**	**14**	<0.1	**15**	**38**	**0.4**	<0.5	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	Not Detected
BH113	0.1-0.3	Fill: Silty Clay	**7**	<0.4	**19**	**15**	**15**	<0.1	**12**	**16**	<0.05	<0.5	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	Not Detected
BH114	0-0.1	Fill: Silty Clay	**14**	**0.5**	**20**	**49**	**100**	<0.1	**4**	**220**	<0.05	<0.5	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	Not Detected
BH115	0-0.15	Fill: Clayey Sand	**7**	<0.4	**16**	**7**	**33**	<0.1	**3**	**76**	<0.05	<0.5	<0.1	<0.1	<0.1	**2**	<0.1	<0.1	<0.1	<0.1	<0.1	Not Detected
BH116	0-0.1	Fill: Silty Clay	**7**	<0.4	**15**	**15**	**68**	<0.1	**3**	**100**	**0.2**	<0.5	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	Not Detected
BH117	0-0.1	Fill: Silty Gravelly Clay	**19**	<0.4	**31**	**19**	**50**	<0.1	**5**	**81**	**0.4**	<0.5	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	Detected
BH118	0-0.1	Fill: Clayey Gravelly Sand	**11**	<0.4	**21**	**200**	**74**	<0.1	**4**	**110**	**0.5**	<0.5	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	Not Detected
BH119	0-0.15	Fill: Silty Clay	**10**	<0.4	**22**	**31**	**120**	<0.1	**14**	**140**	<0.05	<0.5	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	Not Detected
BH120	0-0.1	Fill: Silty Clay	**8**	<0.4	**20**	**8**	**33**	**0.4**	**3**	**56**	<0.05	<0.5	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	Detected
BH121	0-0.1	Fill: Silty Clay	**10**	**0.6**	**27**	**31**	**94**	**0.1**	**5**	**230**	**9.1**	**1.3**	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	Not Detected
BH122	0-0.1	Fill: Silty Clay	**20**	<0.4	**16**	**14**	**83**	<0.1	**4**	**140**	**1.6**	<0.5	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	Detected
BH122 - [LAB_DUP]	0-0.1	Laboratory Duplicate	**32**	<0.4	**21**	**20**	**74**	<0.1	**3**	**120**	**0.9**	<0.5	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	NA
BH123	0-0.1	Fill: Silty Sandy Clay	**4**	<0.4	**10**	**20**	**23**	<0.1	**3**	**98**	**2.1**	<0.5	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	Not Detected
BH123 - [LAB_DUP]	0-0.1	Laboratory Duplicate	<4	<0.4	**9**	**18**	**20**	<0.1	**3**	**93**	**1.1**	<0.5	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	NA
BH124	0-0.1	Fill: Silty Clay	**9**	<0.4	**18**	**7**	**57**	<0.1	**3**	**73**	**0.51**	<0.5	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	Not Detected
SDUP1	0-0.1	Duplicate of BH1	<4	<0.4	**20**	**43**	**38**	<0.1	**14**	**100**	**1.5**	<0.5	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	NA
SDUP3	0-0.1	Duplicate of BH102	<4	<0.4	**12**	**21**	**61**	<0.1	**4**	**96**	**1**	<0.5	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	NA
SDUP2	0-0.1	Duplicate of BH112	**9**	<0.4	**22**	**15**	**17**	<0.1	**10**	**32**	<0.05	<0.5	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	NA
SDUP4	0-0.1	Duplicate of BH108	**10**	<0.4	**24**	**9**	**40**	**0.2**	**14**	**110**	**0.35**	<0.5	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	NA	Not Detected
FCF1	Surface	Fragment	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	Detected
FCF1-BH116	0-0.1	Fragment	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	Detected
FCF1-BH118	0-0.1	Fragment	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	Detected
FCF1-BH121	0-0.1	Fragment	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	Detected
FCF3-BH122	0-0.1	Fragment	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	Detected
Total Number of Samples			40	40	40	40	40	40	40	40	39	39	38	38	38	38	38	38	38	38	37	36
Maximum Value			32	0.6	31	200	120	0.4	34	590	60	4.6	<PQL	<PQL	<PQL	2	<PQL	<PQL	<PQL	<PQL	<PQL	Detected

Concentration above the SAC	**VALUE**
Concentration above the PQL	**Bold**
Asbestos Detected	Detected

TABLE S2
SOIL LABORATORY RESULTS COMPARED TO HSLs
All data in mg/kg unless stated otherwise

Sample Reference	Sample Depth	Sample Description	Depth Category	Soil Category	C_6-C_{10} (F1)	>C_{10}-C_{16} (F2)	Benzene	Toluene	Ethylbenzene	Xylenes	Naphthalene	Field PID Measurement
PQL - Envirolab Services					25	50	0.2	0.5	1	1	1	ppm
NEPM 2013 HSL Land Use Category					**HSL-A/B: LOW/HIGH DENSITY RESIDENTIAL**							
BH1	0-0.1	Fill: Sandy Gravel	0m to <1m	Sand	<25	<50	<0.2	<0.5	<1	<1	<1	0
BH1 - [LAB_DUP]	0-0.1	Laboratory Duplicate	0m to <1m	Sand	<25	<50	<0.2	<0.5	<1	<1	<1	NA
BH2	0.1-0.4	Fill: Gravelly Sand	0m to <1m	Sand	<25	<50	<0.2	<0.5	<1	<1	<1	0
BH3	0.04-0.1	Fill: Sandy Gravel	0m to <1m	Sand	<25	<50	<0.2	<0.5	<1	<1	<1	0
BH4	0.04-0.3	Fill: Gravelly Sand	0m to <1m	Sand	<25	<50	<0.2	<0.5	<1	<1	<1	0
BH5	0.04-0.3	Fill: Gravelly Sand	0m to <1m	Sand	<25	<50	<0.2	<0.5	<1	<1	<1	0
BH7	0-0.1	Fill: Silty Clay	0m to <1m	Sand	<25	<50	<0.2	<0.5	<1	<1	<1	0
BH101	0-0.1	Fill: Silty Clay	0m to <1m	Sand	<25	<50	<0.2	<0.5	<1	<1	<1	0
BH102	0-0.1	Fill: Sandy Clay	0m to <1m	Sand	<25	<50	<0.2	<0.5	<1	<1	<1	0
BH103	0-0.1	Fill: Sandy Clay	0m to <1m	Sand	<25	<50	<0.2	<0.5	<1	<1	<1	0
BH104	0-0.2	Fill: Sandy Clay	0m to <1m	Sand	<25	<50	<0.2	<0.5	<1	<1	<1	0
BH105	0.02-0.1	Fill: Sandy Gravel	0m to <1m	Sand	<25	<50	<0.2	<0.5	<1	<1	<1	0.1
BH106	0.02-0.1	Fill: Sandy Gravel	0m to <1m	Sand	<25	<50	<0.2	<0.5	<1	<1	<1	0
BH107	0-0.1	Fill: Sandy Clay	0m to <1m	Sand	<25	<50	<0.2	<0.5	<1	<1	<1	0
BH108	0-0.1	Fill: Silty Sandy Clay	0m to <1m	Sand	<25	<50	<0.2	<0.5	<1	<1	<1	0.1
BH109	0.015-0.1	Fill: Sandy Gravel	0m to <1m	Sand	<25	<50	<0.2	<0.5	<1	<1	<1	0.1
BH109 - [LAB_DUP]	0.015-0.1	Laboratory Duplicate	0m to <1m	Sand	<25	<50	<0.2	<0.5	<1	<1	<1	NA
BH110	0.04-0.1	Fill: Sandy Gravel	0m to <1m	Sand	<25	<50	<0.2	<0.5	<1	<1	<1	0.1
BH111	0-0.1	Fill: Silty Clay	0m to <1m	Sand	<25	<50	<0.2	<0.5	<1	<1	<1	0.1
BH112	0-0.1	Fill: Clayey Sand	0m to <1m	Sand	<25	<50	<0.2	<0.5	<1	<1	<1	0
BH113	0.1-0.3	Fill: Silty Clay	0m to <1m	Sand	<25	<50	<0.2	<0.5	<1	<1	<1	0
BH114	0-0.1	Fill: Silty Clay	0m to <1m	Sand	<25	<50	<0.2	<0.5	<1	<1	<1	0
BH115	0-0.15	Fill: Clayey Sand	0m to <1m	Sand	<25	<50	<0.2	<0.5	<1	<1	<1	0
BH116	0-0.1	Fill: Silty Clay	0m to <1m	Sand	<25	<50	<0.2	<0.5	<1	<1	<1	0.1
BH117	0-0.1	Fill: Silty Gravelly Clay	0m to <1m	Sand	<25	<50	<0.2	<0.5	<1	<1	<1	0
BH118	0-0.1	Fill: Clayey Gravelly Sand	0m to <1m	Sand	<25	<50	<0.2	<0.5	<1	<1	<1	0
BH119	0-0.15	Fill: Silty Clay	0m to <1m	Sand	<25	<50	<0.2	<0.5	<1	<1	<1	0
BH120	0-0.1	Fill: Silty Clay	0m to <1m	Sand	<25	<50	<0.2	<0.5	<1	<1	<1	0
BH121	0-0.1	Fill: Silty Clay	0m to <1m	Sand	<25	<50	<0.2	<0.5	<1	<1	<1	0.8
BH122	0-0.1	Fill: Silty Clay	0m to <1m	Sand	<25	<50	<0.2	<0.5	<1	<1	<1	0
BH122 - [LAB_DUP]	0-0.1	Laboratory Duplicate	0m to <1m	Sand	<25	<50	<0.2	<0.5	<1	<1	<1	NA
BH123	0-0.1	Fill: Silty Sandy Clay	0m to <1m	Sand	<25	**240**	<0.2	<0.5	<1	<1	<1	0.1
BH123 - [LAB_DUP]	0-0.1	Laboratory Duplicate	0m to <1m	Sand	<25	**220**	<0.2	<0.5	<1	<1	<1	NA
BH123_Silica Gel	0-0.1	Fill: Silty Sandy Clay	0m to <1m	Sand	NA	**130**	NA	NA	NA	NA	NA	NA
BH123_Silica Gel - [LAB_DUP]	0-0.1	Laboratory Duplicate	0m to <1m	Sand	NA	**160**	NA	NA	NA	NA	NA	NA
BH124	0-0.1	Fill: Silty Clay	0m to <1m	Sand	<25	<50	<0.2	<0.5	<1	<1	<1	0.1
SDUP1	0-0.1	Duplicate of BH1	0m to <1m	Sand	<25	<50	<0.2	<0.5	<1	<1	<1	-
SDUP3	0-0.1	Duplicate of BH102	0m to <1m	Sand	<25	<50	<0.2	<0.5	<1	<1	<1	-
SDUP2	0-0.1	Duplicate of BH112	0m to <1m	Sand	<25	<50	<0.2	<0.5	<1	<1	<1	-
SDUP4	0-0.1	Duplicate of BH108	0m to <1m	Sand	<25	<50	<0.2	<0.5	<1	NA	<1	-
Total Number of Samples					38	40	38	38	38	37	38	30
Maximum Value					<PQL	240	<PQL	<PQL	<PQL	<PQL	<PQL	0.8

Concentration above the SAC — VALUE
Concentration above the PQL — **Bold**
The guideline corresponding to the concentration above the SAC is highlighted in grey in the Site Assessment Criteria Table below

HSL SOIL ASSESSMENT CRITERIA

Sample Reference	Sample Depth	Sample Description	Depth Category	Soil Category	C_6-C_{10} (F1)	>C_{10}-C_{16} (F2)	Benzene	Toluene	Ethylbenzene	Xylenes	Naphthalene
BH1	0-0.1	Fill: Sandy Gravel	0m to <1m	Sand	45	110	0.5	160	55	40	3
BH1 - [LAB_DUP]	0-0.1	Laboratory Duplicate	0m to <1m	Sand	45	110	0.5	160	55	40	3
BH2	0.1-0.4	Fill: Gravelly Sand	0m to <1m	Sand	45	110	0.5	160	55	40	3
BH3	0.04-0.1	Fill: Sandy Gravel	0m to <1m	Sand	45	110	0.5	160	55	40	3
BH4	0.04-0.3	Fill: Gravelly Sand	0m to <1m	Sand	45	110	0.5	160	55	40	3
BH5	0.04-0.3	Fill: Gravelly Sand	0m to <1m	Sand	45	110	0.5	160	55	40	3
BH7	0-0.1	Fill: Silty Clay	0m to <1m	Sand	45	110	0.5	160	55	40	3
BH101	0-0.1	Fill: Silty Clay	0m to <1m	Sand	45	110	0.5	160	55	40	3
BH102	0-0.1	Fill: Sandy Clay	0m to <1m	Sand	45	110	0.5	160	55	40	3
BH103	0-0.1	Fill: Sandy Clay	0m to <1m	Sand	45	110	0.5	160	55	40	3
BH104	0-0.2	Fill: Sandy Clay	0m to <1m	Sand	45	110	0.5	160	55	40	3
BH105	0.02-0.1	Fill: Sandy Gravel	0m to <1m	Sand	45	110	0.5	160	55	40	3
BH106	0.02-0.1	Fill: Sandy Gravel	0m to <1m	Sand	45	110	0.5	160	55	40	3
BH107	0-0.1	Fill: Sandy Clay	0m to <1m	Sand	45	110	0.5	160	55	40	3
BH108	0-0.1	Fill: Silty Sandy Clay	0m to <1m	Sand	45	110	0.5	160	55	40	3
BH109	0.015-0.1	Fill: Sandy Gravel	0m to <1m	Sand	45	110	0.5	160	55	40	3
BH109 - [LAB_DUP]	0.015-0.1	Laboratory Duplicate	0m to <1m	Sand	45	110	0.5	160	55	40	3
BH110	0.04-0.1	Fill: Sandy Gravel	0m to <1m	Sand	45	110	0.5	160	55	40	3
BH111	0-0.1	Fill: Silty Clay	0m to <1m	Sand	45	110	0.5	160	55	40	3
BH112	0-0.1	Fill: Clayey Sand	0m to <1m	Sand	45	110	0.5	160	55	40	3
BH113	0.1-0.3	Fill: Silty Clay	0m to <1m	Sand	45	110	0.5	160	55	40	3
BH114	0-0.1	Fill: Silty Clay	0m to <1m	Sand	45	110	0.5	160	55	40	3
BH115	0-0.15	Fill: Clayey Sand	0m to <1m	Sand	45	110	0.5	160	55	40	3
BH116	0-0.1	Fill: Silty Clay	0m to <1m	Sand	45	110	0.5	160	55	40	3
BH117	0-0.1	Fill: Silty Gravelly Clay	0m to <1m	Sand	45	110	0.5	160	55	40	3
BH118	0-0.1	Fill: Clayey Gravelly Sand	0m to <1m	Sand	45	110	0.5	160	55	40	3
BH119	0-0.15	Fill: Silty Clay	0m to <1m	Sand	45	110	0.5	160	55	40	3
BH120	0-0.1	Fill: Silty Clay	0m to <1m	Sand	45	110	0.5	160	55	40	3
BH121	0-0.1	Fill: Silty Clay	0m to <1m	Sand	45	110	0.5	160	55	40	3
BH122	0-0.1	Fill: Silty Clay	0m to <1m	Sand	45	110	0.5	160	55	40	3
BH122 - [LAB_DUP]	0-0.1	Laboratory Duplicate	0m to <1m	Sand	45	110	0.5	160	55	40	3
BH123	0-0.1	Fill: Silty Sandy Clay	0m to <1m	Sand	45	110	0.5	160	55	40	3
BH123 - [LAB_DUP]	0-0.1	Laboratory Duplicate	0m to <1m	Sand	45	110	0.5	160	55	40	3
BH123_Silica Gel	0-0.1	Fill: Silty Sandy Clay	0m to <1m	Sand	NA	110	NA	NA	NA	NA	NA
BH123_Silica Gel - [LAB_DUP]	0-0.1	Laboratory Duplicate	0m to <1m	Sand	NA	110	NA	NA	NA	NA	NA
BH124	0-0.1	Fill: Silty Clay	0m to <1m	Sand	45	110	0.5	160	55	40	3
SDUP1	0-0.1	Duplicate of BH1	0m to <1m	Sand	45	110	0.5	160	55	40	3
SDUP3	0-0.1	Duplicate of BH102	0m to <1m	Sand	45	110	0.5	160	55	40	3
SDUP2	0-0.1	Duplicate of BH112	0m to <1m	Sand	45	110	0.5	160	55	40	3
SDUP4	0-0.1	Duplicate of BH108	0m to <1m	Sand	45	110	0.5	160	55	NA	3

TABLE S3
SOIL LABORATORY RESULTS COMPARED TO MANAGEMENT LIMITS
All data in mg/kg unless stated otherwise

			C_6-C_{10} (F1) plus BTEX	>C_{10}-C_{16} (F2) plus napthalene	>C_{16}-C_{34} (F3)	>C_{34}-C_{40} (F4)
PQL - Envirolab Services			25	50	100	100
NEPM 2013 Land Use Category			**RESIDENTIAL, PARKLAND & PUBLIC OPEN SPACE**			
Sample Reference	**Sample Depth**	**Soil Texture**				
BH1	0-0.1	Coarse	<25	<50	<100	<100
BH1 - [LAB_DUP]	0-0.1	Coarse	<25	<50	<100	<100
BH2	0.1-0.4	Coarse	<25	**220**	**240**	**320**
BH3	0.04-0.1	Coarse	<25	**820**	**600**	**940**
BH4	0.04-0.3	Coarse	<25	**490**	**360**	**610**
BH5	0.04-0.3	Coarse	<25	<50	<100	**110**
BH7	0-0.1	Coarse	<25	<50	<100	<100
BH101	0-0.1	Coarse	<25	<50	<100	<100
BH102	0-0.1	Coarse	<25	<50	<100	<100
BH103	0-0.1	Coarse	<25	<50	<100	<100
BH104	0-0.2	Coarse	<25	<50	<100	<100
BH105	0.02-0.1	Coarse	<25	**540**	**420**	**480**
BH106	0.02-0.1	Coarse	<25	**1000**	**890**	**730**
BH107	0-0.1	Coarse	<25	**280**	**260**	<100
BH108	0-0.1	Coarse	<25	**260**	**230**	<100
BH109	0.015-0.1	Coarse	<25	<50	<100	<100
BH109 - [LAB_DUP]	0.015-0.1	Coarse	<25	<50	<100	<100
BH110	0.04-0.1	Coarse	<25	**130**	**120**	**220**
BH111	0-0.1	Coarse	<25	<50	<100	<100
BH112	0-0.1	Coarse	<25	<50	<100	<100
BH113	0.1-0.3	Coarse	<25	<50	<100	<100
BH114	0-0.1	Coarse	<25	<50	**110**	<100
BH115	0-0.15	Coarse	<25	<50	<100	<100
BH116	0-0.1	Coarse	<25	<50	<100	<100
BH117	0-0.1	Coarse	<25	<50	<100	<100
BH118	0-0.1	Coarse	<25	<50	**130**	<100
BH119	0-0.15	Coarse	<25	<50	<100	<100
BH120	0-0.1	Coarse	<25	<50	<100	<100
BH121	0-0.1	Coarse	<25	<50	<100	<100
BH122	0-0.1	Coarse	<25	**260**	**220**	<100
BH122 - [LAB_DUP]	0-0.1	Coarse	<25	**220**	**190**	<100
BH123	0-0.1	Coarse	<25	**240**	**540**	**250**
BH123 - [LAB_DUP]	0-0.1	Coarse	<25	**220**	**510**	**290**
BH123_Silica Gel	0-0.1	Coarse	NA	**130**	**130**	<100
BH123_Silica Gel - [LAB_DUP]	0-0.1	Coarse	NA	**160**	**110**	<100
BH124	0-0.1	Coarse	<25	<50	<100	<100
SDUP1	0-0.1	Coarse	<25	<50	<100	<100
SDUP3	0-0.1	Coarse	<25	<50	<100	<100
SDUP2	0-0.1	Coarse	<25	<50	<100	<100
SDUP4	0-0.1	Coarse	<25	<50	<100	<100
Total Number of Samples			38	40	40	40
Maximum Value			<PQL	1000	890	940

Concentration above the SAC	**VALUE**
Concentration above the PQL	**Bold**

MANAGEMENT LIMIT ASSESSMENT CRITERIA

Sample Reference	**Sample Depth**	**Soil Texture**	C_6-C_{10} (F1) plus BTEX	>C_{10}-C_{16} (F2) plus napthalene	>C_{16}-C_{34} (F3)	>C_{34}-C_{40} (F4)
BH1	0-0.1	Coarse	700	1000	2500	10000
BH1 - [LAB_DUP]	0-0.1	Coarse	700	1000	2500	10000
BH2	0.1-0.4	Coarse	700	1000	2500	10000
BH3	0.04-0.1	Coarse	700	1000	2500	10000
BH4	0.04-0.3	Coarse	700	1000	2500	10000
BH5	0.04-0.3	Coarse	700	1000	2500	10000
BH7	0-0.1	Coarse	700	1000	2500	10000
BH101	0-0.1	Coarse	700	1000	2500	10000
BH102	0-0.1	Coarse	700	1000	2500	10000
BH103	0-0.1	Coarse	700	1000	2500	10000
BH104	0-0.2	Coarse	700	1000	2500	10000
BH105	0.02-0.1	Coarse	700	1000	2500	10000
BH106	0.02-0.1	Coarse	700	1000	2500	10000
BH107	0-0.1	Coarse	700	1000	2500	10000
BH108	0-0.1	Coarse	700	1000	2500	10000
BH109	0.015-0.1	Coarse	700	1000	2500	10000
BH109 - [LAB_DUP]	0.015-0.1	Coarse	700	1000	2500	10000
BH110	0.04-0.1	Coarse	700	1000	2500	10000
BH111	0-0.1	Coarse	700	1000	2500	10000
BH112	0-0.1	Coarse	700	1000	2500	10000
BH113	0.1-0.3	Coarse	700	1000	2500	10000
BH114	0-0.1	Coarse	700	1000	2500	10000
BH115	0-0.15	Coarse	700	1000	2500	10000
BH116	0-0.1	Coarse	700	1000	2500	10000
BH117	0-0.1	Coarse	700	1000	2500	10000
BH118	0-0.1	Coarse	700	1000	2500	10000
BH119	0-0.15	Coarse	700	1000	2500	10000
BH120	0-0.1	Coarse	700	1000	2500	10000
BH121	0-0.1	Coarse	700	1000	2500	10000
BH122	0-0.1	Coarse	700	1000	2500	10000
BH122 - [LAB_DUP]	0-0.1	Coarse	700	1000	2500	10000
BH123	0-0.1	Coarse	700	1000	2500	10000
BH123 - [LAB_DUP]	0-0.1	Coarse	700	1000	2500	10000
BH123_Silica Gel	0-0.1	Coarse	NA	1000	2500	10000
BH123_Silica Gel - [LAB_DUP]	0-0.1	Coarse	NA	1000	2500	10000
BH124	0-0.1	Coarse	700	1000	2500	10000
SDUP1	0-0.1	Coarse	700	1000	2500	10000
SDUP3	0-0.1	Coarse	700	1000	2500	10000
SDUP2	0-0.1	Coarse	700	1000	2500	10000
SDUP4	0-0.1	Coarse	700	1000	2500	10000

TABLE S4
SOIL LABORATORY RESULTS COMPARED T0 DIRECT CONTACT CRITERIA
All data in mg/kg unless stated otherwise

Analyte		C_6-C_{10}	>C_{10}-C_{16}	>C_{16}-C_{34}	>C_{34}-C_{40}	Benzene	Toluene	Ethylbenzene	Xylenes	Naphthalene	PID
PQL - Envirolab Services		25	50	100	100	0.2	0.5	1	1	1	
CRC 2011 -Direct contact Criteria		4,400	3,300	4,500	6,300	100	14,000	4,500	12,000	1,400	
Site Use		RESIDENTIAL WITH ACCESSIBLE SOIL- DIRECT SOIL CONTACT									
Sample Reference	**Sample Depth**										
BH1	0-0.1	<25	<50	<100	<100	<0.2	<0.5	<1	<1	<1	0
BH1 - [LAB_DUP]	0-0.1	<25	<50	<100	<100	<0.2	<0.5	<1	<1	<1	NA
BH2	0.1-0.4	<25	<50	**240**	**320**	<0.2	<0.5	<1	<1	<1	0
BH3	0.04-0.1	<25	<50	**600**	**940**	<0.2	<0.5	<1	<1	<1	0
BH4	0.04-0.3	<25	<50	**360**	**610**	<0.2	<0.5	<1	<1	<1	0
BH5	0.04-0.3	<25	<50	<100	**110**	<0.2	<0.5	<1	<1	<1	0
BH7	0-0.1	<25	<50	<100	<100	<0.2	<0.5	<1	<1	<1	0
BH101	0-0.1	<25	<50	<100	<100	<0.2	<0.5	<1	<1	<1	0
BH102	0-0.1	<25	<50	<100	<100	<0.2	<0.5	<1	<1	<1	0
BH103	0-0.1	<25	<50	<100	<100	<0.2	<0.5	<1	<1	<1	0
BH104	0-0.2	<25	<50	<100	<100	<0.2	<0.5	<1	<1	<1	0
BH105	0.02-0.1	<25	<50	**420**	**480**	<0.2	<0.5	<1	<1	<1	**0.1**
BH106	0.02-0.1	<25	<50	**890**	**730**	<0.2	<0.5	<1	<1	<1	0
BH107	0-0.1	<25	<50	**260**	<100	<0.2	<0.5	<1	<1	<1	0
BH108	0-0.1	<25	<50	**230**	<100	<0.2	<0.5	<1	<1	<1	**0.1**
BH109	0.015-0.1	<25	<50	<100	<100	<0.2	<0.5	<1	<1	<1	**0.1**
BH109 - [LAB_DUP]	0.015-0.1	<25	<50	<100	<100	<0.2	<0.5	<1	<1	<1	NA
BH110	0.04-0.1	<25	<50	**120**	**220**	<0.2	<0.5	<1	<1	<1	**0.1**
BH111	0-0.1	<25	<50	<100	<100	<0.2	<0.5	<1	<1	<1	**0.1**
BH112	0-0.1	<25	<50	<100	<100	<0.2	<0.5	<1	<1	<1	0
BH113	0.1-0.3	<25	<50	<100	<100	<0.2	<0.5	<1	<1	<1	0
BH114	0-0.1	<25	<50	**110**	<100	<0.2	<0.5	<1	<1	<1	0
BH115	0-0.15	<25	<50	<100	<100	<0.2	<0.5	<1	<1	<1	0
BH116	0-0.1	<25	<50	<100	<100	<0.2	<0.5	<1	<1	<1	**0.1**
BH117	0-0.1	<25	<50	<100	<100	<0.2	<0.5	<1	<1	<1	0
BH118	0-0.1	<25	<50	**130**	<100	<0.2	<0.5	<1	<1	<1	0
BH119	0-0.15	<25	<50	<100	<100	<0.2	<0.5	<1	<1	<1	0
BH120	0-0.1	<25	<50	<100	<100	<0.2	<0.5	<1	<1	<1	0
BH121	0-0.1	<25	<50	<100	<100	<0.2	<0.5	<1	<1	<1	**0.8**
BH122	0-0.1	<25	<50	**220**	<100	<0.2	<0.5	<1	<1	<1	0
BH122 - [LAB_DUP]	0-0.1	<25	<50	**190**	<100	<0.2	<0.5	<1	<1	<1	NA
BH123	0-0.1	<25	**240**	**540**	**250**	<0.2	<0.5	<1	<1	<1	**0.1**
BH123 - [LAB_DUP]	0-0.1	<25	**220**	**510**	**290**	<0.2	<0.5	<1	<1	<1	NA
BH123_Silica Gel	0-0.1	NA	**130**	**130**	<100	NA	NA	NA	NA	NA	NA
BH123_Silica Gel - [LAB_DUP]	0-0.1	NA	**160**	**110**	<100	NA	NA	NA	NA	NA	NA
BH124	0-0.1	<25	<50	<100	<100	<0.2	<0.5	<1	<1	<1	**0.1**
SDUP1	0-0.1	<25	<50	<100	<100	<0.2	<0.5	<1	<1	<1	-
SDUP3	0-0.1	<25	<50	<100	<100	<0.2	<0.5	<1	<1	<1	-
SDUP2	0-0.1	<25	<50	<100	<100	<0.2	<0.5	<1	<1	<1	-
SDUP4	0-0.1	<25	<50	<100	<100	<0.2	<0.5	<1	NA	<1	-
Total Number of Samples		38	40	40	40	38	38	38	37	38	30
Maximum Value		<PQL	240	890	940	<PQL	<PQL	<PQL	<PQL	<PQL	0.8

Concentration above the SAC	**VALUE**
Concentration above the PQL	**Bold**

TABLE S5
ASBESTOS QUANTIFICATION - FIELD OBSERVATIONS AND LABORATORY RESULTS
HSL-A: Residential with garden/accessible soils; children's day care centers; preschools; and primary schools

FIELD DATA															LABORATORY DATA											
Date Sampled	Sample reference	Sample Depth	Visible ACM in top 100mm	Approx. Volume of Soil (L)	Soil Mass (g)	Mass ACM (g)	Mass Asbestos in ACM (g)	[Asbestos from ACM in soil] (%w/w)	Mass ACM <7mm (g)	Mass Asbestos in ACM <7mm (g)	[Asbestos from ACM <7mm in soil] (%w/w)	Mass FA (g)	Mass Asbestos in FA (g)	[Asbestos from FA in soil] (%w/w)	Lab Report Number	Sample refeference	Sample Depth	Sample Mass (g)	Asbestos ID in soil (AS4964) >0.1g/kg	Trace Analysis	Total Asbestos (g/kg)	Asbestos ID in soil <0.1g/kg	ACM >7mm Estimation (g)	FA and AF Estimation (g)	ACM >7mm Estimation %(w/w)	FA and AF Estimation %(w/w)
SAC			**No**					**0.01**			**0.001**			**0.001**											**0.01**	**0.001**
12/07/2022	BH1	0-0.1	No	<10	9,350	No ACM observed	--	--	No ACM <7mm observed	--	--	No FA observed	--	--	300587	BH1	0-0.1	805.99	Chrysotile asbestos detected: Organic fibres detected	No asbestos detected	0.1843	See Above	0.1485	–	0.0184	<0.001
12/07/2022	BH2	0.1-0.4	NA	10	13,280	No ACM observed	--	--	No ACM <7mm observed	--	--	No FA observed	--	--	300587	BH2	0.1-0.4	850.59	No asbestos detected at reporting limit of 0.1g/kg: Organic fibres detected	No asbestos detected	<0.1	No visible asbestos detected	–	–	<0.01	<0.001
12/07/2022	BH3	0.04-0.1	No	<10	8,060	No ACM observed	--	--	No ACM <7mm observed	--	--	No FA observed	--	--	300587	BH3	0.04-0.1	484.31	No asbestos detected at reporting limit of 0.1g/kg: Organic fibres detected	No asbestos detected	<0.1	No visible asbestos detected	–	–	<0.01	<0.001
12/07/2022	BH4	0.04-0.5	No	<10	5,800	No ACM observed	--	--	No ACM <7mm observed	--	--	No FA observed	--	--	300836-D	BH4	0.04-0.3	982.01	No asbestos detected at reporting limit of 0.1g/kg: Organic fibres detected	No asbestos detected	<0.1	No visible asbestos detected	–	–	<0.01	<0.001
13/07/2022	BH5	0.04-0.3	No	<10	6,780	No ACM observed	--	--	No ACM <7mm observed	--	--	No FA observed	--	--	300836	BH5	0.04-0.3	676.3	No asbestos detected at reporting limit of 0.1g/kg: Organic fibres detected	No asbestos detected	<0.1	No visible asbestos detected	–	–	<0.01	<0.001
15/07/2022	BH6	0-0.4	No	10	10,300	No ACM observed	--	--	No ACM <7mm observed	--	--	No FA observed	--	--	-	-	-	-	-	-	-	-	-	-	-	-
15/07/2022	BH7	0-0.1	No	10	11,580	No ACM observed	--	--	No ACM <7mm observed	--	--	No FA observed	--	--	300836	BH7	0-0.1	676.3	No asbestos detected at reporting limit of 0.1g/kg: Organic fibres detected	No asbestos detected	<0.1	No visible asbestos detected	–	–	<0.01	<0.001
15/07/2022	BH7	0.1-0.75	NA	<10	4,200	No ACM observed	--	--	No ACM <7mm observed	--	--	No FA observed	--	--	-	-	-	-	-	-	-	-	-	-	-	-
15/07/2022	BH8	0-0.45	No	10	10,950	No ACM observed	--	--	No ACM <7mm observed	--	--	No FA observed	--	--	-	-	-	-	-	-	-	-	-	-	-	-
13/07/2022	BH101	0-0.1	No	<10	7,300	No ACM observed	--	--	No ACM <7mm observed	--	--	No FA observed	--	--	300836-D	BH101	0-0.1	609.52	No asbestos detected at reporting limit of 0.1g/kg: Organic fibres detected	No asbestos detected	<0.1	No visible asbestos detected	–	–	<0.01	<0.001
13/07/2022	BH101	0.1-0.3	NA	<10	2,200	No ACM observed	--	--	No ACM <7mm observed	--	--	No FA observed	--	--	-	-	-	-	-	-	-	-	-	-	-	-
13/07/2022	BH102	0-0.1	No	10	10,050	No ACM observed	--	--	No ACM <7mm observed	--	--	No FA observed	--	--	300836-D	BH102	0-0.1	747.29	No asbestos detected at reporting limit of 0.1g/kg: Organic fibres detected	No asbestos detected	<0.1	No visible asbestos detected	–	–	<0.01	<0.001
13/07/2022	BH102	0.1-0.3	NA	<10	3,350	No ACM observed	--	--	No ACM <7mm observed	--	--	No FA observed	--	--	-	-	-	-	-	-	-	-	-	-	-	-
13/07/2022	BH103	0-0.3	No	<10	9,200	No ACM observed	--	--	No ACM <7mm observed	--	--	No FA observed	--	--	300836	BH103	0.1-0.3	842.46	No asbestos detected at reporting limit of 0.1g/kg: Organic fibres detected	No asbestos detected	<0.1	No visible asbestos detected	–	–	<0.01	<0.001
13/07/2022	BH104	0-0.1	No	10	10,000	No ACM observed	--	--	No ACM <7mm observed	--	--	No FA observed	--	--	300836	BH104	0-0.2	995.07	No asbestos detected at reporting limit of 0.1g/kg: Organic fibres detected	No asbestos detected	<0.1	No visible asbestos detected	–	–	<0.01	<0.001
--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	300836	BH105	0.02-0.1	953	No asbestos detected at reporting limit of 0.1g/kg: Organic fibres detected	No asbestos detected	<0.1	No visible asbestos detected	–	–	<0.01	<0.001
15/07/2022	BH106	0.02-0.1	No	<10	1,450	No ACM observed	--	--	No ACM <7mm observed	--	--	No FA observed	--	--	300836	BH106	0.02-0.1	680.28	No asbestos detected at reporting limit of 0.1g/kg: Organic fibres detected	No asbestos detected	<0.1	No visible asbestos detected	–	–	<0.01	<0.001
15/07/2022	BH107	0-0.1	No	10	10,700	No ACM observed	--	--	No ACM <7mm observed	--	--	No FA observed	--	--	300836	BH107	0-0.1	714.12	No asbestos detected at reporting limit of 0.1g/kg: Organic fibres detected	No asbestos detected	<0.1	No visible asbestos detected	–	–	<0.01	<0.001
15/07/2022	BH107	0.1-0.3	NA	<10	3,900	No ACM observed	--	--	No ACM <7mm observed	--	--	No FA observed	--	--	-	-	-	-	-	-	-	-	-	-	-	-
13/07/2022	BH108	0-0.1	No	10	10,050	No ACM observed	--	--	No ACM <7mm observed	--	--	No FA observed	--	--	300836	BH108	0-0.1	655.69	No asbestos detected at reporting limit of 0.1g/kg: Organic fibres detected	No asbestos detected	<0.1	No visible asbestos detected	–	–	<0.01	<0.001
13/07/2022	BH108	0.1-0.3	NA	<10	4,320	No ACM observed	--	--	No ACM <7mm observed	--	--	No FA observed	--	--	-	-	-	-	-	-	-	-	-	-	-	-
--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	300836	BH109	0.015-0.1	859.85	No asbestos detected at reporting limit of 0.1g/kg: Organic fibres detected	No asbestos detected	<0.1	No visible asbestos detected	–	–	<0.01	<0.001
15/07/2022	BH109	0.1-0.3	NA	<10	3,400	No ACM observed	--	--	No ACM <7mm observed	--	--	No FA observed	--	--	-	-	-	-	-	-	-	-	-	-	-	-
15/07/2022	BH110	0.1-0.3	NA	<10	3,450	No ACM observed	--	--	No ACM <7mm observed	--	--	No FA observed	--	--	300836	BH110	0.04-0.10	727.53	No asbestos detected at reporting limit of 0.1g/kg: Organic fibres detected	No asbestos detected	<0.1	No visible asbestos detected	–	–	<0.01	<0.001
13/07/2022	BH111	0-0.1	No	10	11,670	No ACM observed	--	--	No ACM <7mm observed	--	--	No FA observed	--	--	300836	BH111	0-0.1	859.91	No asbestos detected at reporting limit of 0.1g/kg: Organic fibres detected	No asbestos detected	<0.1	No visible asbestos detected	–	–	<0.01	<0.001
13/07/2022	BH111	0.1-0.3	NA	<10	4,890	No ACM observed	--	--	No ACM <7mm observed	--	--	No FA observed	--	--	-	-	-	-	-	-	-	-	-	-	-	-
12/07/2022	BH112	0-0.1	No	10	12,000	No ACM observed	--	--	No ACM <7mm observed	--	--	No FA observed	--	--	300587	BH112	0-0.1	699.02	No asbestos detected at reporting limit of 0.1g/kg: Organic fibres detected	No asbestos detected	<0.1	No visible asbestos detected	–	–	<0.01	<0.001
12/07/2022	BH112	0.1-0.4	NA	<10	3,750	No ACM observed	--	--	No ACM <7mm observed	--	--	No FA observed	--	--	-	-	-	-	-	-	-	-	-	-	-	-
15/07/2022	BH113	0-0.1	No	10	10,600	No ACM observed	--	--	No ACM <7mm observed	--	--	No FA observed	--	--	300836	BH113	0.1-0.3	538.59	No asbestos detected at reporting limit of 0.1g/kg: Organic fibres detected	No asbestos detected	<0.1	No visible asbestos detected	–	–	<0.01	<0.001
15/07/2022	BH113	0.1-0.4	NA	<10	3,700	No ACM observed	--	--	No ACM <7mm observed	--	--	No FA observed	--	--	-	-	-	-	-	-	-	-	-	-	-	-
15/07/2022	BH114	0-0.1	No	10	10,100	No ACM observed	--	--	No ACM <7mm observed	--	--	No FA observed	--	--	300836	BH114	0-0.1	623.54	No asbestos detected at reporting limit of 0.1g/kg: Organic fibres detected	No asbestos detected	<0.1	No visible asbestos detected	–	–	<0.01	<0.001
15/07/2022	BH114	0.1-0.2	NA	<10	4,300	No ACM observed	--	--	No ACM <7mm observed	--	--	No FA observed	--	--	-	-	-	-	-	-	-	-	-	-	-	-
14/07/2022	BH115	0-0.15	No	10	15,180	No ACM observed	--	--	No ACM <7mm observed	--	--	No FA observed	--	--	300836	BH115	0-0.15	827.64	No asbestos detected at reporting limit of 0.1g/kg: Organic fibres detected	No asbestos detected	<0.1	No visible asbestos detected	–	–	<0.01	<0.001
14/07/2022	BH116	0-0.1	Yes	10	10,100	17.0	2.5515	0.0253	No ACM <7mm observed	--	--	No FA observed	--	--	300836	BH116	0-0.1	628.06	No asbestos detected at reporting limit of 0.1g/kg: Organic fibres detected	No asbestos detected	<0.1	No visible asbestos detected	–	–	<0.01	<0.001
14/07/2022	BH116	0.1-0.3	NA	10	11,130	No ACM observed	--	--	No ACM <7mm observed	--	--	No FA observed	--	--	-	-	-	-	-	-	-	-	-	-	-	-
14/07/2022	BH117	0-0.2	No	<10	6,180	No ACM observed	--	--	No ACM <7mm observed	--	--	No FA observed	--	--	300836	BH117	0-0.1	855.58	No asbestos detected at reporting limit of 0.1g/kg: Organic fibres detected	No asbestos detected	<0.1	Crocidolite	–	0.0007	<0.01	<0.001
14/07/2022	BH118	0-0.1	Yes	10	11,880	8.5	1.281	0.0108	No ACM <7mm observed	--	--	No FA observed	--	--	300836	BH118	0-0.1	696.02	No asbestos detected at reporting limit of 0.1g/kg: Organic fibres detected	No asbestos detected	<0.1	No visible asbestos detected	–	–	<0.01	<0.001
14/07/2022	BH118	0.1-0.2	NA	<10	5,200	No ACM observed	--	--	No ACM <7mm observed	--	--	No FA observed	--	--	-	-	-	-	-	-	-	-	-	-	-	-
14/07/2022	BH119	0-0.15	No	10	10,550	No ACM observed	--	--	No ACM <7mm observed	--	--	No FA observed	--	--	300836	BH119	0-0.15	735.59	No asbestos detected at reporting limit of 0.1g/kg: Organic fibres detected	No asbestos detected	<0.1	No visible asbestos detected	–	–	<0.01	<0.001
14/07/2022	BH120	0-0.1	Yes	10	10,100	98.8	14.8155	0.1467	No ACM <7mm observed	--	--	No FA observed	--	--	300836	BH120	0-0.1	684.78	No asbestos detected at reporting limit of 0.1g/kg: Organic fibres detected	No asbestos detected	<0.1	Chrysotile:Amosite	–	0.009	<0.01	0.0013
14/07/2022	BH120	0.1-0.4	NA	10	11,060	12.6	1.8945	0.0171	No ACM <7mm observed	--	--	No FA observed	--	--	-	-	-	-	-	-	-	-	-	-	-	-
14/07/2022	BH121	0-0.1	Yes	10	12,980	2.0	0.3	0.0023	No ACM <7mm observed	--	--	No FA observed	--	--	300836	BH121	0-0.1	705.21	No asbestos detected at reporting limit of 0.1g/kg: Organic fibres detected	No asbestos detected	<0.1	No visible asbestos detected	–	–	<0.01	<0.001
14/07/2022	BH121	0.1-0.2	NA	<10	4,360	No ACM observed	--	--	No ACM <7mm observed	--	--	No FA observed	--	--	-	-	-	-	-	-	-	-	-	-	-	-
14/07/2022	BH122	0-0.1	Yes	10	10,750	50.6	7.5855	0.0706	No ACM <7mm observed	--	--	No FA observed	--	--	300836	BH122	0-0.1	608.35	Chrysotile asbestos detected: Amosite asbestos detected: Organic fibres detected	No asbestos detected	1.0373	See Above	0.631	–	0.1037	<0.001
14/07/2022	BH122	0.1-0.3	NA	<10	5,490	No ACM observed	--	--	No ACM <7mm observed	--	--	No FA observed	--	--	-	-	-	-	-	-	-	-	-	-	-	-
20/07/2022	BH123	0-0.1	No	10	10,610	No ACM observed	--	--	No ACM <7mm observed	--	--	No FA observed	--	--	301048	BH123	0-0.1	336.37	No asbestos detected at reporting limit of 0.1g/kg: Organic fibres detected	No asbestos detected	<0.1	No visible asbestos detected	–	–	<0.01	<0.001
20/07/2022	BH124	0-0.1	No	10	12,110	No ACM observed	--	--	No ACM <7mm observed	--	--	No FA observed	--	--	301048	BH124	0-0.1	577.55	No asbestos detected at reporting limit of 0.1g/kg: Organic fibres detected	No asbestos detected	<0.1	No visible asbestos detected	–	–	<0.01	<0.001
--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	285674	SDUP4	0-0.1	700	No asbestos detected at reporting limit of 0.1g/kg	No asbestos detected	<0.1	No visible asbestos detected	–	–	<0.01	<0.001

Concentration above the SAC **VALUE**

TABLE S6
SOIL LABORATORY RESULTS COMPARED TO NEPM 2013 EILs AND ESLs
All data in mg/kg unless stated otherwise

Land Use Category				URBAN RESIDENTIAL AND PUBLIC OPEN SPACE																			
							AGED HEAVY METALS-EILs						EILs		ESLs								
				pH	CEC (cmolc/kg)	Clay Content (% clay)	Arsenic	Chromium	Copper	Lead	Nickel	Zinc	Naphthalene	DDT	C_6-C_{10} (F1)	>C_{10}-C_{16} (F2)	>C_{16}-C_{34} (F3)	>C_{34}-C_{40} (F4)	Benzene	Toluene	Ethylbenzene	Total Xylenes	B(a)P
PQL - Envirolab Services				-	1	-	4	1	1	1	1	1	1	0.1	25	50	100	100	0.2	0.5	1	1	0.05
Ambient Background Concentration (ABC)				-	-	-	NSL	8	18	104	5	77	NSL	NSL	NSL	NSL	NSL	NSL	NSL	NSL	NSL	NSL	NSL
Sample Reference	**Sample Depth**	**Sample Description**	**Soil Texture**																				
BH1	0-0.1	Fill: Sandy Gravel	Coarse	NA	NA	NA	<4	**26**	**26**	**41**	**9**	**61**	<1	<0.1	<25	<50	<100	<100	<0.2	<0.5	<1	<1	**0.3**
BH1 - [LAB_DUP]	0-0.1	Laboratory Duplicate	Coarse	NA	NA	NA	**6**	**20**	**25**	**27**	**10**	**52**	<1	<0.1	<25	<50	<100	<100	<0.2	<0.5	<1	<1	**0.2**
BH1 - [LAB_TRIP]	0-0.1	Laboratory Triplicate	Coarse	NA	NA	NA	**4**	**15**	**23**	**28**	**11**	**88**	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
BH2	0.1-0.4	Fill: Gravelly Sand	Coarse	NA	NA	NA	**4**	**10**	**16**	**7**	**9**	**9**	<1	<0.1	<25	<50	**240**	**320**	<0.2	<0.5	<1	<1	<0.05
BH3	0.04-0.1	Fill: Sandy Gravel	Coarse	NA	NA	NA	**5**	**12**	**34**	**6**	**16**	**15**	<1	<0.1	<25	<50	**600**	**940**	<0.2	<0.5	<1	<1	<0.05
BH4	0.04-0.3	Fill: Gravelly Sand	Coarse	NA	NA	NA	<4	**6**	**76**	**3**	**34**	**24**	<1	<0.1	<25	<50	**360**	**610**	<0.2	<0.5	<1	<1	<0.05
BH5	0.04-0.3	Fill: Gravelly Sand	Coarse	NA	NA	NA	<4	**10**	**13**	**23**	**4**	**47**	<1	<0.1	<25	<50	<100	**110**	<0.2	<0.5	<1	<1	**0.1**
BH7	0-0.1	Fill: Silty Clay	Fine	NA	NA	NA	**9**	**22**	**14**	**22**	**7**	**41**	<1	<0.1	<25	<50	<100	<100	<0.2	<0.5	<1	<1	**1.8**
BH101	0-0.1	Fill: Silty Clay	Fine	NA	NA	NA	**5**	**14**	**2**	**12**	**1**	**8**	<1	<0.1	<25	<50	<100	<100	<0.2	<0.5	<1	<1	**0.07**
BH102	0-0.1	Fill: Sandy Clay	Fine	NA	NA	NA	**4**	**14**	**13**	**43**	**3**	**61**	<1	<0.1	<25	<50	<100	<100	<0.2	<0.5	<1	<1	**0.1**
BH103	0-0.1	Fill: Sandy Clay	Fine	NA	NA	NA	<4	**9**	**10**	**29**	**3**	**52**	<1	<0.1	<25	<50	<100	<100	<0.2	<0.5	<1	<1	**0.05**
BH104	0-0.2	Fill: Sandy Clay	Fine	NA	NA	NA	**5**	**16**	**8**	**32**	**2**	**30**	<1	<0.1	<25	<50	<100	<100	<0.2	<0.5	<1	<1	**0.3**
BH105	0.02-0.1	Fill: Sandy Gravel	Coarse	NA	NA	NA	<4	**16**	**29**	**6**	**24**	**22**	<1	<0.1	<25	<50	**420**	**480**	<0.2	<0.5	<1	<1	**0.1**
BH106	0.02-0.1	Fill: Sandy Gravel	Coarse	NA	NA	NA	**4**	**17**	**27**	**10**	**23**	**42**	<1	<0.1	<25	<50	**890**	**730**	<0.2	<0.5	<1	<1	<0.05
BH107	0-0.1	Fill: Sandy Clay	Fine	NA	NA	NA	**10**	**19**	**27**	**58**	**10**	**120**	<1	<0.1	<25	<50	**260**	<100	<0.2	<0.5	<1	<1	**3**
BH107	0.3-0.45	Silty Clay	Fine	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<0.05
BH108	0-0.1	Fill: Silty Sandy Clay	Fine	NA	NA	NA	<4	**20**	**10**	**36**	**13**	**130**	<1	<0.1	<25	<50	**230**	<100	<0.2	<0.5	<1	<1	**0.06**
BH109	0.015-0.1	Fill: Sandy Gravel	Coarse	**9.9**	**13**	NA	**5**	**17**	**28**	**13**	**18**	**590**	<1	<0.1	<25	<50	<100	<100	<0.2	<0.5	<1	<1	<0.05
BH109 - [LAB_DUP]	0.015-0.1	Laboratory Duplicate	Coarse	**9.9**	**13**	NA	**5**	**19**	**35**	**16**	**22**	**270**	<1	<0.1	<25	<50	<100	<100	<0.2	<0.5	<1	<1	<0.05
BH109 - [LAB_TRIP]	0.015-0.1	Laboratory Triplicate	Coarse	**9.9**	**13**	NA	**6**	**17**	**22**	**15**	**14**	**340**	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
BH110	0.04-0.1	Fill: Sandy Gravel	Coarse	**9.9**	**23**	NA	<4	**8**	**91**	**16**	**8**	**41**	<1	<0.1	<25	<50	**120**	**220**	<0.2	<0.5	<1	<1	**0.1**
BH111	0-0.1	Fill: Silty Clay	Fine	NA	NA	NA	**7**	**18**	**8**	**29**	**5**	**32**	<1	<0.1	<25	<50	<100	<100	<0.2	<0.5	<1	<1	**0.2**
BH112	0-0.1	Fill: Clayey Sand	Coarse	NA	NA	NA	<4	**14**	**34**	**14**	**15**	**38**	<1	<0.1	<25	<50	<100	<100	<0.2	<0.5	<1	<1	**0.1**
BH113	0.1-0.3	Fill: Silty Clay	Fine	NA	NA	NA	**7**	**19**	**15**	**15**	**12**	**16**	<1	<0.1	<25	<50	<100	<100	<0.2	<0.5	<1	<1	<0.05
BH114	0-0.1	Fill: Silty Clay	Fine	**5.5**	**9**	NA	**14**	**20**	**49**	**100**	**4**	**220**	<1	<0.1	<25	<50	**110**	<100	<0.2	<0.5	<1	<1	<0.05
BH115	0-0.15	Fill: Clayey Sand	Coarse	NA	NA	NA	**7**	**16**	**7**	**33**	**3**	**76**	<1	<0.1	<25	<50	<100	<100	<0.2	<0.5	<1	<1	<0.05
BH116	0-0.1	Fill: Silty Clay	Fine	NA	NA	NA	**7**	**15**	**15**	**68**	**3**	**100**	<1	<0.1	<25	<50	<100	<100	<0.2	<0.5	<1	<1	**0.05**
BH117	0-0.1	Fill: Silty Gravelly Clay	Fine	NA	NA	NA	**19**	**31**	**19**	**50**	**5**	**81**	<1	<0.1	<25	<50	<100	<100	<0.2	<0.5	<1	<1	**0.1**
BH118	0-0.1	Fill: Clayey Gravelly Sand	Coarse	**6.8**	**9.2**	NA	**11**	**21**	**200**	**74**	**4**	**110**	<1	<0.1	<25	<50	**130**	<100	<0.2	<0.5	<1	<1	**0.07**
BH119	0-0.15	Fill: Silty Clay	Fine	NA	NA	NA	**10**	**22**	**31**	**120**	**14**	**140**	<1	<0.1	<25	<50	<100	<100	<0.2	<0.5	<1	<1	<0.05
BH120	0-0.1	Fill: Silty Clay	Fine	NA	NA	NA	**8**	**20**	**8**	**33**	**3**	**56**	<1	<0.1	<25	<50	<100	<100	<0.2	<0.5	<1	<1	<0.05
BH121	0-0.1	Fill: Silty Clay	Fine	**5.5**	**12**	NA	**10**	**27**	**31**	**94**	**5**	**230**	<1	<0.1	<25	<50	<100	<100	<0.2	<0.5	<1	<1	**0.9**
BH122	0-0.1	Fill: Silty Clay	Fine	NA	NA	NA	**20**	**16**	**14**	**83**	**4**	**140**	<1	<0.1	<25	<50	**220**	<100	<0.2	<0.5	<1	<1	**0.1**
BH122 - [LAB_DUP]	0-0.1	Laboratory Duplicate	Fine	NA	NA	NA	**32**	**21**	**20**	**74**	**3**	**120**	<1	<0.1	<25	<50	**190**	<100	<0.2	<0.5	<1	<1	**0.1**
BH123	0-0.1	Fill: Silty Sandy Clay	Fine	NA	NA	NA	**4**	**10**	**20**	**23**	**3**	**98**	<1	<0.1	<25	**240**	**540**	**250**	<0.2	<0.5	<1	<1	**0.2**
BH123 - [LAB_DUP]	0-0.1	Laboratory Duplicate	Fine	NA	NA	NA	<4	**9**	**18**	**20**	**3**	**93**	<1	<0.1	<25	**220**	**510**	**290**	<0.2	<0.5	<1	<1	**0.1**
BH123_Silica Gel	0-0.1	Fill: Silty Sandy Clay	Fine	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	**130**	**130**	<100	NA	NA	NA	NA	NA
BH123_Silica Gel - [LAB_DUP]	0-0.1	Laboratory Duplicate	Fine	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	**160**	**110**	<100	NA	NA	NA	NA	NA
BH124	0-0.1	Fill: Silty Clay	Fine	NA	NA	NA	**9**	**18**	**7**	**57**	**3**	**73**	<1	<0.1	<25	<50	<100	<100	<0.2	<0.5	<1	<1	**0.09**
SDUP1	0-0.1	Duplicate of BH1	Coarse	NA	NA	NA	<4	**20**	**43**	**38**	**14**	**100**	<1	<0.1	<25	<50	<100	<100	<0.2	<0.5	<1	<1	**0.2**
SDUP3	0-0.1	Duplicate of BH102	Fine	NA	NA	NA	<4	**12**	**21**	**61**	**4**	**96**	<1	<0.1	<25	<50	<100	<100	<0.2	<0.5	<1	<1	**0.2**
SDUP2	0-0.1	Duplicate of BH112	Coarse	NA	NA	NA	**9**	**22**	**15**	**17**	**10**	**32**	<1	<0.1	<25	<50	<100	<100	<0.2	<0.5	<1	<1	<0.05
SDUP4	0-0.1	Duplicate of BH108	Fine	NA	NA	NA	**10**	**24**	**9**	**40**	**14**	**110**	<1	<0.1	<25	<50	<100	<100	<0.2	<0.5	<1	NA	**0.09**
Total Number of Samples				7	7	0	40	40	40	40	40	40	38	38	38	40	40	40	38	38	38	37	39
Maximum Value				9.9	23	NA	32	31	200	120	34	590	<PQL	<PQL	<PQL	240	890	940	<PQL	<PQL	<PQL	<PQL	3

Concentration above the SAC — **VALUE**
Concentration above the PQL — **Bold**
The guideline corresponding to the elevated value is highlighted in grey in the EIL and ESL Assessment Criteria Table below

EIL AND ESL ASSESSMENT CRITERIA

Sample Reference	Sample Depth	Sample Description	Soil Texture	pH	CEC (cmolc/kg)	Clay Content (% clay)	Arsenic	Chromium	Copper	Lead	Nickel	Zinc	Naphthalene	DDT	C_6-C_{10} (F1)	>C_{10}-C_{16} (F2)	>C_{16}-C_{34} (F3)	>C_{34}-C_{40} (F4)	Benzene	Toluene	Ethylbenzene	Total Xylenes	B(a)P
BH1	0-0.1	Fill: Sandy Gravel	Coarse	NA	NA	NA	100	200	80	1200	35	150	170	180	180	120	300	2800	50	85	70	105	20
BH1 - [LAB_DUP]	0-0.1	Laboratory Duplicate	Coarse	NA	NA	NA	100	200	80	1200	35	150	170	180	180	120	300	2800	50	85	70	105	20
BH1 - [LAB_TRIP]	0-0.1	Laboratory Triplicate	Coarse	NA	NA	NA	100	200	80	1200	35	150	--	--	--	--	--	--	--	--	--	--	--
BH2	0.1-0.4	Fill: Gravelly Sand	Coarse	NA	NA	NA	100	200	80	1200	35	150	170	180	180	120	300	2800	50	85	70	105	20
BH3	0.04-0.1	Fill: Sandy Gravel	Coarse	NA	NA	NA	100	200	80	1200	35	150	170	180	180	120	300	2800	50	85	70	105	20
BH4	0.04-0.3	Fill: Gravelly Sand	Coarse	NA	NA	NA	100	200	80	1200	35	150	170	180	180	120	300	2800	50	85	70	105	20
BH5	0.04-0.3	Fill: Gravelly Sand	Coarse	NA	NA	NA	100	200	80	1200	35	150	170	180	180	120	300	2800	50	85	70	105	20
BH7	0-0.1	Fill: Silty Clay	Fine	NA	NA	NA	100	200	80	1200	35	150	170	180	180	120	1300	5600	65	105	125	45	20
BH101	0-0.1	Fill: Silty Clay	Fine	NA	NA	NA	100	200	80	1200	35	150	170	180	180	120	1300	5600	65	105	125	45	20
BH102	0-0.1	Fill: Sandy Clay	Fine	NA	NA	NA	100	200	80	1200	35	150	170	180	180	120	1300	5600	65	105	125	45	20
BH103	0-0.1	Fill: Sandy Clay	Fine	NA	NA	NA	100	200	80	1200	35	150	170	180	180	120	1300	5600	65	105	125	45	20
BH104	0-0.2	Fill: Sandy Clay	Fine	NA	NA	NA	100	200	80	1200	35	150	170	180	180	120	1300	5600	65	105	125	45	20
BH105	0.02-0.1	Fill: Sandy Gravel	Coarse	NA	NA	NA	100	200	80	1200	35	150	170	180	180	120	300	2800	50	85	70	105	20
BH106	0.02-0.1	Fill: Sandy Gravel	Coarse	NA	NA	NA	100	200	80	1200	35	150	170	180	180	120	300	2800	50	85	70	105	20
BH107	0-0.1	Fill: Sandy Clay	Fine	NA	NA	NA	100	200	80	1200	35	150	170	180	180	120	1300	5600	65	105	125	45	20
BH107	0.3-0.45	Silty Clay	Fine	NA	NA	NA	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	20
BH108	0-0.1	Fill: Silty Sandy Clay	Fine	NA	NA	NA	100	200	80	1200	35	150	170	180	180	120	1300	5600	65	105	125	45	20
BH109	0.015-0.1	Fill: Sandy Gravel	Coarse	9.9	13	NA	100	200	230	1200	280	780	170	180	180	120	300	2800	50	85	70	105	20
BH109 - [LAB_DUP]	0.015-0.1	Laboratory Duplicate	Coarse	9.9	13	NA	100	200	230	1200	280	780	170	180	180	120	300	2800	50	85	70	105	20
BH109 - [LAB_TRIP]	0.015-0.1	Laboratory Triplicate	Coarse	9.9	13	NA	100	200	230	1200	280	780	--	--	--	--	--	--	--	--	--	--	--
BH110	0.04-0.1	Fill: Sandy Gravel	Coarse	9.9	23	NA	100	200	240	1200	360	1000	170	180	180	120	300	2800	50	85	70	105	20
BH111	0-0.1	Fill: Silty Clay	Fine	NA	NA	NA	100	200	80	1200	35	150	170	180	180	120	1300	5600	65	105	125	45	20
BH112	0-0.1	Fill: Clayey Sand	Coarse	NA	NA	NA	100	200	80	1200	35	150	170	180	180	120	300	2800	50	85	70	105	20
BH113	0.1-0.3	Fill: Silty Clay	Fine	NA	NA	NA	100	200	80	1200	35	150	170	180	180	120	1300	5600	65	105	125	45	20
BH114	0-0.1	Fill: Silty Clay	Fine	5.5	9	NA	100	200	150	1200	180	350	170	180	180	120	1300	5600	65	105	125	45	20
BH115	0-0.15	Fill: Clayey Sand	Coarse	NA	NA	NA	100	200	80	1200	35	150	170	180	180	120	300	2800	50	85	70	105	20
BH116	0-0.1	Fill: Silty Clay	Fine	NA	NA	NA	100	200	80	1200	35	150	170	180	180	120	1300	5600	65	105	125	45	20
BH117	0-0.1	Fill: Silty Gravelly Clay	Fine	NA	NA	NA	100	200	80	1200	35	150	170	180	180	120	1300	5600	65	105	125	45	20
BH118	0-0.1	Fill: Clayey Gravelly Sand	Coarse	6.8	9.2	NA	100	200	210	1200	180	480	170	180	180	120	300	2800	50	85	70	105	20
BH119	0-0.15	Fill: Silty Clay	Fine	NA	NA	NA	100	200	80	1200	35	150	170	180	180	120	1300	5600	65	105	125	45	20
BH120	0-0.1	Fill: Silty Clay	Fine	NA	NA	NA	100	200	80	1200	35	150	170	180	180	120	1300	5600	65	105	125	45	20
BH121	0-0.1	Fill: Silty Clay	Fine	5.5	12	NA	100	200	150	1200	280	350	170	180	180	120	1300	5600	65	105	125	45	20
BH122	0-0.1	Fill: Silty Clay	Fine	NA	NA	NA	100	200	80	1200	35	150	170	180	180	120	1300	5600	65	105	125	45	20
BH122 - [LAB_DUP]	0-0.1	Laboratory Duplicate	Fine	NA	NA	NA	100	200	80	1200	35	150	170	180	180	120	1300	5600	65	105	125	45	20
BH123	0-0.1	Fill: Silty Sandy Clay	Fine	NA	NA	NA	100	200	80	1200	35	150	170	180	180	120	1300	5600	65	105	125	45	20
BH123 - [LAB_DUP]	0-0.1	Laboratory Duplicate	Fine	NA	NA	NA	100	200	80	1200	35	150	170	180	180	120	1300	5600	65	105	125	45	20
BH123_Silica Gel	0-0.1	Fill: Silty Sandy Clay	Fine	NA	NA	NA	--	--	--	--	--	--	--	--	--	120	1300	5600	--	--	--	--	--
BH123_Silica Gel - [LAB_DUP]	0-0.1	Laboratory Duplicate	Fine	NA	NA	NA	--	--	--	--	--	--	--	--	--	120	1300	5600	--	--	--	--	--
BH124	0-0.1	Fill: Silty Clay	Fine	NA	NA	NA	100	200	80	1200	35	150	170	180	180	120	1300	5600	65	105	125	45	20
SDUP1	0-0.1	Duplicate of BH1	Coarse	NA	NA	NA	100	200	80	1200	35	150	170	180	180	120	300	2800	50	85	70	105	20
SDUP3	0-0.1	Duplicate of BH102	Fine	NA	NA	NA	100	200	80	1200	35	150	170	180	180	120	1300	5600	65	105	125	45	20
SDUP2	0-0.1	Duplicate of BH112	Coarse	NA	NA	NA	100	200	80	1200	35	150	170	180	180	120	300	2800	50	85	70	105	20
SDUP4	0-0.1	Duplicate of BH108	Fine	NA	NA	NA	100	200	80	1200	35	150	170	180	180	120	1300	5600	65	105	125	--	20

JKGeotechnics

TABLE S7
SOIL LABORATORY RESULTS COMPARED TO WASTE CLASSIFICATION GUIDELINES
All data in mg/kg unless stated otherwise

			HEAVY METALS								PAHs		OC/OP PESTICIDES				Total PCBs	TRH					BTEX COMPOUNDS				ASBESTOS FIBRES
			Arsenic	Cadmium	Chromium	Copper	Lead	Mercury	Nickel	Zinc	Total PAHs	B(a)P	Total Endosulfans	Chloropyrifos	Total Moderately Harmful	Total Scheduled		C_6-C_9	C_{10}-C_{14}	C_{15}-C_{28}	C_{29}-C_{36}	Total C_{10}-C_{36}	Benzene	Toluene	Ethyl benzene	Total Xylenes	
PQL - Envirolab Services			4	0.4	1	1	1	0.1	1	1	-	0.05	0.1	0.1	0.1	0.1	0.1	25	50	100	100	50	0.2	0.5	1	1	100
General Solid Waste CT1			100	20	100	NSL	100	4	40	NSL	200	0.8	60	4	250	50	50	650		NSL		10,000	10	288	600	1,000	-
General Solid Waste SCC1			500	100	1900	NSL	1500	50	1050	NSL	200	10	108	7.5	250	50	50	650		NSL		10,000	18	518	1,080	1,800	-
Restricted Solid Waste CT2			400	80	400	NSL	400	16	160	NSL	800	3.2	240	16	1000	50	50	2600		NSL		40,000	40	1,152	2,400	4,000	-
Restricted Solid Waste SCC2			2000	400	7600	NSL	6000	200	4200	NSL	800	23	432	30	1000	50	50	2600		NSL		40,000	72	2,073	4,320	7,200	-
Sample Reference	**Sample Depth**	**Sample Description**																									
BH1	0-0.1	Fill: Sandy Gravel	<4	<0.4	**26**	**26**	**41**	<0.1	**9**	**61**	**1.9**	**0.3**	<0.1	<0.1	<0.1	<0.1	<0.1	<25	<50	<100	<100	<50	<0.2	<0.5	<1	<1	Detected
BH1 - [LAB_DUP]	0-0.1	Laboratory Duplicate	**6**	<0.4	**20**	**25**	**27**	<0.1	**10**	**52**	**1.4**	**0.2**	<0.1	<0.1	<0.1	<0.1	<0.1	<25	<50	<100	<100	<50	<0.2	<0.5	<1	<1	NA
BH1 - [LAB_TRIP]	0-0.1	Laboratory Triplicate	**4**	<0.4	**15**	**23**	**28**	<0.1	**11**	**88**	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
BH2	0.1-0.4	Fill: Gravelly Sand	**4**	<0.4	**10**	**16**	**7**	<0.1	**9**	**9**	<0.05	<0.05	<0.1	<0.1	<0.1	<0.1	<0.1	<25	<50	<100	**220**	**220**	<0.2	<0.5	<1	<1	Not Detected
BH3	0.04-0.1	Fill: Sandy Gravel	**5**	<0.4	**12**	**34**	**6**	<0.1	**16**	**15**	<0.05	<0.05	<0.1	<0.1	<0.1	<0.1	<0.1	<25	<50	**220**	**600**	**820**	<0.2	<0.5	<1	<1	Not Detected
BH4	0.04-0.3	Fill: Gravelly Sand	<4	<0.4	**6**	**76**	**3**	<0.1	**34**	**24**	<0.05	<0.05	<0.1	<0.1	<0.1	<0.1	<0.1	<25	<50	**110**	**380**	**490**	<0.2	<0.5	<1	<1	Not Detected
BH5	0.04-0.3	Fill: Gravelly Sand	<4	<0.4	**10**	**13**	**23**	<0.1	**4**	**47**	**1.2**	**0.1**	<0.1	<0.1	<0.1	<0.1	<0.1	<25	<50	<100	<100	<50	<0.2	<0.5	<1	<1	Not Detected
BH7	0-0.1	Fill: Silty Clay	**9**	<0.4	**22**	**14**	**22**	<0.1	**7**	**41**	**31**	**1.8**	<0.1	<0.1	<0.1	<0.1	<0.1	<25	<50	<100	<100	<50	<0.2	<0.5	<1	<1	Not Detected
BH101	0-0.1	Fill: Silty Clay	**5**	<0.4	**14**	**2**	**12**	<0.1	**1**	**8**	**0.3**	**0.07**	<0.1	<0.1	<0.1	<0.1	<0.1	<25	<50	<100	<100	<50	<0.2	<0.5	<1	<1	Not Detected
BH102	0-0.1	Fill: Sandy Clay	**4**	<0.4	**14**	**13**	**43**	<0.1	**3**	**61**	**0.64**	**0.1**	<0.1	<0.1	<0.1	<0.1	<0.1	<25	<50	<100	<100	<50	<0.2	<0.5	<1	<1	Not Detected
BH103	0-0.1	Fill: Sandy Clay	<4	<0.4	**9**	**10**	**29**	<0.1	**3**	**52**	**0.3**	**0.05**	<0.1	<0.1	<0.1	<0.1	<0.1	<25	<50	<100	<100	<50	<0.2	<0.5	<1	<1	Not Detected
BH104	0-0.2	Fill: Sandy Clay	**5**	<0.4	**16**	**8**	**32**	<0.1	**2**	**30**	**2.1**	**0.3**	<0.1	<0.1	<0.1	<0.1	<0.1	<25	<50	<100	<100	<50	<0.2	<0.5	<1	<1	Not Detected
BH105	0.02-0.1	Fill: Sandy Gravel	<4	<0.4	**16**	**29**	**6**	<0.1	**24**	**22**	**0.4**	**0.1**	<0.1	<0.1	<0.1	<0.1	<0.1	<25	<50	**150**	**390**	**540**	<0.2	<0.5	<1	<1	Not Detected
BH106	0.02-0.1	Fill: Sandy Gravel	**4**	<0.4	**17**	**27**	**10**	<0.1	**23**	**42**	<0.05	<0.05	<0.1	<0.1	<0.1	<0.1	<0.1	<25	<50	**280**	**730**	**1010**	<0.2	<0.5	<1	<1	Not Detected
BH107	0-0.1	Fill: Sandy Clay	**10**	**0.5**	**19**	**27**	**58**	<0.1	**10**	**120**	**60**	**3**	<0.1	<0.1	<0.1	<0.1	<0.1	<25	<50	**170**	**110**	**280**	<0.2	<0.5	<1	<1	Not Detected
BH107	0.3-0.45	Silty Clay	NA	NA	NA	NA	NA	NA	NA	NA	<0.05	<0.05	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
BH108	0-0.1	Fill: Silty Sandy Clay	<4	<0.4	**20**	**10**	**36**	<0.1	**13**	**130**	**0.3**	**0.06**	<0.1	<0.1	<0.1	<0.1	<0.1	<25	<50	**110**	**150**	**260**	<0.2	<0.5	<1	<1	Not Detected
BH109	0.015-0.1	Fill: Sandy Gravel	**5**	<0.4	**17**	**28**	**13**	<0.1	**18**	**590**	<0.05	<0.05	<0.1	<0.1	<0.1	<0.1	<0.1	<25	<50	<100	<100	<50	<0.2	<0.5	<1	<1	Not Detected
BH109 - [LAB_DUP]	0.015-0.1	Laboratory Duplicate	**5**	<0.4	**19**	**35**	**16**	<0.1	**22**	**270**	<0.05	<0.05	<0.1	<0.1	<0.1	<0.1	<0.1	<25	<50	<100	<100	<50	<0.2	<0.5	<1	<1	NA
BH109 - [LAB_TRIP]	0.015-0.1	Laboratory Triplicate	**6**	<0.4	**17**	**22**	**15**	<0.1	**14**	**340**	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
BH110	0.04-0.1	Fill: Sandy Gravel	<4	<0.4	**8**	**91**	**16**	<0.1	**8**	**41**	**0.5**	**0.1**	<0.1	<0.1	<0.1	<0.1	<0.1	<25	<50	<100	**130**	**130**	<0.2	<0.5	<1	<1	Not Detected
BH111	0-0.1	Fill: Silty Clay	**7**	<0.4	**18**	**8**	**29**	<0.1	**5**	**32**	**1.6**	**0.2**	<0.1	<0.1	<0.1	<0.1	<0.1	<25	<50	<100	<100	<50	<0.2	<0.5	<1	<1	Not Detected
BH112	0-0.1	Fill: Clayey Sand	<4	<0.4	**14**	**34**	**14**	<0.1	**15**	**38**	**0.4**	**0.1**	<0.1	<0.1	<0.1	<0.1	<0.1	<25	<50	<100	<100	<50	<0.2	<0.5	<1	<1	Not Detected
BH113	0.1-0.3	Fill: Silty Clay	**7**	<0.4	**19**	**15**	**15**	<0.1	**12**	**16**	<0.05	<0.05	<0.1	<0.1	<0.1	<0.1	<0.1	<25	<50	<100	<100	<50	<0.2	<0.5	<1	<1	Not Detected
BH114	0-0.1	Fill: Silty Clay	**14**	**0.5**	**20**	**49**	**100**	<0.1	**4**	**220**	<0.05	<0.05	<0.1	<0.1	<0.1	<0.1	<0.1	<25	<50	<100	<100	<50	<0.2	<0.5	<1	<1	Not Detected
BH115	0-0.15	Fill: Clayey Sand	**7**	<0.4	**16**	**7**	**33**	<0.1	**3**	**76**	<0.05	<0.05	<0.1	<0.1	<0.1	**2**	<0.1	<25	<50	<100	<100	<50	<0.2	<0.5	<1	<1	Not Detected
BH116	0-0.1	Fill: Silty Clay	**7**	<0.4	**15**	**15**	**68**	<0.1	**3**	**100**	**0.2**	**0.05**	<0.1	<0.1	<0.1	<0.1	<0.1	<25	<50	<100	<100	<50	<0.2	<0.5	<1	<1	Not Detected
BH117	0-0.1	Fill: Silty Gravelly Clay	**19**	<0.4	**31**	**19**	**50**	<0.1	**5**	**81**	**0.4**	**0.1**	<0.1	<0.1	<0.1	<0.1	<0.1	<25	<50	<100	<100	<50	<0.2	<0.5	<1	<1	Detected
BH118	0-0.1	Fill: Clayey Gravelly Sand	**11**	<0.4	**21**	**200**	**74**	<0.1	**4**	**110**	**0.5**	**0.07**	<0.1	<0.1	<0.1	<0.1	<0.1	<25	<50	<100	<100	<50	<0.2	<0.5	<1	<1	Not Detected
BH119	0-0.15	Fill: Silty Clay	**10**	<0.4	**22**	**31**	**120**	<0.1	**14**	**140**	<0.05	<0.05	<0.1	<0.1	<0.1	<0.1	<0.1	<25	<50	<100	<100	<50	<0.2	<0.5	<1	<1	Not Detected
BH120	0-0.1	Fill: Silty Clay	**8**	<0.4	**20**	**8**	**33**	**0.4**	**3**	**56**	<0.05	<0.05	<0.1	<0.1	<0.1	<0.1	<0.1	<25	<50	<100	<100	<50	<0.2	<0.5	<1	<1	Detected
BH121	0-0.1	Fill: Silty Clay	**10**	**0.6**	**27**	**31**	**94**	**0.1**	**5**	**230**	**9.1**	**0.9**	<0.1	<0.1	<0.1	<0.1	<0.1	<25	<50	<100	<100	<50	<0.2	<0.5	<1	<1	Not Detected
BH122	0-0.1	Fill: Silty Clay	**20**	<0.4	**16**	**14**	**83**	<0.1	**4**	**140**	**1.6**	**0.1**	<0.1	<0.1	<0.1	<0.1	<0.1	<25	<50	**120**	**140**	**260**	<0.2	<0.5	<1	<1	Detected
BH122 - [LAB_DUP]	0-0.1	Laboratory Duplicate	**32**	<0.4	**21**	**20**	**74**	<0.1	**3**	**120**	**0.9**	**0.1**	<0.1	<0.1	<0.1	<0.1	<0.1	<25	<50	**100**	**120**	**220**	<0.2	<0.5	<1	<1	NA
BH123	0-0.1	Fill: Silty Sandy Clay	**4**	<0.4	**10**	**20**	**23**	<0.1	**3**	**98**	**2.1**	**0.2**	<0.1	<0.1	<0.1	<0.1	<0.1	<25	**84**	**500**	**320**	**904**	<0.2	<0.5	<1	<1	Not Detected
BH123 - [LAB_DUP]	0-0.1	Laboratory Duplicate	<4	<0.4	**9**	**18**	**20**	<0.1	**3**	**93**	**1.1**	**0.1**	<0.1	<0.1	<0.1	<0.1	<0.1	<25	**81**	**430**	**330**	**841**	<0.2	<0.5	<1	<1	NA
BH123_Silica Gel	0-0.1	Fill: Silty Sandy Clay	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	**54**	**170**	**100**	**324**	NA	NA	NA	NA	NA
BH123_Silica Gel - [LAB_DUP]	0-0.1	Laboratory Duplicate	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	**50**	**200**	<100	**250**	NA	NA	NA	NA	NA
BH124	0-0.1	Fill: Silty Clay	**9**	<0.4	**18**	**7**	**57**	<0.1	**3**	**73**	**0.51**	**0.09**	<0.1	<0.1	<0.1	<0.1	<0.1	<25	<50	<100	<100	<50	<0.2	<0.5	<1	<1	Not Detected
SDUP1	0-0.1	Duplicate of BH1	<4	<0.4	**20**	**43**	**38**	<0.1	**14**	**100**	**1.5**	**0.2**	<0.1	<0.1	<0.1	<0.1	<0.1	<25	<50	<100	<100	<50	<0.2	<0.5	<1	<1	NA
SDUP3	0-0.1	Duplicate of BH102	<4	<0.4	**12**	**21**	**61**	<0.1	**4**	**96**	**1**	**0.2**	<0.1	<0.1	<0.1	<0.1	<0.1	<25	<50	<100	<100	<50	<0.2	<0.5	<1	<1	NA
SDUP2	0-0.1	Duplicate of BH112	**9**	<0.4	**22**	**15**	**17**	<0.1	**10**	**32**	<0.05	<0.05	<0.1	<0.1	<0.1	<0.1	<0.1	<25	<50	<100	<100	<50	<0.2	<0.5	<1	<1	NA
SDUP4	0-0.1	Duplicate of BH108	**10**	<0.4	**24**	**9**	**40**	**0.2**	**14**	**110**	**0.35**	**0.09**	<0.1	<0.1	<0.1	<0.1	NA	<25	<50	<100	<100	<50	<0.2	<0.5	<1	NA	Not Detected
FCF1	Surface	Fragment	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	Detected
FCF1-BH116	0-0.1	Fragment	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	Detected
FCF1-BH118	0-0.1	Fragment	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	Detected
FCF1-BH121	0-0.1	Fragment	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	Detected
FCF3-BH122	0-0.1	Fragment	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	Detected
Total Number of Samples			40	40	40	40	40	40	40	40	39	39	38	38	38	38	37	38	40	40	40	40	38	38	38	37	36
Maximum Value			32	0.6	31	200	120	0.4	34	590	60	3	<PQL	<PQL	<PQL	2	<PQL	<PQL	84	500	730	1010	<PQL	<PQL	<PQL	<PQL	Detected

Concentration above the CT1	VALUE
Concentration above SCC1	VALUE
Concentration above the SCC2	VALUE
Concentration above PQL	**Bold**
Asbestos Detected > Special Waste (asbestos)	Detected

TABLE S8
SOIL LABORATORY TCLP RESULTS
All data in mg/L unless stated otherwise

			Lead	B(a)P
PQL - Envirolab Services			0.03	0.001
TCLP1 - General Solid Waste			5	0.04
TCLP2 - Restricted Solid Waste			20	0.16
TCLP3 - Hazardous Waste			>20	>0.16
Sample Reference	**Sample Depth**	**Sample Description**		
BH7	0-0.1	F: Silty Clay	NA	<0.001
BH107	0-0.1	F: Sandy Clay	NA	<0.001
BH119	0-0.15	F: Silty Clay	<0.03	NA
BH121	0-0.1	F: Silty Clay	NA	<0.001
Total Number of samples			1	3
Maximum Value			<PQL	<PQL

General Solid Waste	**VALUE**
Restricted Solid Waste	**VALUE**
Hazardous Waste	**VALUE**
Concentration above PQL	**Bold**

JKGeotechnics

TABLE S9
SUMMARY OF PFAS CONCENTRATIONS IN SOIL - ECOLOGY
Units are µg/Kg unless stated otherwise.

	PQL Envirolab Services	NEMP 2020 Indirect exposure All land use	BH102 0-0.1 Fill: Sandy Clay	BH104 0-0.2 Fill: Sandy Clay	BH109 0.015-0.1 Fill: Sandy Gravel	BH109 - [LAB DUP] 0.015-0.1 Lab Duplicate	BH116 0-0.1 Fill: Silty Clay	BH118 0-0.1 Fill: Clayey Gravelly Sand	BH122 0-0.1 Fill: Silty Clay	BH122 - [LAB DUP] 0-0.1 Lab Duplicate	SDUP6 0-0.1 Duplicate of BH116	SDUP3 0-0.1 Duplicate of BH102
PFAS Compound												
Perfluorobutanesulfonic acid	0.1	NSL	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Perfluoropentanesulfonic acid	0.1	NSL	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Perfluorohexanesulfonic acid - PFHxS	0.1	NSL	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Perfluoroheptanesulfonic acid	0.1	NSL	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Perfluorooctanesulfonic acid PFOS	0.1	10	**5.7**	**4.5**	**0.2**	**0.1**	**1.6**	**0.9**	**0.9**	**0.9**	**1.9**	**5.4**
Perfluorodecanesulfonic acid	0.2	NSL	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Perfluorobutanoic acid	0.2	NSL	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Perfluoropentanoic acid	0.2	NSL	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Perfluorohexanoic acid	0.1	NSL	**0.1**	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.1
Perfluoroheptanoic acid	0.1	NSL	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Perfluorooctanoic acid PFOA	0.1	NSL	**0.3**	**0.3**	<0.1	<0.1	**0.1**	**0.1**	**0.1**	**<0.1**	**0.2**	**0.4**
Perfluorononanoic acid	0.1	NSL	**0.2**	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	**0.2**
Perfluorodecanoic acid	0.5	NSL	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	**0.6**
Perfluoroundecanoic acid	0.5	NSL	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Perfluorododecanoic acid	0.5	NSL	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Perfluorotridecanoic acid	0.5	NSL	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Perfluorotetradecanoic acid	5	NSL	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5
4:2 FTS	0.1	NSL	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
6:2 FTS	0.1	NSL	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
8:2 FTS	0.1	NSL	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
10:2 FTS	0.1	NSL	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Perfluorooctane sulfonamide	1	NSL	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
N-Methyl perfluorooctane sulfonamide	1	NSL	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
N-Ethyl perfluorooctanesulfon amide	1	NSL	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
N-Me perfluorooctanesulfonamid oethanol	1	NSL	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
N-Et perfluorooctanesulfonamid oethanol	5	NSL	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5
MePerfluorooctanesulf-amid oacetic acid	0.2	NSL	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
EtPerfluorooctanesulf-amid oacetic acid	0.2	NSL	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Total Positive PFHxS & PFOS	0.1	NSL	**5.7**	**4.5**	**0.2**	**0.1**	**1.6**	**0.9**	**0.9**	**0.9**	**1.9**	**5.4**
Total Positive PFOS & PFOA	0.1	NSL	**6**	**4.8**	**0.2**	**0.1**	**1.8**	**1**	**1**	**0.9**	**2.1**	**5.8**
Total Positive PFAS	0.1	NSL	**6.3**	**4.8**	**0.2**	**0.1**	**1.8**	**1**	**1**	**0.9**	**2.1**	**6.7**

Positive PFAS result	**Bold**
PFAS result above the SAC	**Bold**

TABLE S10
SUMMARY OF PFAS CONCENTRATIONS IN SOIL - HUMAN HEALTH
Units are µg/Kg unless stated otherwise.

	PQL Envirolab Services	NEMP 2020 Residential accessible soil	BH102 0-0.1 Fill: Sandy Clay	BH104 0-0.2 Fill: Sandy Clay	BH109 0.015-0.1 Fill: Sandy Gravel	BH109 - [LAB DUP] 0.015-0.1 Lab Duplicate	BH116 0-0.1 Fill: Silty Clay	BH118 0-0.1 Fill: Clayey Gravelly Sand	BH122 0-0.1 Fill: Silty Clay	BH122 - [LAB DUP] 0-0.1 Lab Duplicate	SDUP6 0-0.1 Duplicate of BH116	SDUP3 0-0.1 Duplicate of BH102
PFAS Compound												
Perfluorobutanesulfonic acid	0.1	NSL	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Perfluoropentanesulfonic acid	0.1	NSL	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Perfluorohexanesulfonic acid - PFHxS	0.1	NSL	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Perfluoroheptanesulfonic acid	0.1	NSL	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Perfluorooctanesulfonic acid PFOS	0.1	NSL	**5.7**	**4.5**	**0.2**	**0.1**	**1.6**	**0.9**	**0.9**	**0.9**	**1.9**	**5.4**
Perfluorodecanesulfonic acid	0.2	NSL	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Perfluorobutanoic acid	0.2	NSL	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Perfluoropentanoic acid	0.2	NSL	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Perfluorohexanoic acid	0.1	NSL	**0.1**	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	**0.1**
Perfluoroheptanoic acid	0.1	NSL	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Perfluorooctanoic acid PFOA	0.1	300	**0.3**	**0.3**	<0.1	<0.1	**0.1**	**0.1**	**0.1**	<0.1	**0.2**	**0.4**
Perfluorononanoic acid	0.1	NSL	**0.2**	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	**0.2**
Perfluorodecanoic acid	0.5	NSL	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	**0.6**
Perfluoroundecanoic acid	0.5	NSL	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Perfluorododecanoic acid	0.5	NSL	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Perfluorotridecanoic acid	0.5	NSL	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Perfluorotetradecanoic acid	5	NSL	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5
4:2 FTS	0.1	NSL	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
6:2 FTS	0.1	NSL	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
8:2 FTS	0.1	NSL	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
10:2 FTS	0.1	NSL	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Perfluorooctane sulfonamide	1	NSL	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
N-Methyl perfluorooctane sulfonamide	1	NSL	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
N-Ethyl perfluorooctanesulfon amide	1	NSL	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
N-Me perfluorooctanesulfonamid oethanol	1	NSL	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
N-Et perfluorooctanesulfonamid oethanol	5	NSL	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5
MePerfluorooctanesulf-amid oacetic acid	0.2	NSL	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
EtPerfluorooctanesulf-amid oacetic acid	0.2	NSL	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Total Positive PFHxS & PFOS	0.1	10	**5.7**	**4.5**	**0.2**	**0.1**	**1.6**	**0.9**	**0.9**	**0.9**	**1.9**	**5.4**
Total Positive PFOS & PFOA	0.1	NSL	**6**	**4.8**	**0.2**	**0.1**	**1.8**	**1**	**1**	**0.9**	**2.1**	**5.8**
Total Positive PFAS	0.1	NSL	**6.3**	**4.8**	**0.2**	**0.1**	**1.8**	**1**	**1**	**0.9**	**2.1**	**6.7**

Positive PFAS result	**Bold**
PFAS result above the SAC	**Bold**

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TABLE S11
SUMMARY OF PFAS CONCENTRATIONS IN SOIL - WASTE CLASSIFICATION
Units are µg/Kg unless stated otherwise.

	PQL Envirolab Services	SCC1	SCC2	BH102 0-0.1 Fill: Sandy Clay	BH104 0-0.2 Fill: Sandy Clay	BH109 0.015-0.1 Fill: Sandy Gravel	BH109 - [LAB DUP] 0.015-0.1 Lab Duplicate	BH116 0-0.1 Fill: Silty Clay	BH118 0-0.1 Fill: Clayey Gravelly Sand	BH122 0-0.1 Fill: Silty Clay	BH122 - [LAB DUP] 0-0.1 Lab Duplicate	SDUP6 0-0.1 Duplicate of BH116	SDUP3 0-0.1 Duplicate of BH102
PFAS Compound													
Perfluorobutanesulfonic acid	0.1	NSL	NSL	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Perfluoropentanesulfonic acid	0.1	NSL	NSL	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Perfluorohexanesulfonic acid - PFHxS	0.1	NSL	NSL	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Perfluoroheptanesulfonic acid	0.1	NSL	NSL	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Perfluorooctanesulfonic acid PFOS	0.1	NSL	NSL	**5.7**	**4.5**	**0.2**	**0.1**	**1.6**	**0.9**	**0.9**	**0.9**	**1.9**	**5.4**
Perfluorodecanesulfonic acid	0.2	NSL	NSL	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Perfluorobutanoic acid	0.2	NSL	NSL	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Perfluoropentanoic acid	0.2	NSL	NSL	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Perfluorohexanoic acid	0.1	NSL	NSL	**0.1**	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	**0.1**
Perfluoroheptanoic acid	0.1	NSL	NSL	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Perfluorooctanoic acid PFOA	0.1	18,000	72,000	**0.3**	**0.3**	<0.1	<0.1	**0.1**	**0.1**	**0.1**	<0.1	**0.2**	**0.4**
Perfluorononanoic acid	0.1	NSL	NSL	**0.2**	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	**0.2**
Perfluorodecanoic acid	0.5	NSL	NSL	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	**0.6**
Perfluoroundecanoic acid	0.5	NSL	NSL	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Perfluorododecanoic acid	0.5	NSL	NSL	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Perfluorotridecanoic acid	0.5	NSL	NSL	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Perfluorotetradecanoic acid	5	NSL	NSL	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5
4:2 FTS	0.1	NSL	NSL	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
6:2 FTS	0.1	NSL	NSL	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
8:2 FTS	0.1	NSL	NSL	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
10:2 FTS	0.1	NSL	NSL	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Perfluorooctane sulfonamide	1	NSL	NSL	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
N-Methyl perfluorooctane sulfonamide	1	NSL	NSL	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
N-Ethyl perfluorooctanesulfon amide	1	NSL	NSL	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
N-Me perfluorooctanesulfonamid oethanol	1	NSL	NSL	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
N-Et perfluorooctanesulfonamid oethanol	5	NSL	NSL	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5
MePerfluorooctanesulf-amid oacetic acid	0.2	NSL	NSL	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
EtPerfluorooctanesulf-amid oacetic acid	0.2	NSL	NSL	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Total Positive PFHxS & PFOS	0.1	1800	7,200	**5.7**	**4.5**	**0.2**	**0.1**	**1.6**	**0.9**	**0.9**	**0.9**	**1.9**	**5.4**
Total Positive PFOS & PFOA	0.1	NSL	NSL	**6**	**4.8**	**0.2**	**0.1**	**1.8**	**1**	**1**	**0.9**	**2.1**	**5.8**
Total Positive PFAS	0.1	NSL	NSL	**6.3**	**4.8**	**0.2**	**0.1**	**1.8**	**1**	**1**	**0.9**	**2.1**	**6.7**

Result above SCC1 Criteria	**Bold**
Result above SCC2 Criteria	**Bold**

TABLE S12
SUMMARY OF PFAS CONCENTRATIONS IN TCLP LEACHATE - WASTE CLASSIFICATION
Units are µg/L unless stated otherwise.

	PQL Envirolab Services	TCLP1	TCLP2	BH102 0-0.1	BH104 0-0.2	BH109 0.015-0.1	BH109 0.015-0.1	BH116 0-0.1	BH118 0-0.1	BH122 0-0.1
PFAS Compound										
Perfluorobutanesulfonic acid	0.01	NSL	NSL	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Perfluoropentanesulfonic acid	0.01	NSL	NSL	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Perfluorohexanesulfonic acid - PFHxS	0.01	NSL	NSL	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Perfluoroheptanesulfonic acid	0.01	NSL	NSL	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Perfluorooctanesulfonic acid PFOS	0.01	NSL	NSL	**0.02**	**0.03**	**0.01**	**0.01**	<0.01	<0.01	<0.01
Perfluorodecanesulfonic acid	0.02	NSL	NSL	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorobutanoic acid	0.02	NSL	NSL	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Perfluoropentanoic acid	0.02	NSL	NSL	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorohexanoic acid	0.01	NSL	NSL	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Perfluoroheptanoic acid	0.01	NSL	NSL	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Perfluorooctanoic acid PFOA	0.01	500	2,000	<0.01	**0.01**	<0.01	<0.01	<0.01	<0.01	<0.01
Perfluorononanoic acid	0.01	NSL	NSL	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Perfluorodecanoic acid	0.02	NSL	NSL	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Perfluoroundecanoic acid	0.02	NSL	NSL	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorododecanoic acid	0.05	NSL	NSL	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Perfluorotridecanoic acid	0.1	NSL	NSL	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Perfluorotetradecanoic acid	0.5	NSL	NSL	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
4:2 FTS	0.01	NSL	NSL	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
6:2 FTS	0.01	NSL	NSL	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
8:2 FTS	0.02	NSL	NSL	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
10:2 FTS	0.02	NSL	NSL	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorooctane sulfonamide	0.1	NSL	NSL	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
N-Methyl perfluorooctane sulfonamide	0.05	NSL	NSL	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
N-Ethyl perfluorooctanesulfon amide	0.1	NSL	NSL	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
N-Me perfluorooctanesulfonamid oethanol	0.05	NSL	NSL	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
N-Et perfluorooctanesulfonamid oethanol	0.5	NSL	NSL	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
MePerfluorooctanesulf-amid oacetic acid	0.02	NSL	NSL	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
EtPerfluorooctanesulf-amid oacetic acid	0.02	NSL	NSL	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Total Positive PFHxS & PFOS	0.01	50	200	**0.02**	**0.03**	**0.01**	**0.01**	<0.01	<0.01	<0.01
Total Positive PFOS & PFOA	0.01	NSL	NSL	**0.02**	**0.05**	**0.01**	**0.01**	<0.01	<0.01	<0.01
Total Positive PFAS	0.01	NSL	NSL	**0.02**	**0.05**	**0.01**	**0.01**	<0.01	<0.01	<0.01

Result above TCLP1 Criteria	**Bold**
Result above TCLP2 Criteria	**Bold**

TABLE S13
SUMMARY OF SOIL LABORATORY RESULTS - EC and ECe

Borehole Number	Sample Depth (m)	Sample Description	EC (µS/cm)	ECe (dS/m)	Salinity Class
BH1	0.5-0.7	Silty Clay	120	<2	NON SALINE
BH1	1.8-2.0	XW Sandstone	93	<2	NON SALINE
BH1	4.5-4.7	Laminite	34	<2	NON SALINE
BH3	0.4-0.5	Silty Clay	62	<2	NON SALINE
BH3	2.4-2.5	Sandstone	16	<2	NON SALINE
BH3	6.3-6.5	Sandstone	24	<2	NON SALINE
BH5	0.5-0.95	Silty Clay	56	<2	NON SALINE
BH5	1.5-1.7	XW Sandstone	47	<2	NON SALINE
BH5	3.3-3.5	Laminite	32	<2	NON SALINE
BH6	2.7-3.0	Sandstone	40	<2	NON SALINE
BH7	0.5-0.7	Fill: Silty Clay	44	<2	NON SALINE
BH7	1.0-1.2	Silty Clay	52	<2	NON SALINE
BH7	3.3-3.6	Sandstone	34	<2	NON SALINE
BH7 - [LAB_DUP]	3.3-3.6	Laboratory Duplicate	32	<2	NON SALINE
BH8	0.7-0.9	Silty Clay	41	<2	NON SALINE
BH8	2.6-2.8	XW Sandstone	64	<2	NON SALINE
Total Number of Samples			16	16	-
Minimum Value			16	<PQL	-
Maximum Value			120	<PQL	-

ECe Values (dS/m)	Salinity Class
<2	NON SALINE
2 to 4	SLIGHTLY SALINE
4 to 8	MODERATELY SALINE
8 to 16	VERY SALINE
>16	HIGHLY SALINE

TABLE S14
SUMMARY OF RESISTIVITY CALCULATION ON SOIL EC RESULTS

Borehole Number	Sample Depth (m)	Sample Description	EC (µS/cm)	Resistivity (ohm.cm)	Classification Condition B
BH1	0.5-0.7	Silty Clay	120	8,333	Non Aggressive
BH1	1.8-2.0	XW Sandstone	93	10,753	Non Aggressive
BH1	4.5-4.7	Laminite	34	29,412	Non Aggressive
BH3	0.4-0.5	Silty Clay	62	16,129	Non Aggressive
BH3	2.4-2.5	Sandstone	16	62,500	Non Aggressive
BH3	6.3-6.5	Sandstone	24	41,667	Non Aggressive
BH5	0.5-0.95	Silty Clay	56	17,857	Non Aggressive
BH5	1.5-1.7	XW Sandstone	47	21,277	Non Aggressive
BH5	3.3-3.5	Laminite	32	31,250	Non Aggressive
BH6	2.7-3.0	Sandstone	40	25,000	Non Aggressive
BH7	0.5-0.7	Fill: Silty Clay	44	22,727	Non Aggressive
BH7	1.0-1.2	Silty Clay	52	19,231	Non Aggressive
BH7	3.3-3.6	Sandstone	34	29,412	Non Aggressive
BH7 - [LAB_DUP]	3.3-3.6	Laboratory Duplicate	32	31,250	Non Aggressive
BH8	0.7-0.9	Silty Clay	41	24,390	Non Aggressive
BH8	2.6-2.8	XW Sandstone	64	15,625	Non Aggressive
Total Number of Samples			16	16	-
Minimum Value			16	8,333	-
Maximum Value			120	62,500	-

Classification is based on Soil condition 'B' - low permeability soils (e.g. silts & clays) or all soils above groundwater.

Resistivity Values (ohm.cm)	Classification for Steel Piles
>5,000	Non-Aggressive
2,000 - 5,000	Non-Aggressive
1,000 - 2,000	Mildly Aggressive
<1,000	Moderately Aggressive

TABLE S15
SUMMARY OF SOIL LABORATORY RESULTS - pH

Borehole Number	Sample Depth (m)	Sample Description	pH	Classification for Concrete Piles Condition B	Classification for Steel Piles Condition B
BH1	0.5-0.7	Silty Clay	4.4	Moderately Aggressive	Non-Aggressive
BH1 - [LAB_DUP]	0.5-0.7	Laboratory Duplicate	4.5	Moderately Aggressive	Non-Aggressive
BH1	1.8-2.0	XW Sandstone	4.5	Moderately Aggressive	Non-Aggressive
BH1	4.5-4.7	Laminite	6.2	Non-Aggressive	Non-Aggressive
BH3	0.4-0.5	Silty Clay	5.8	Non-Aggressive	Non-Aggressive
BH3	2.4-2.5	Sandstone	5.7	Non-Aggressive	Non-Aggressive
BH3	6.3-6.5	Sandstone	6.1	Non-Aggressive	Non-Aggressive
BH5	0.5-0.95	Silty Clay	4.9	Mildly Aggressive	Non-Aggressive
BH5	1.5-1.7	XW Sandstone	5.6	Non-Aggressive	Non-Aggressive
BH5	3.3-3.5	Laminite	5.9	Non-Aggressive	Non-Aggressive
BH6	2.7-3.0	Sandstone	6	Non-Aggressive	Non-Aggressive
BH7	0.5-0.7	Fill: Silty Clay	6.6	Non-Aggressive	Non-Aggressive
BH7	1.0-1.2	Silty Clay	5.8	Non-Aggressive	Non-Aggressive
BH7	3.3-3.6	Sandstone	6.4	Non-Aggressive	Non-Aggressive
BH7 - [LAB_DUP]	3.3-3.6	Laboratory Duplicate	6.4	Non-Aggressive	Non-Aggressive
BH8	0.7-0.9	Silty Clay	5.8	Non-Aggressive	Non-Aggressive
BH8	2.6-2.8	XW Sandstone	5.5	Mildly Aggressive	Non-Aggressive
BH110	0.04-0.1	Fill: Sandy Gravel	9.9	Non-Aggressive	Non-Aggressive
BH118	0-0.1	Fill: Clayey Gravelly Sand	6.8	Non-Aggressive	Non-Aggressive
Total Number of Samples			19	-	-
Minimum Value			4.4	-	-
Maximum Value			9.9	-	-

Classification is based on Soil condition 'B' - low permeability soils (e.g. silts & clays) or all soils above groundwater.

	Classification for Concrete Piles	pH Value	Classification for Steel Piles
>5.5	Non-Aggressive	>5	Non-Aggressive
4.5 - 5.5	Mildly Aggressive	4.0 - 5.0	Non-Aggressive
4 - 4.5	Moderately Aggressive	3.0 - 4.0	Mildly Aggressive
<4	Severely Aggressive	<3	Moderately Aggressive

TABLE S16
SUMMARY OF SOIL LABORATORY RESULTS - SULPHATE & CHLORIDES

Borehole Number	Sample Depth (m)	Sample Description	Chloride (mg/kg)	Sulphate (mg/kg)	Classification for Concrete Piles Sulfate - Condition B	Classification for Steel Piles Chloride - Condition B
BH1	0.5-0.7	Silty Clay	<10	180	Non-Aggressive	Non-Aggressive
BH1 - [LAB_DUP]	0.5-0.7	Laboratory Duplicate	<10	220	Non-Aggressive	Non-Aggressive
BH1	1.8-2.0	XW Sandstone	<10	140	Non-Aggressive	Non-Aggressive
BH1	4.5-4.7	Laminite	10	27	Non-Aggressive	Non-Aggressive
BH3	0.4-0.5	Silty Clay	10	61	Non-Aggressive	Non-Aggressive
BH3	2.4-2.5	Sandstone	24	20	Non-Aggressive	Non-Aggressive
BH3	6.3-6.5	Sandstone	<10	23	Non-Aggressive	Non-Aggressive
BH5	0.5-0.95	Silty Clay	21	10	Non-Aggressive	Non-Aggressive
BH5	1.5-1.7	XW Sandstone	38	24	Non-Aggressive	Non-Aggressive
BH5	3.3-3.5	Laminite	10	27	Non-Aggressive	Non-Aggressive
BH6	2.7-3.0	Sandstone	20	31	Non-Aggressive	Non-Aggressive
BH7	0.5-0.7	Fill: Silty Clay	<10	20	Non-Aggressive	Non-Aggressive
BH7	1.0-1.2	Silty Clay	<10	61	Non-Aggressive	Non-Aggressive
BH7	3.3-3.6	Sandstone	<10	33	Non-Aggressive	Non-Aggressive
BH7 - [LAB_DUP]	3.3-3.6	Laboratory Duplicate	<10	34	Non-Aggressive	Non-Aggressive
BH8	0.7-0.9	Silty Clay	<10	49	Non-Aggressive	Non-Aggressive
BH8	2.6-2.8	XW Sandstone	41	42	Non-Aggressive	Non-Aggressive
Total Number of Samples			17	17	-	-
Minimum Value			<PQL	10	-	-
Maximum Value			41	220	-	-

Classification is based on Soil condition 'B' - low permeability soils (e.g. silts & clays) or all soils above groundwater.

Sulfate Values	Classification for Concrete Piles	Chloride Values	Classification for Steel Piles
<5,000	Non-Aggressive	<5,000	Non-Aggressive
5,000 - 10,000	Mildly Aggressive	5,000 - 20,000	Non-Aggressive
10,000 - 20,000	Moderately Aggressive	20,000 - 50,000	Mildly Aggressive
>20,000	Severely Aggressive	>50,000	Moderately Aggressive

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TABLE S17
SUMMARY OF SOIL LABORATORY RESULTS - CEC & ESP

Borehole Number	Sample Depth (m)	Sample Description	Exchangeable Ca	Exchangeable K	Exchangeable Mg	Exchangeable Na	CEC	ESP	Ca:Mg
					(meq/100g)			%	
BH1	0.5-0.7	Silty Clay	2.4	<0.1	4.9	<0.1	7.5	1.3%	0.49:1
BH3	0.4-0.5	Silty Clay	0.7	0.2	8.9	0.5	10	5%	0.08:1
BH7	0.5-0.7	Fill: Silty Clay	4.3	<0.1	2.6	<0.1	7.1	1.4%	1.65:1
BH8	0.7-0.9	Silty Clay	0.6	0.2	7	0.5	8.3	6%	0.09:1
BH109	0.015-0.1	Fill: Sandy Gravel	9.3	0.2	3.1	0.3	13	2.3%	3:1
BH110	0.04-0.1	Fill: Sandy Gravel	23	0.1	0.2	<0.1	23	0.4%	115:1
BH118	0-0.1	Fill: Clayey Gravelly Sand	7.9	0.3	1.1	<0.1	9.2	1.1%	7.18:1
BH121	0-0.1	Fill: Silty Clay	10	0.3	1.6	<0.1	12	0.8%	6.25:1
Total Number of Samples			8	8	8	8	8	8	8
Minimum Value			0.6	<PQL	0.2	<PQL	7.1	0.4%	0.08 :1
Maximum Value			23	0.3	8.9	0.5	23	6%	115 :1

ESP Value	**Sodicity Rating**
< 5%	Non-Sodic
5% to 15%	Sodic
> 15%	Highly Sodic

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TABLE S18
SUMMARY OF LABORATORY RESULTS - ACID SULFATE SOIL ANALYSIS

Soil Texture:	Coarse	Analysis	pH_F and pH_{FOX}					Actual Acidity (Titratable Actual Acidity - TAA)	Potential Sulfidic Acidity		Retained Acidity	Acid Neutralising Capacity (ANC_{BT})	a-Net Acidity without ANCE	s-Net Acidity without ANCE	Liming Rate - without ANCE
			pH_F	pH_{FOX}	Reaction	pH_F - pH_{FOX}	pH_{KCL}	(mol H^+/t)	(% SCr)	(mol H^+/t)	($\%S_{NAS}$)	(% $CaCO_3$)	(mol H^+/t)	(%w/w S)	(kg $CaCO_3$/tonne)
National Acid Sulfate Soils Guidance (2018)			-	-	-	-	-	-	-	-	-	-	18	0.03	-
Sample Reference	**Sample Depth (m)**	**Sample Description**													
BH1	0-0.1	Fill: Sandy Gravel	8.3	7.5	High reaction	0.8	NA	NA	NA	NA	NA	NA	NA	NA	NA
BH1	0.8-1.0	Silty Clay	5	6.4	Low reaction	-1.4	NA	NA	NA	NA	NA	NA	NA	NA	NA
BH1	1.3-1.5	Silty Clay	4.3	3.6	Low reaction	0.7	NA	NA	NA	NA	NA	NA	NA	NA	NA
BH1	2.8-3.0	Sandstone	4.7	3.9	Low reaction	0.8	4.3	38	<0.005	<3	<0.005	[NT]	41	0.065	3.1
BH1	4.5-4.7	Laminite	5.3	4.2	Low reaction	1.1	NA	NA	NA	NA	NA	NA	NA	NA	NA
BH1	5.4-5.6	Sandstone	5.1	4.2	Low reaction	0.9	NA	NA	NA	NA	NA	NA	NA	NA	NA
BH3	0.4-0.5	Silty Clay	5.8	4.7	Low reaction	1.1	NA	NA	NA	NA	NA	NA	NA	NA	NA
BH3	0.8-0.95	Silty Clay	5.4	4.2	Low reaction	1.2	NA	NA	NA	NA	NA	NA	NA	NA	NA
BH3	1.9-2.0	XW Sandstone	5	3.9	Low reaction	1.1	NA	NA	NA	NA	NA	NA	NA	NA	NA
BH3	3.4-3.5	Sandstone	5.3	4.1	Low reaction	1.2	NA	NA	NA	NA	NA	NA	NA	NA	NA
BH3	3.9-4.0	Sandstone	5.3	3.9	Low reaction	1.4	NA	NA	NA	NA	NA	NA	NA	NA	NA
BH3	6.3-6.5	Sandstone	5.4	4.2	Low reaction	1.2	NA	NA	NA	NA	NA	NA	NA	NA	NA
BH5	0.5-0.95	Silty Clay	4.6	3.8	Low reaction	0.8	NA	NA	NA	NA	NA	NA	NA	NA	NA
BH5	1.3-1.5	Silty Clay	4.7	3.5	Low reaction	1.2	NA	NA	NA	NA	NA	NA	NA	NA	NA
BH5	1.8-2.0	XW Sandstone	5.1	3.9	Low reaction	1.2	NA	NA	NA	NA	NA	NA	NA	NA	NA
BH5	2.8-3.0	Laminite	5.4	3.3	Low reaction	2.1	4.4	26	<0.005	<3	0.005	[NT]	31	0.049	2.3
BH5	3.3-3.5	Laminite	5.3	3.9	Low reaction	1.4	NA	NA	NA	NA	NA	NA	NA	NA	NA
BH6	2.7-3.0	Sandstone	6.8	4.8	Low reaction	2	NA	NA	NA	NA	NA	NA	NA	NA	NA
BH7	0.5-0.7	Fill: Silty Clay	7.8	5.8	Low reaction	2	NA	NA	NA	NA	NA	NA	NA	NA	NA
BH7	1.0-1.2	Silty Clay	7.8	4.4	Low reaction	3.4	4.2	83	<0.005	<3	<0.005	[NT]	86	0.14	6.5
BH7	2.8-3.0	XW Sandstone	6.4	5	Low reaction	1.4	NA	NA	NA	NA	NA	NA	NA	NA	NA
BH7	3.3-3.6	Sandstone	6.2	4.3	Low reaction	1.9	NA	NA	NA	NA	NA	NA	NA	NA	NA
BH8	0.7-0.9	Silty Clay	7.3	4.2	Low reaction	3.1	4.3	31	0.005	3	<0.005	[NT]	37	0.059	2.8
BH8	1.7-2.0	Silty Clay	5.9	4.2	Low reaction	1.7	NA	NA	NA	NA	NA	NA	NA	NA	NA
BH8	2.6-2.8	XW Sandstone	5.9	4.8	Low reaction	1.1	NA	NA	NA	NA	NA	NA	NA	NA	NA
BH8	3.5-3.7	Sandstone	5.9	4.7	Low reaction	1.2	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total Number of Samples			26	26	-	26	4	4	4	4	4	4	4	4	4
Minimum Value			4.3	3.3	-	-1.4	4.2	26	<PQL	<PQL	<PQL	<PQL	31	0.049	2.3
Maximum Value			8.3	7.5	-	3.4	4.4	83	0.005	3	0.005	<PQL	86	0.14	6.5

Values Exceeding Action Criteria

TABLE G1
SUMMARY OF GROUNDWATER LABORATORY RESULTS COMPARED TO ECOLOGICAL GILs SAC
All results in µg/L unless stated otherwise.

	PQL Envirolab Services	ANZG 2018 Marine Waters	SAMPLES					
			MW1	MW1 [LAB_DUP]	MW3	MW6	WDUP1	WDUP2
Inorganic Compounds and Parameters								
pH	-	7 - 8.5	5.3	NA	5.2	5.6	NA	NA
Electrical Conductivity (µS/cm)	1	NSL	**1300**	NA	**200**	**1400**	NA	NA
Chloride (mg/L)	1	NSL	**130**	NA	**27**	**510**	NA	NA
Sulphate (mg/L)	1	NSL	**340**	NA	**35**	**87**	NA	NA
Metals and Metalloids								
Arsenic (As III)	1	2.3	<1	[NT]	<1	<1	<1	<1
Cadmium	0.1	0.7	<0.1	[NT]	<0.1	<0.1	<0.1	<0.1
Chromium (SAC for Cr III adopted)	1	27	<1	[NT]	<1	<1	<1	<1
Copper	1	1.3	**2**	[NT]	**1**	**1**	**2**	**1**
Lead	1	4.4	<1	[NT]	<1	<1	<1	<1
Total Mercury (inorganic)	0.05	0.1	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Nickel	1	7	**3**	[NT]	<1	**13**	**3**	<1
Zinc	1	15	**14**	[NT]	**6**	**71**	**14**	**4**
Monocyclic Aromatic Hydrocarbons (BTEX Compounds)								
Benzene	1	500	<1	<1	<1	<1	<1	<1
Toluene	1	180	<1	<1	<1	<1	<1	<1
Ethylbenzene	1	5	<1	<1	<1	<1	<1	<1
m+p-xylene	2	75	<2	<2	<2	<2	<2	<2
o-xylene	1	350	<1	<1	<1	<1	<1	<1
Total xylenes	2	NSL	<2	<2	<2	<2	<2	<2
Total Recoverable Hydrocarbons (TRHs)								
TRH F1	10	NSL	<10	<10	<10	<10	<10	<10
TRH F2	50	NSL	<50	<50	<50	<50	<50	<50
TRH F3	100	NSL	<100	<100	<100	<100	<100	<100
TRH F4	100	NSL	<100	<100	<100	<100	<100	<100
Volatile Organic Compounds (VOCs), including chlorinated VOCs								
Dichlorodifluoromethane	10	NSL	<10	<10	<10	<10	<10	<10
Chloromethane	10	NSL	<10	<10	<10	<10	<10	<10
Vinyl Chloride	10	100	<10	<10	<10	<10	<10	<10
Bromomethane	10	NSL	<10	<10	<10	<10	<10	<10
Chloroethane	10	NSL	<10	<10	<10	<10	<10	<10
Trichlorofluoromethane	10	NSL	<10	<10	<10	<10	<10	<10
1,1-Dichloroethene	1	700	<1	<1	<1	<1	<1	<1
Trans-1,2-dichloroethene	1	NSL	<1	<1	<1	<1	<1	<1
1,1-dichloroethane	1	250	<1	<1	<1	<1	<1	<1
Cis-1,2-dichloroethene	1	NSL	<1	<1	<1	<1	<1	<1
Bromochloromethane	1	NSL	<1	<1	<1	<1	<1	<1
Chloroform	1	370	<1	<1	<1	<1	<1	<1
2,2-dichloropropane	1	NSL	<1	<1	<1	<1	<1	<1
1,2-dichloroethane	1	1900	<1	<1	<1	<1	<1	<1
1,1,1-trichloroethane	1	270	<1	<1	<1	<1	<1	<1
1,1-dichloropropene	1	NSL	<1	<1	<1	<1	<1	<1
Cyclohexane	1	NSL	<1	<1	<1	<1	<1	<1
Carbon tetrachloride	1	240	<1	<1	<1	<1	<1	<1
Benzene	1	500	<1	<1	<1	<1	<1	<1
Dibromomethane	1	NSL	<1	<1	<1	<1	<1	<1
1,2-dichloropropane	1	900	<1	<1	<1	<1	<1	<1
Trichloroethene	1	330	<1	<1	<1	<1	<1	<1
Bromodichloromethane	1	NSL	<1	<1	<1	<1	<1	<1
trans-1,3-dichloropropene	1	NSL	<1	<1	<1	<1	<1	<1
cis-1,3-dichloropropene	1	NSL	<1	<1	<1	<1	<1	<1
1,1,2-trichloroethane	1	1900	<1	<1	<1	<1	<1	<1
Toluene	1	180	<1	<1	<1	<1	<1	<1
1,3-dichloropropane	1	1100	<1	<1	<1	<1	<1	<1
Dibromochloromethane	1	NSL	<1	<1	<1	<1	<1	<1
1,2-dibromoethane	1	NSL	<1	<1	<1	<1	<1	<1
Tetrachloroethene	1	70	<1	<1	<1	<1	<1	<1
1,1,1,2-tetrachloroethane	1	NSL	<1	<1	<1	<1	<1	<1
Chlorobenzene	1	55	<1	<1	<1	<1	<1	<1
Ethylbenzene	1	5	<1	<1	<1	<1	<1	<1
Bromoform	1	NSL	<1	<1	<1	<1	<1	<1
m+p-xylene	2	75	<2	<2	<2	<2	<2	<2
Styrene	1	NSL	<1	<1	<1	<1	<1	<1
1,1,2,2-tetrachloroethane	1	400	<1	<1	<1	<1	<1	<1
o-xylene	1	350	<1	<1	<1	<1	<1	<1
1,2,3-trichloropropane	1	NSL	<1	<1	<1	<1	<1	<1
Isopropylbenzene	1	30	<1	<1	<1	<1	<1	<1
Bromobenzene	1	NSL	<1	<1	<1	<1	<1	<1
n-propyl benzene	1	NSL	<1	<1	<1	<1	<1	<1
2-chlorotoluene	1	NSL	<1	<1	<1	<1	<1	<1
4-chlorotoluene	1	NSL	<1	<1	<1	<1	<1	<1
1,3,5-trimethyl benzene	1	NSL	<1	<1	<1	<1	<1	<1
Tert-butyl benzene	1	NSL	<1	<1	<1	<1	<1	<1
1,2,4-trimethyl benzene	1	NSL	<1	<1	<1	<1	<1	<1
1,3-dichlorobenzene	1	260	<1	<1	<1	<1	<1	<1
Sec-butyl benzene	1	NSL	<1	<1	<1	<1	<1	<1
1,4-dichlorobenzene	1	60	<1	<1	<1	<1	<1	<1
4-isopropyl toluene	1	NSL	<1	<1	<1	<1	<1	<1
1,2-dichlorobenzene	1	160	<1	<1	<1	<1	<1	<1
n-butyl benzene	1	NSL	<1	<1	<1	<1	<1	<1
1,2-dibromo-3-chloropropane	1	NSL	<1	<1	<1	<1	<1	<1
1,2,4-trichlorobenzene	1	20	<1	<1	<1	<1	<1	<1
Hexachlorobutadiene	1	NSL	<1	<1	<1	<1	<1	<1
1,2,3-trichlorobenzene	1	3	<1	<1	<1	<1	<1	<1
Polycyclic Aromatic Hydrocarbons (PAHs)								
Naphthalene	0.2	50	<0.2	<0.2	<0.2	<0.2	<0.2	<0.1
Acenaphthylene	0.1	NSL	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Acenaphthene	0.1	NSL	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Fluorene	0.1	NSL	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Phenanthrene	0.1	0.6	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Anthracene	0.1	0.01	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Fluoranthene	0.1	1	**0.2**	**0.2**	**0.2**	**0.2**	**0.2**	<0.1
Pyrene	0.1	NSL	**0.2**	**0.2**	**0.1**	**0.2**	**0.1**	<0.1
Benzo(a)anthracene	0.1	NSL	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Chrysene	0.1	NSL	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Benzo(b,j+k)fluoranthene	0.2	NSL	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Benzo(a)pyrene	0.1	0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Indeno(1,2,3-c,d)pyrene	0.1	NSL	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Dibenzo(a,h)anthracene	0.1	NSL	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Benzo(g,h,i)perylene	0.1	NSL	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Total PAHs	0.1	NSL	**0.38**	**0.36**	**0.3**	**0.38**	**0.32**	<0.1

Concentration above the SAC	**VALUE**
Concentration above the PQL	**Bold**
GIL >PQL	Red

TABLE G2
SUMMARY OF GROUNDWATER LABORATORY RESULTS COMPARED TO HUMAN CONTACT GILs
All results in µg/L unless stated otherwise.

	PQL Envirolab Services	Recreational (10 x NHMRC ADWG)	MW1	MW1 [LAB_DUP]	MW3	MW6	WDUP1	WDUP2
Inorganic Compounds and Parameters								
pH	-	6.5 - 8.5	5.3	NA	5.2	5.6	NA	NA
Electrical Conductivity (µS/cm)	1	NSL	**1300**	NA	**200**	**1400**	NA	NA
Chloride (mg/L)	1	NSL	**130**	NA	**27**	**510**	NA	NA
Sulphate (mg/L)	1	NSL	**340**	NA	**35**	**87**	NA	NA
Metals and Metalloids								
Arsenic (As III)	1	100	<1	[NT]	<1	<1	<1	<1
Cadmium	0.1	20	<0.1	[NT]	<0.1	<0.1	<0.1	<0.1
Chromium (total)	1	500	<1	[NT]	<1	<1	<1	<1
Copper	1	20000	**2**	[NT]	**1**	**1**	**2**	**1**
Lead	1	100	<1	[NT]	<1	<1	<1	<1
Total Mercury (inorganic)	0.05	10	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Nickel	1	200	**3**	[NT]	<1	**13**	**3**	<1
Zinc	1	30000	**14**	[NT]	**6**	**71**	**14**	**4**
Monocyclic Aromatic Hydrocarbons (BTEX Compounds)								
Benzene	1	10	<1	<1	<1	<1	<1	<1
Toluene	1	8000	<1	<1	<1	<1	<1	<1
Ethylbenzene	1	3000	<1	<1	<1	<1	<1	<1
m+p-xylene	2	NSL	<2	<2	<2	<2	<2	<2
o-xylene	1	NSL	<1	<1	<1	<1	<1	<1
Total xylenes	2	6000	<2	<2	<2	<2	<2	<2
Total Recoverable Hydrocarbons (TRHs)								
TRH F1	10	NSL	<10	<10	<10	<10	<10	<10
TRH F2	50	NSL	<50	<50	<50	<50	<50	<50
TRH F3	100	NSL	<100	<100	<100	<100	<100	<100
TRH F4	100	NSL	<100	<100	<100	<100	<100	<100
Volatile Organic Compounds (VOCs), including chlorinated VOCs								
Dichlorodifluoromethane	10	NSL	<10	<10	<10	<10	<10	<10
Chloromethane	10	NSL	<10	<10	<10	<10	<10	<10
Vinyl Chloride	10	3	<10	<10	<10	<10	<10	<10
Bromomethane	10	NSL	<10	<10	<10	<10	<10	<10
Chloroethane	10	NSL	<10	<10	<10	<10	<10	<10
Trichlorofluoromethane	10	NSL	<10	<10	<10	<10	<10	<10
1,1-Dichloroethene	1	300	<1	<1	<1	<1	<1	<1
Trans-1,2-dichloroethene	1	600	<1	<1	<1	<1	<1	<1
1,1-dichloroethane	1	NSL	<1	<1	<1	<1	<1	<1
Cis-1,2-dichloroethene	1	600	<1	<1	<1	<1	<1	<1
Bromochloromethane	1	2500	<1	<1	<1	<1	<1	<1
Chloroform	1		<1	<1	<1	<1	<1	<1
2,2-dichloropropane	1	NSL	<1	<1	<1	<1	<1	<1
1,2-dichloroethane	1	30	<1	<1	<1	<1	<1	<1
1,1,1-trichloroethane	1	NSL	<1	<1	<1	<1	<1	<1
1,1-dichloropropene	1	NSL	<1	<1	<1	<1	<1	<1
Cyclohexane	1	NSL	<1	<1	<1	<1	<1	<1
Carbon tetrachloride	1	30	<1	<1	<1	<1	<1	<1
Benzene	1	10	<1	<1	<1	<1	<1	<1
Dibromomethane	1	NSL	<1	<1	<1	<1	<1	<1
1,2-dichloropropane	1	NSL	<1	<1	<1	<1	<1	<1
Trichloroethene	1	NSL	<1	<1	<1	<1	<1	<1
Bromodichloromethane	1	NSL	<1	<1	<1	<1	<1	<1
trans-1,3-dichloropropene	1	1000	<1	<1	<1	<1	<1	<1
cis-1,3-dichloropropene	1	1000	<1	<1	<1	<1	<1	<1
1,1,2-trichloroethane	1	NSL	<1	<1	<1	<1	<1	<1
Toluene	1	8000	<1	<1	<1	<1	<1	<1
1,3-dichloropropane	1	NSL	<1	<1	<1	<1	<1	<1
Dibromochloromethane	1	NSL	<1	<1	<1	<1	<1	<1
1,2-dibromoethane	1	NSL	<1	<1	<1	<1	<1	<1
Tetrachloroethene	1	500	<1	<1	<1	<1	<1	<1
1,1,1,2-tetrachloroethane	1	NSL	<1	<1	<1	<1	<1	<1
Chlorobenzene	1	3000	<1	<1	<1	<1	<1	<1
Ethylbenzene	1	3000	<1	<1	<1	<1	<1	<1
Bromoform	1	NSL	<1	<1	<1	<1	<1	<1
m+p-xylene	2	NSL	<2	<2	<2	<2	<2	<2
Styrene	1	300	<1	<1	<1	<1	<1	<1
1,1,2,2-tetrachloroethane	1	NSL	<1	<1	<1	<1	<1	<1
o-xylene	1	NSL	<1	<1	<1	<1	<1	<1
1,2,3-trichloropropane	1	NSL	<1	<1	<1	<1	<1	<1
Isopropylbenzene	1	NSL	<1	<1	<1	<1	<1	<1
Bromobenzene	1	NSL	<1	<1	<1	<1	<1	<1
n-propyl benzene	1	NSL	<1	<1	<1	<1	<1	<1
2-chlorotoluene	1	NSL	<1	<1	<1	<1	<1	<1
4-chlorotoluene	1	NSL	<1	<1	<1	<1	<1	<1
1,3,5-trimethyl benzene	1	NSL	<1	<1	<1	<1	<1	<1
Tert-butyl benzene	1	NSL	<1	<1	<1	<1	<1	<1
1,2,4-trimethyl benzene	1	NSL	<1	<1	<1	<1	<1	<1
1,3-dichlorobenzene	1	200	<1	<1	<1	<1	<1	<1
Sec-butyl benzene	1	NSL	<1	<1	<1	<1	<1	<1
1,4-dichlorobenzene	1	400	<1	<1	<1	<1	<1	<1
4-isopropyl toluene	1	NSL	<1	<1	<1	<1	<1	<1
1,2-dichlorobenzene	1	15000	<1	<1	<1	<1	<1	<1
n-butyl benzene	1	NSL	<1	<1	<1	<1	<1	<1
1,2-dibromo-3-chloropropane	1	NSL	<1	<1	<1	<1	<1	<1
1,2,4-trichlorobenzene	1	300	<1	<1	<1	<1	<1	<1
1,2,3-trichlorobenzene	1		<1	<1	<1	<1	<1	<1
Hexachlorobutadiene	1	7	<1	<1	<1	<1	<1	<1
Polycyclic Aromatic Hydrocarbons (PAHs)								
Naphthalene	0.2	NSL	<0.2	<0.2	<0.2	<0.2	<0.2	<0.1
Acenaphthylene	0.1	NSL	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Acenaphthene	0.1	NSL	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Fluorene	0.1	NSL	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Phenanthrene	0.1	NSL	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Anthracene	0.1	NSL	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Fluoranthene	0.1	NSL	**0.2**	**0.2**	**0.2**	**0.2**	**0.2**	<0.1
Pyrene	0.1	NSL	**0.2**	**0.2**	**0.1**	**0.2**	**0.1**	<0.1
Benzo(a)anthracene	0.1	NSL	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Chrysene	0.1	NSL	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Benzo(b,j+k)fluoranthene	0.2	NSL	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Benzo(a)pyrene	0.1	0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Indeno(1,2,3-c,d)pyrene	0.1	NSL	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Dibenzo(a,h)anthracene	0.1	NSL	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Benzo(g,h,i)perylene	0.1	NSL	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Total PAHs	0.1	NSL	**0.38**	**0.36**	**0.3**	**0.38**	**0.32**	<0.1

Concentration above the SAC	**VALUE**
Concentration above the PQL	**Bold**
GIL >PQL	Red

TABLE G3
GROUNDWATER LABORATORY RESULTS COMPARED TO HSLs
All data in µg/L unless stated otherwise

				C_6-C_{10} (F1)	>C_{10}-C_{16} (F2)	Benzene	Toluene	Ethylbenzene	Xylenes	Naphthalene	PID
PQL - Envirolab Services				10	50	1	1	1	2	1	
NEPM 2013 - Land Use Category				**HSL-A/B: LOW/HIGH DENSITY RESIDENTIAL**							
Sample Reference	**Water Depth**	**Depth Category**	**Soil Category**								
MW1	3.27	2m to <4m	Sand	<10	<50	<1	<1	<1	<2	<1	3.5
MW1 - [LAB DUP]	3.27	2m to <4m	Sand	<10	<50	<1	<1	<1	<2	<1	NA
MW3	2.6	2m to <4m	Sand	<10	<50	<1	<1	<1	<2	<1	2.6
MW6	2.76	2m to <4m	Sand	<10	<50	<1	<1	<1	<2	<1	41.5
WDUP1	3.27	2m to <4m	Sand	<10	<50	<1	<1	<1	<2	<1	NA
WDUP2	2.6	2m to <4m	Sand	<10	<50	<1	<1	<1	<2	<1	NA
Total Number of Samples				6	6	6	6	6	6	6	3
Maximum Value				<PQL	<PQL	<PQL	<PQL	<PQL	<PQL	<PQL	41.5

Concentration above the SAC **VALUE**
Site specific assesment (SSA) required **VALUE**
Concentration above the PQL **Bold**
The guideline corresponding to the elevated value is highlighted in grey in the Groundwater Assessment Criteria Table below

HSL GROUNDWATER ASSESSMENT CRITERIA

Sample Reference	**Water Depth**	**Depth Category**	**Soil Category**	C_6-C_{10} (F1)	>C_{10}-C_{16} (F2)	Benzene	Toluene	Ethylbenzene	Xylenes	Naphthalene
MW1	3.27	2m to <4m	Sand	1000	1000	800	NL	NL	NL	NL
MW1 - [LAB DUP]	3.27	2m to <4m	Sand	1000	1000	800	NL	NL	NL	NL
MW3	2.6	2m to <4m	Sand	1000	1000	800	NL	NL	NL	NL
MW6	2.76	2m to <4m	Sand	1000	1000	800	NL	NL	NL	NL
WDUP1	3.27	2m to <4m	Sand	1000	1000	800	NL	NL	NL	NL
WDUP2	2.6	2m to <4m	Sand	1000	1000	800	NL	NL	NL	NL

TABLE G4
SUMMARY OF PFAS CONCENTRATIONS IN GROUNDWATER - ECOLOGY
All results in µg/L unless stated otherwise.

	PQL Envirolab Services	NEMP 2020 Interim 99% Marine	SAMPLES					
			MW1	MW1 [LAB_DUP]	MW3	MW6	WDUP1	WDUP2
PFAS Compound								
Perfluorobutanesulfonic acid	0.1	NSL	**0.0097**	**0.01**	**0.003**	**0.003**	**0.01**	<0.02
Perfluoropentanesulfonic acid	0.1	NSL	**0.004**	**0.004**	**0.001**	<0.001	**0.005**	<0.02
Perfluorohexanesulfonic acid - PFHxS	0.1	NSL	**0.0043**	**0.0041**	**0.0033**	**0.0048**	**0.0031**	<0.01
Perfluoroheptanesulfonic acid	0.1	NSL	<0.001	<0.001	<0.001	<0.001	<0.001	<0.02
Perfluorooctanesulfonic acid PFOS	0.1	0.00023	**0.002**	**0.001**	**0.001**	**0.0047**	**0.001**	<0.01
Perfluorodecanesulfonic acid	0.2	NSL	<0.002	<0.002	<0.002	<0.002	<0.002	<0.02
Perfluorobutanoic acid	0.2	NSL	<0.002	<0.002	<0.002	<0.002	<0.002	<0.1
Perfluoropentanoic acid	0.2	NSL	**0.002**	**0.002**	<0.002	<0.002	**0.002**	<0.02
Perfluorohexanoic acid	0.1	NSL	**0.002**	**0.002**	<0.0004	<0.0004	**0.002**	<0.02
Perfluoroheptanoic acid	0.1	NSL	**0.0006**	<0.0004	<0.0004	<0.0004	**0.0004**	<0.02
Perfluorooctanoic acid PFOA	0.1	19	**0.001**	**0.001**	**0.0006**	**0.002**	**0.0009**	<0.01
Perfluorononanoic acid	0.1	NSL	<0.001	<0.001	<0.001	<0.001	<0.001	<0.02
Perfluorodecanoic acid	0.5	NSL	<0.002	<0.002	<0.002	<0.002	<0.002	<0.02
Perfluoroundecanoic acid	0.5	NSL	<0.002	<0.002	<0.002	<0.002	<0.002	<0.02
Perfluorododecanoic acid	0.5	NSL	<0.005	<0.005	<0.005	<0.005	<0.005	<0.02
Perfluorotridecanoic acid	0.5	NSL	<0.01	<0.01	<0.01	<0.01	<0.01	<0.02
Perfluorotetradecanoic acid	5	NSL	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
4:2 FTS	0.1	NSL	<0.001	<0.001	<0.001	<0.001	<0.001	<0.05
6:2 FTS	0.1	NSL	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004	<0.05
8:2 FTS	0.1	NSL	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004	<0.05
10:2 FTS	0.1	NSL	<0.002	<0.002	<0.002	<0.002	<0.002	<0.05
Perfluorooctane sulfonamide	1	NSL	<0.01	<0.01	<0.01	<0.01	<0.01	<0.02
N-Methyl perfluorooctane sulfonamide	1	NSL	<0.005	<0.005	<0.005	<0.005	<0.005	<0.05
N-Ethyl perfluorooctanesulfon amide	1	NSL	<0.01	<0.01	<0.01	<0.01	<0.01	<0.05
N-Me perfluorooctanesulfonamid oethanol	1	NSL	<0.005	<0.005	<0.005	<0.005	<0.005	<0.05
N-Et perfluorooctanesulfonamid oethanol	5	NSL	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
MePerfluorooctanesulf-amid oacetic acid	0.2	NSL	<0.002	<0.002	<0.002	<0.002	<0.002	<0.02
EtPerfluorooctanesulf-amid oacetic acid	0.2	NSL	<0.002	<0.002	<0.002	<0.002	<0.002	<0.02
Total Positive PFHxS & PFOS	0.1	NSL	**0.006**	**0.0054**	**0.0046**	**0.0095**	**0.0046**	<0.01
Total Positive PFOS & PFOA	0.1	NSL	**0.003**	**0.0025**	**0.002**	**0.0062**	**0.0024**	<0.01
Total Positive PFAS	0.1	NSL	**0.025**	**0.025**	**0.0094**	**0.014**	**0.025**	<0.01

Positive PFAS result	**Bold**
PFAS result above the SAC	**Bold** (highlighted)

TABLE G5
SUMMARY OF PFAS CONCENTRATIONS IN GROUNDWATER - HUMAN HEALTH
All results in µg/L unless stated otherwise.

	PQL Envirolab Services	NEMP 2020 Recreational	SAMPLES					
			MW1	MW1 [LAB_DUP]	MW3	MW6	WDUP1	WDUP2
PFAS Compound								
Perfluorobutanesulfonic acid	0.1	NSL	**0.0097**	**0.01**	**0.003**	**0.003**	**0.01**	<0.02
Perfluoropentanesulfonic acid	0.1	NSL	**0.004**	**0.004**	**0.001**	<0.001	**0.005**	<0.02
Perfluorohexanesulfonic acid - PFHxS	0.1	NSL	**0.0043**	**0.0041**	**0.0033**	**0.0048**	**0.0031**	<0.01
Perfluoroheptanesulfonic acid	0.1	NSL	<0.001	<0.001	<0.001	<0.001	<0.001	<0.02
Perfluorooctanesulfonic acid PFOS	0.1	NSL	**0.002**	**0.001**	**0.001**	**0.0047**	**0.001**	<0.01
Perfluorodecanesulfonic acid	0.2	NSL	<0.002	<0.002	<0.002	<0.002	<0.002	<0.02
Perfluorobutanoic acid	0.2	NSL	<0.002	<0.002	<0.002	<0.002	<0.002	<0.1
Perfluoropentanoic acid	0.2	NSL	**0.002**	**0.002**	<0.002	<0.002	**0.002**	<0.02
Perfluorohexanoic acid	0.1	NSL	**0.002**	**0.002**	<0.0004	<0.0004	**0.002**	<0.02
Perfluoroheptanoic acid	0.1	NSL	**0.0006**	<0.0004	<0.0004	<0.0004	**0.0004**	<0.02
Perfluorooctanoic acid PFOA	0.1	10	**0.001**	**0.001**	**0.0006**	**0.002**	**0.0009**	<0.01
Perfluorononanoic acid	0.1	NSL	<0.001	<0.001	<0.001	<0.001	<0.001	<0.02
Perfluorodecanoic acid	0.5	NSL	<0.002	<0.002	<0.002	<0.002	<0.002	<0.02
Perfluoroundecanoic acid	0.5	NSL	<0.002	<0.002	<0.002	<0.002	<0.002	<0.02
Perfluorododecanoic acid	0.5	NSL	<0.005	<0.005	<0.005	<0.005	<0.005	<0.02
Perfluorotridecanoic acid	0.5	NSL	<0.01	<0.01	<0.01	<0.01	<0.01	<0.02
Perfluorotetradecanoic acid	5	NSL	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
4:2 FTS	0.1	NSL	<0.001	<0.001	<0.001	<0.001	<0.001	<0.05
6:2 FTS	0.1	NSL	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004	<0.05
8:2 FTS	0.1	NSL	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004	<0.05
10:2 FTS	0.1	NSL	<0.002	<0.002	<0.002	<0.002	<0.002	<0.05
Perfluorooctane sulfonamide	1	NSL	<0.01	<0.01	<0.01	<0.01	<0.01	<0.02
N-Methyl perfluorooctane sulfonamide	1	NSL	<0.005	<0.005	<0.005	<0.005	<0.005	<0.05
N-Ethyl perfluorooctanesulfon amide	1	NSL	<0.01	<0.01	<0.01	<0.01	<0.01	<0.05
N-Me perfluorooctanesulfonamid oethanol	1	NSL	<0.005	<0.005	<0.005	<0.005	<0.005	<0.05
N-Et perfluorooctanesulfonamid oethanol	5	NSL	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
MePerfluorooctanesulf-amid oacetic acid	0.2	NSL	<0.002	<0.002	<0.002	<0.002	<0.002	<0.02
EtPerfluorooctanesulf-amid oacetic acid	0.2	NSL	<0.002	<0.002	<0.002	<0.002	<0.002	<0.02
Total Positive PFHxS & PFOS	0.1	2	**0.006**	**0.0054**	**0.0046**	**0.0095**	**0.0046**	<0.01
Total Positive PFOS & PFOA	0.1	NSL	**0.003**	**0.0025**	**0.002**	**0.0062**	**0.0024**	<0.01
Total Positive PFAS	0.1	NSL	**0.025**	**0.025**	**0.0094**	**0.014**	**0.025**	<0.01

Positive PFAS result	**Bold**
PFAS result above the SAC	**Bold**

Table G6
SUMMARY OF GROUNDWATER LABORATORY RESULTS

Sample Reference	Field Measurements						Laboratory Results				Classification for Concrete Piles Soil Condition B	Classification for Steel Piles Soil Condition B
	SWL (m)	pH	EC (µS/cm)	Temp (°C)	Eh (mV)	DO (mg/L)	pH	EC (µS/cm)	Sulfate (mg/L)	Chloride (mg/L)		
MW1	3.27	5.2	970	16.4	47.6	1.9	5.3	1,300	340	130	Mildly Aggressive	Non-Aggressive
MW3	2.6	4.7	155	18	23.1	0.8	5.2	200	35	27	Mildly Aggressive	Non-Aggressive
MW6	2.76	5.1	1,578	17.5	103	4.9	5.6	1,400	87	510	Non-Aggressive	Non-Aggressive
Total Number of Samples	3	3	3	3	3	3	3	3	3	3	-	-
Minimum Value	2.6	4.7	155	16.4	23.1	0.8	5.2	200	35	27	-	-
Maximum Value	3.27	5.2	1,578	18	103	4.9	5.6	1,400	340	510	-	-

Exposure Classification for Concrete Piles

Classification is based on Soil condition 'B' - low permeability soils (e.g. silts and clays) or all soils above groundwater.

pH	Sulfate (mg/L)	Chloride (mg/L)	Classification B
> 5.5	<1,000	<6,000	Non-Aggressive
4.5 - 5.5	1,000 - 3,000	6,000 - 12,000	Mildly Aggressive
4.0 - 4.5	3,000 - 10,000	12,000 - 30,000	Moderately Aggressive
< 4	>10,000	>30,000	Severely Aggressive

Exposure Classification for Steel Piles

Classification is also based on Soil condition 'B' - low permeability soils (e.g. silts and clays) or all soils above groundwater.

pH	Chloride (mg/L)	Classification B
> 5	<1,000	Non-Aggressive
4.0 - 5.0	1,000 - 10,000	Non-Aggressive
3.0 - 4.0	10,000 - 20,000	Mildly Aggressive
<3	>20,000	Moderately Aggressive

TABLE Q1
SOIL QA/QC SUMMARY

			TRH C6 - C10	TRH >C10-C16	TRH >C16-C34	TRH >C34-C40	Benzene	Toluene	Ethylbenzene	m+p-xylene	o-Xylene	Naphthalene	Acenaphthylene	Acenaph-thene	Fluorene	Phenanthrene	Anthracene	Fluoranthene	Pyrene	Benzo(a)anthracene	Chrysene	Benzo(b,j+k)fluoranthene	Benzo(a)pyrene	Indeno(1,2,3-c,d)pyrene	Dibenzo(a,h)anthra-cene	Benzo(g,h,i)perylene
	PQL Envirolab SYD		25	50	100	100	0.2	0.5	1	2	1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.2	0.05	0.1	0.1	0.1
	PQL Envirolab VIC & WA		25	50	100	100	0.2	0.5	1	2	1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.2	0.05	0.1	0.1	0.1
Intra	BH1	0-0.1	<25	<50	<100	<100	<0.2	<0.5	<1	<2	<1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.2	0.2	0.2	0.1	0.7	0.3	0.2	<0.1	0.2
laboratory	SDUP1	0-0.1	<25	<50	<100	<100	<0.2	<0.5	<1	<2	<1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.1	0.1	0.1	0.1	0.5	0.2	0.2	<0.1	0.2
duplicate	MEAN		nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	0.15	0.15	0.15	0.1	0.6	0.25	0.2	nc	0.2
	RPD %		nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	67%	67%	67%	0%	33%	40%	0%	nc	0%
Intra	BH102	0-0.1	<25	<50	<100	<100	<0.2	<0.5	<1	<2	<1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.1	<0.1	<0.1	0.3	0.1	0.1	<0.1	<0.1
laboratory	SDUP3	0-0.1	<25	<50	<100	<100	<0.2	<0.5	<1	<2	<1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.1	0.1	0.1	<0.1	0.4	0.2	0.1	<0.1	<0.1
duplicate	MEAN		nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	0.08	0.1	0.08	nc	0.35	0.15	0.1	nc	nc
	RPD %		nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	67%	0%	67%	nc	29%	67%	0%	nc	nc
Inter	BH112	0-0.1	<25	<50	<100	<100	<0.2	<0.5	<1	<2	<1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.2	0.1	<0.1	<0.1	<0.1
laboratory	SDUP2	0-0.1	<25	<50	<100	<100	<0.2	<0.5	<1	<2	<1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.2	<0.05	<0.1	<0.1	<0.1
duplicate	MEAN		nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	0.15	0.06	nc	nc	nc
	RPD %		nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	67%	120%	nc	nc	nc
Inter	BH108	0-0.1	<25	260	230	<100	<0.2	<0.5	<1	<2	<1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.1	0.1	<0.1	<0.1	<0.2	0.06	<0.1	<0.1	<0.1
laboratory	SDUP4	0-0.1	<25	<50	<100	<100	<0.2	<0.5	<1	<2	<1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.1	0.1	<0.1	<0.1	<0.2	0.09	<0.1	<0.1	<0.1
duplicate	MEAN		nc	143	140	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	0.1	0.1	nc	nc	nc	0.08	nc	nc	nc
	RPD %		nc	165%	129%	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	0%	0%	nc	nc	nc	40%	nc	nc	nc
Field Blank	TB 13/07/22	-	<25	<50	<100	<100	<0.2	<0.5	<1	<2	<1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.2	<0.05	<0.1	<0.1	<0.1
Field Blank	TB-S2 15/07/22	-	<25	-	-	-	<0.2	<0.5	<1	<2	<1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Field Rinsate	FR-S2-SPT 15/07/22	μg/L	-	-	-	-	<1	<1	<1	<2	<1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Field Rinsate	FR-S2-HA 15/07/22	μg/L	-	-	-	-	<1	<1	<1	<2	<1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Trip Spike	TS 13/07/22	-	-	-	-	-	82%	81%	83%	83%	83%	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Trip Spike	TS-S2 15/07/22	-	-	-	-	-	95%	94%	98%	98%	94%	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

			HCB	alpha- BHC	gamma- BHC	beta- BHC	Heptachlor	delta- BHC	Aldrin	Heptachlor Epoxide	Gamma- Chlordane	alpha- chlordane	Endosulfan I	pp- DDE	Dieldrin	Endrin	pp- DDD	Endosulfan II	pp- DDT	Endrin Aldehyde	Endosulfan Sulphate	Methoxychlor
	PQL Envirolab SYD		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	0.1	0.1	0.1	0.1	0.1	0.1	0.1
	PQL Envirolab VIC & WA		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	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Intra	BH1	0-0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
laboratory	SDUP1	0-0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
duplicate	MEAN		nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc
	RPD %		nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc
Intra	BH102	0-0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
laboratory	SDUP3	0-0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
duplicate	MEAN		nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc
	RPD %		nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc
Inter	BH112	0-0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
laboratory	SDUP2	0-0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
duplicate	MEAN		nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc
	RPD %		nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc
Inter	BH108	0-0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
laboratory	SDUP4	0-0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
duplicate	MEAN		nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc
	RPD %		nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc
Field Blank	TB 13/07/22	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Field Blank	TB-S2 15/07/22	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Field Rinsate	FR-S2-SPT 15/07/22	μg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Field Rinsate	FR-S2-HA 15/07/22	μg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Trip Spike	TS 13/07/22	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Trip Spike	TS-S2 15/07/22	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

			Azinphos-methyl (Guthion)	Bromophos-ethyl	Chlorpyriphos	Chlorpyriphos-methyl	Diazinon	Dichlorvos	Dimethoate	Ethion	Fenitrothion	Malathion	Parathion	Ronnel	Total PCBS	Arsenic	Cadmium	Chromium	Copper	Lead	Mercury	Nickel	Zinc	ACM >7mm	AF/FA Asbestos
	PQL Envirolab SYD		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	4	0.4	1	1	1	0.1	1	1	0.01	0.001
	PQL Envirolab VIC & WA		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	4	0.4	1	1	1	0.1	1	1	0.01	0.001
Intra	BH1	0-0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<4	<0.4	26	26	41	<0.1	9	61	-	-
laboratory	SDUP1	0-0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<4	<0.4	20	43	38	<0.1	14	100	-	-
duplicate	MEAN		nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	23	34.5	39.5	nc	11.5	80.5	-	-
	RPD %		nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	26%	49%	8%	nc	43%	48%	-	-
Intra	BH102	0-0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	4	<0.4	14	13	43	<0.1	3	61	-	-
laboratory	SDUP3	0-0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<4	<0.4	12	21	61	<0.1	4	96	-	-
duplicate	MEAN		nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	3	nc	13	17	52	nc	3.5	78.5	-	-
	RPD %		nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	67%	nc	15%	47%	35%	nc	29%	45%	-	-
Inter	BH112	0-0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<4	<0.4	14	34	14	<0.1	15	38	-	-
laboratory	SDUP2	0-0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	9	<0.4	22	15	17	<0.1	10	32	-	-
duplicate	MEAN		nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	5.5	nc	18	24.5	15.5	nc	12.5	35	-	-
	RPD %		nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	127%	nc	44%	78%	19%	nc	40%	17%	-	-
Inter	BH108	0-0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<4	<0.4	20	10	36	<0.1	13	130	<0.01	<0.001
laboratory	SDUP4	0-0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	NA	10	<0.4	24	9	40	0.2	14	110	<0.01	<0.001
duplicate	MEAN		nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	6	nc	22	9.5	38	0.13	13.5	120	nc	nc
	RPD %		nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	133%	nc	18%	11%	11%	120%	7%	17%	nc	nc
Field Blank	TB 13/07/22	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<4	<0.4	<1	<1	<1	<0.1	<1	<1	-	-
Field Blank	TB-S2 15/07/22	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Field Rinsate	FR-S2-SPT 15/07/22	μg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Field Rinsate	FR-S2-HA 15/07/22	μg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Trip Spike	TS 13/07/22	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Trip Spike	TS-S2 15/07/22	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Result outside of QA/QC acceptance criteria — Value

Rinsate metals results in mg/L

JKGeotechnics

TABLE Q2
SUMMARY OF PFAS FIELD QA/QC IN SOIL
Units are µg/Kg unless stated otherwise.

			Perfluorobutanesulfonic acid	Perfluoropentanesulfonic acid	Perfluorohexanesulfonic acid - PFHxS	Perfluoroheptanesulfonic acid	Perfluorooctanesulfonic acid PFOS	Perfluorodecanesulfonic acid	Perfluorobutanoic acid	Perfluoropentanoic acid	Perfluorohexanoic acid	Perfluoroheptanoic acid	Perfluorooctanoic acid PFOA	Perfluorononanoic acid	Perfluorodecanoic acid	Perfluoroundecanoic acid	Perfluorododecanoic acid	Perfluorotridecanoic acid	Perfluorotetradecanoic acid	4:2 FTS	6:2 FTS	8:2 FTS	10:2 FTS	Perfluorooctane sulfonamide	N-Methyl perfluorooctane sulfonamide	N-Ethyl perfluorooctanesulfon amide	N-Me perfluorooctanesulfonamid oethanol	N-Et perfluorooctanesulfonamid oethanol	MePerfluorooctanesulf-amid oacetic acid	EtPerfluorooctanesulf-amid oacetic acid	Total Positive PFHxS & PFOS	Total Positive PFOS & PFOA	Total Positive PFAS
PQL Envirolab			*0.1*	*0.1*	*0.1*	*0.1*	*0.1*	*0.2*	*0.2*	*0.2*	*0.1*	*0.1*	*0.1*	*0.1*	*0.5*	*0.5*	*0.5*	*0.5*	*5*	*0.1*	*0.1*	*0.1*	*0.1*	*1*	*1*	*1*	*1*	*5*	*0.2*	*0.2*	*0.1*	*0.1*	*0.1*
PQL Envirolab VIC			*0.1*	*0.1*	*0.1*	*0.1*	*0.1*	*0.2*	*0.2*	*0.2*	*0.1*	*0.1*	*0.1*	*0.1*	*0.5*	*0.5*	*0.5*	*0.5*	*5*	*0.1*	*0.1*	*0.1*	*0.1*	*1*	*1*	*1*	*1*	*5*	*0.2*	*0.2*	*0.1*	*0.1*	*0.1*
Intra	BH116	0-0.1	<0.1	<0.1	<0.1	<0.1	1.6	<0.2	<0.2	<0.2	<0.1	<0.1	0.1	<0.1	<0.5	<0.5	<0.5	<0.5	<5	<0.1	<0.1	<0.2	<0.2	<1	<1	<1	<1	<5	<0.2	<0.2	1.6	1.8	1.8
laboratory	SDUP6	0-0.1	<0.1	<0.1	<0.1	<0.1	1.9	<0.2	<0.2	<0.2	<0.1	<0.1	0.2	<0.1	<0.5	<0.5	<0.5	<0.5	<5	<0.1	<0.1	<0.2	<0.2	<1	<1	<1	<1	<5	<0.2	<0.2	1.9	2.1	2.1
duplicate	MEAN		nc	nc	nc	nc	1.75	nc	nc	nc	nc	nc	0.15	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	1.75	1.95	1.95
	RPD %		nc	nc	nc	nc	17%	nc	nc	nc	nc	nc	67%	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	17%	15%	15%
Inter	BH102	0-0.1	<0.1	<0.1	<0.1	<0.1	5.7	<0.2	<0.2	<0.2	0.1	<0.1	0.3	0.2	<0.5	<0.5	<0.5	<0.5	<5	<0.1	<0.1	<0.2	<0.2	<1	<1	<1	<1	<5	<0.2	<0.2	5.7	6	6.3
laboratory	SDUP3	0-0.1	<0.1	<0.1	<0.1	<0.1	5.4	<0.2	<0.2	<0.2	0.1	<0.1	0.4	0.2	0.6	<0.5	<0.5	<0.5	<5	<0.1	<0.1	<0.2	<0.2	<1	<1	<1	<1	<5	<0.2	<0.2	5.4	5.8	6.7
duplicate	MEAN		nc	nc	nc	nc	5.55	nc	nc	nc	0.1	nc	0.35	0.2	0.425	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	5.55	5.9	6.5
	RPD %		nc	nc	nc	nc	5%	nc	nc	nc	0%	nc	29%	0%	82%	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	5%	3%	6%
Field	TB	-	<0.1	<0.1	<0.1	<0.1	<0.1	<0.2	<0.2	<0.2	<0.1	<0.1	<0.1	<0.1	<0.5	<0.5	<0.5	<0.5	<5	<0.1	<0.1	<0.2	<0.2	<1	<1	<1	<1	<5	<0.2	<0.2	<0.1	<0.1	<0.1
Blank	13/07/2022																																

Result outside of QA/QC acceptance criteria — Value

TABLE Q3
GROUNDWATER QA/QC SUMMARY

		Dichlorodifluoromethane	Chloromethane	Vinyl Chloride	Bromomethane	Chloroethane	Trichlorofluoromethane	1,1-Dichloroethene	Trans-1,2-dichloroethene	1,1-dichloroethane	Cis-1,2-dichloroethene	Bromochloromethane	Chloroform	2,2-dichloropropane	1,2-dichloroethane	1,1,1-trichloroethane	1,1-dichloropropene	Cyclohexane	Carbon tetrachloride	Benzene	Dibromomethane	1,2-dichloropropane	Trichloroethene	Bromodichloromethane	trans-1,3-dichloropropene	cis-1,3-dichloropropene	1,1,2-trichloroethane	Toluene	1,3-dichloropropane	Dibromochloromethane
	PQL Envirolab SYD	*10*	*10*	*10*	*10*	*10*	*10*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*
	PQL Envirolab VIC	*10*	*10*	*10*	*10*	*10*	*10*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*
Intra laboratory duplicate	MW1	<10	<10	<10	<10	<10	<10	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
	WDUP1	<10	<10	<10	<10	<10	<10	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
	MEAN	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc
	RPD %	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc
Inter laboratory duplicate	MW3	<10	<10	<10	<10	<10	<10	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
	WDUP2	<10	<10	<10	<10	<10	<10	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
	MEAN	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc
	RPD %	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc
Field Blank	TB-W1 27/07/2022	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Field Rinsate	FR 27/07/2022	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

		1,2-dibromoethane	Tetrachloroethene	1,1,1,2-tetrachloroethane	Chlorobenzene	Ethylbenzene	Bromoform	m+p-xylene	Styrene	1,1,2,2-tetrachloroethane	o-xylene	1,2,3-trichloropropane	Isopropylbenzene	Bromobenzene	n-propyl benzene	2-chlorotoluene	4-chlorotoluene	1,3,5-trimethyl benzene	Tert-butyl benzene	1,2,4-trimethyl benzene	1,3-dichlorobenzene	Sec-butyl benzene	1,4-dichlorobenzene	4-isopropyl toluene	1,2-dichlorobenzene	n-butyl benzene	1,2-dibromo-3-chloropropane	1,2,4-trichlorobenzene	Hexachlorobutadiene	1,2,3-trichlorobenzene
	PQL Envirolab SYD	*1*	*1*	*1*	*1*	*1*	*1*	*2*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*
	PQL Envirolab VIC	*1*	*1*	*1*	*1*	*1*	*1*	*2*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*
Intra laboratory duplicate	MW1	<1	<1	<1	<1	<1	<1	<2	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
	WDUP1	<1	<1	<1	<1	<1	<1	<2	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
	MEAN	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc
	RPD %	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc
Inter laboratory duplicate	MW3	<1	<1	<1	<1	<1	<1	<2	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
	WDUP2	<1	<1	<1	<1	<1	<1	<2	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
	MEAN	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc
	RPD %	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc
Field Blank	TB-W1 27/07/2022	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Field Rinsate	FR 27/07/2022	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

		TRH C6 - C10	TRH >C10-C16	TRH >C16-C34	TRH >C34-C40	Benzene	Toluene	Ethylbenzene	m+p-xylene	o-Xylene	Naphthalene	Acenaphthylene	Acenaph-thene	Fluorene	Phenanthrene	Anthracene	Fluoranthene	Pyrene	Benzo(a)anthracene	Chysene	Benzo(b,j+k)fluoranthene	Benzo(a)pyrene	Indeno(1,2,3-c,d)pyrene	Dibenzo(a,h)anthra-cene	Benzo(g,h,i)perylene	Arsenic	Cadmium	Chromium VI	Copper	Lead	Mercury	Nickel	Zinc
	PQL Envirolab SYD	*10*	*50*	*100*	*100*	*1*	*1*	*1*	*2*	*1*	*0.2*	*0.1*	*0.1*	*0.1*	*0.1*	*0.1*	*0.1*	*0.1*	*0.1*	*0.1*	*0.2*	*0.1*	*0.1*	*0.1*	*0.1*	*1*	*0.1*	*1*	*1*	*1*	*0.05*	*1*	*1*
	PQL Envirolab VIC	*10*	*50*	*100*	*100*	*1.0*	*1.0*	*1.0*	*2.0*	*1.0*	*0.2*	*0.1*	*0.1*	*0.1*	*0.1*	*0.1*	*0.1*	*0.1*	*0.1*	*0.1*	*0.2*	*0.1*	*0.1*	*0.1*	*0.1*	*1*	*0.1*	*1*	*1*	*1*	*0.05*	*1*	*1*
Intra laboratory duplicate	MW1	<10	<50	<100	<100	<1	<1	<1	<2	<1	<0.2	<0.1	<0.1	<0.1	<0.1	<0.1	0.2	0.2	<0.1	<0.1	<0.2	<0.1	<0.1	<0.1	<0.1	<1	<0.1	<1	2	<1	<0.05	3	14
	WDUP1	<10	<50	<100	<100	<1	<1	<1	<2	<1	<0.2	<0.1	<0.1	<0.1	<0.1	<0.1	0.2	0.1	<0.1	<0.1	<0.2	<0.1	<0.1	<0.1	<0.1	<1	<0.1	<1	2	<1	<0.05	3	14
	MEAN	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	0.2	0.15	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	2	nc	nc	3	14
	RPD %	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	0%	67%	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	0%	nc	nc	0%	0%
Inter laboratory duplicate	MW3	<10	<50	<100	<100	<1	<1	<1	<2	<1	<0.2	<0.1	<0.1	<0.1	<0.1	<0.1	0.2	0.1	<0.1	<0.1	<0.2	<0.1	<0.1	<0.1	<0.1	<1	<0.1	<1	1	<1	<0.05	<1	6
	WDUP2	<10	<50	<100	<100	<1	<1	<1	<2	<1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.2	<0.1	<0.1	<0.1	<0.1	<1	<0.1	<1	1	<1	<0.05	<1	4
	MEAN	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	0.125	0.075	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	1	nc	nc	nc	5
	RPD %	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	120%	67%	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	0%	nc	nc	nc	40%
Field Blank	TB-W1 27/07/2022	38	-	-	-	<1	<1	<1	<2	<1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Field Rinsate	FR 27/07/2022	70	-	-	-	<1	<1	<1	<2	<1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Trip Spike	TS-W1 27/07/2022	-	-	-	-	110%	105%	118%	115%	113%	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	

Result outside of QA/QC acceptance criteria: Value

TABLE Q4
SUMMARY OF PFAS FIELD QA/QC IN GROUNDWATER
Units are µg/L unless stated otherwise.

		Perfluorobutanesulfonic acid	Perfluoropentanesulfonic acid	Perfluorohexanesulfonic acid - PFHxS	Perfluoroheptanesulfonic acid	Perfluorooctanesulfonic acid PFOS	Perfluorodecanesulfonic acid	Perfluorobutanoic acid	Perfluoropentanoic acid	Perfluorohexanoic acid	Perfluoroheptanoic acid	Perfluorooctanoic acid PFOA	Perfluorononanoic acid	Perfluorodecanoic acid	Perfluoroundecanoic acid	Perfluorododecanoic acid	Perfluorotridecanoic acid	Perfluorotetradecanoic acid	4:2 FTS	6:2 FTS	8:2 FTS	10:2 FTS	Perfluorooctane sulfonamide	N-Methyl perfluorooctane sulfonamide	N-Ethyl perfluorooctanesulfon amide	N-Me perfluorooctanesulfonamid oethanol	N-Et perfluorooctanesulfonamid oethanol	MePerfluorooctanesulf-amid oacetic acid	EtPerfluorooctanesulf-amid oacetic acid	Total Positive PFHxS & PFOS	Total Positive PFOS & PFOA	Total Positive PFAS
PQL Envirolab		*0.0004*	*0.001*	*0.0002*	*0.001*	*0.0002*	*0.002*	*0.002*	*0.002*	*0.0004*	*0.0004*	*0.0002*	*0.001*	*0.002*	*0.002*	*0.005*	*0.01*	*0.05*	*0.001*	*0.0004*	*0.0004*	*0.002*	*0.01*	*0.005*	*0.01*	*0.005*	*0.05*	*0.002*	*0.002*	*0.0002*	*0.0002*	*0.0002*
PQL ALS Environmental		*0.02*	*0.02*	*0.01*	*0.02*	*0.01*	*0.02*	*0.1*	*0.02*	*0.02*	*0.02*	*0.01*	*0.02*	*0.02*	*0.02*	*0.02*	*0.02*	*0.05*	*0.05*	*0.05*	*0.05*	*0.05*	*0.02*	*0.05*	*0.05*	*0.05*	*0.05*	*0.02*	*0.02*	*0.01*	*0.01*	*0.01*
Intra	MW1	0.0097	0.004	0.0043	<0.001	0.002	<0.002	<0.002	0.002	0.002	0.0006	0.001	<0.001	<0.002	<0.002	<0.005	<0.01	<0.05	<0.001	<0.0004	<0.0004	<0.002	<0.01	<0.005	<0.01	<0.005	<0.05	<0.002	<0.002	0.006	0.003	0.025
laboratory	WDUP1	0.01	0.005	0.0031	<0.001	0.001	<0.002	<0.002	0.002	0.002	0.0004	0.0009	<0.001	<0.002	<0.002	<0.005	<0.01	<0.05	<0.001	<0.0004	<0.0004	<0.002	<0.01	<0.005	<0.01	<0.005	<0.05	<0.002	<0.002	0.0046	0.0024	0.025
duplicate	MEAN	0.0099	0.0045	0.0037	nc	0.0015	nc	nc	0.002	0.002	0.0005	0.001	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	0.0053	0.0027	0.025
	RPD %	3%	22%	32%	nc	67%	nc	nc	0%	0%	40%	11%	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	26%	22%	0%
Inter	MW3	0.003	0.001	0.0033	<0.001	0.001	<0.002	<0.002	<0.002	<0.0004	<0.0004	0.0006	<0.001	<0.002	<0.002	<0.005	<0.01	<0.05	<0.001	<0.0004	<0.0004	<0.002	<0.01	<0.005	<0.01	<0.005	<0.05	<0.002	<0.002	0.0046	0.002	0.0094
laboratory	WDUP2	<0.02	<0.02	<0.01	<0.02	<0.01	<0.02	<0.1	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.02	<0.02	<0.02	<0.05	<0.05	<0.05	<0.05	<0.05	<0.02	<0.05	<0.05	<0.05	<0.05	<0.02	<0.02	<0.01	<0.01	<0.01
duplicate	MEAN	0.0265	0.0255	0.0267	nc	0.0255	nc	nc	nc	nc	nc	0.0253	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	0.0273	0.026	0.0297
	RPD %	177%	192%	175%	nc	192%	nc	nc	nc	nc	nc	195%	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	166%	185%	137%

Result outside of QA/QC acceptance criteria — Value

Appendix D: Borehole Logs

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BOREHOLE LOG

Borehole No. 1

Client: SCHOOL INFRASTRUCTURE NSW
Project: PROPOSED SCHOOL UPGRADE
Location: PARRAMATTA EAST PUBLIC SCHOOL, PARRAMATTA, NSW

Job No.: E35073LT **Method:** SPIRAL AUGER **R.L. Surface:** ~21.2 m
Date: 12/7/22 **Datum:** AHD
Plant Type: JK309 **Logged/Checked By:** T.F./A.B.

Groundwater Record	Field Tests	Depth (m)	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel Density	Hand Penetrometer Readings (kPa)	Remarks
DRY ON COMPLETION		0–0.1		FILL: Sandy gravel, fine to coarse grained igneous, grey, fine to coarse grained sand, with concrete fragments.	M			SCREEN: 9.35kg 0-0.1m NO FCF
	N = 12 3,6,6	0.1–1.3	CH	Silty CLAY: plasticity, orange brown, trace of fine to medium grained ironstone gravel, and root fibres.	w<PL	Hd	500 520 430	RESIDUAL
	N > 11 9,11/ 150mm REFUSAL	1.3–1.5	CI	Silty CLAY: medium plasticity, light grey mottled red brown, trace of fine grained sand.				
		1.5–2.3	-	Extremely Weathered sandstone: silty CLAY, low plasticity, light grey, trace of fine grained sand, with occasional ironstone bands.	XW	Hd	550 >600 >600	HAWKESBURY SANDSTONE
		2.3–3.0		SANDSTONE: fine to medium grained, grey and red brown.	DW	L		LOW RESISTANCE
ON 15/7/22 (water level ~4.5 m)		3.0–4.5		as above, but light grey and red brown, with extremely weathered bands and ironstone bands.		VL		VERY LOW TO LOW RESISTANCE WITH OCCASIONAL MODERATE STRENGTH BANDS
		4.5–5.0	-	LAMINITE: SANDSTONE: fine to medium grained, brown, interbedded with SILTSTONE: dark grey.		L - M		MODERATE RESISTANCE
		5.0–5.6	-	SANDSTONE: fine to medium grained, grey.		M - H		MODERATE TO HIGH RESISTANCE
		5.5–5.6				H		HIGH RESISTANCE
		5.6		END OF BOREHOLE AT 5.60 m				'TC' BIT REFUSAL GROUNDWATER MONITORING WELL INSTALLED TO 5.5m. CLASS 18 MACHINE SLOTTED 50mm DIA. PVC STANDPIPE 5.5m TO 2.5m. CASING 2.5m TO 0m. 2mm SAND FILTER PACK 5.5m TO 2.3m. BENTONITE SEAL 2.3m TO 0.8m.

RL (m AHD) scale: 21, 20, 19, 18, 17, 16, 15. Depth (m) scale: 1, 2, 3, 4, 5, 6.

SAMPLES: ES, U50, DB, DS

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BOREHOLE LOG

Borehole No.
1
2 / 2

Client: SCHOOL INFRASTRUCTURE NSW
Project: PROPOSED SCHOOL UPGRADE
Location: PARRAMATTA EAST PUBLIC SCHOOL, PARRAMATTA, NSW

Job No.: E35073LT **Method:** SPIRAL AUGER **R.L. Surface:** ~21.2 m
Date: 12/7/22 **Datum:** AHD
Plant Type: JK309 **Logged/Checked By:** T.F./A.B.

Groundwater Record	SAMPLES ES	U50	DB	DS	Field Tests	RL (m AHD)	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel Density	Hand Penetrometer Readings (kPa)	Remarks
						14								BACKFILLED WITH SAND AND CUTTINGS TO THE SURFACE. COMPLETED WITH A CONCRETED GATIC COVER.
							8							
						13								
							9							
						12								
							10							
						11								
							11							
						10								
							12							
						9								
							13							
						8								

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BOREHOLE LOG

Borehole No.
2

Client: SCHOOL INFRASTRUCTURE NSW
Project: PROPOSED SCHOOL UPGRADE
Location: PARRAMATTA EAST PUBLIC SCHOOL, PARRAMATTA, NSW

Job No.: E35073LT **Method:** SPIRAL AUGER **R.L. Surface:** ~24.2 m
Date: 12/7/22 **Datum:** AHD
Plant Type: JK309 **Logged/Checked By:** T.F./A.B.

Groundwater Record	Field Tests	Depth (m)	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel Density	Hand Penetrometer Readings (kPa)	Remarks
		0	-	ASPHALTIC CONCRETE: 40mm.t	M			INSUFFICIENT RETURN FOR BULK SCREEN
				FILL: Mixture of Sand and Gravel, fine to coarse grained sand, and fine to coarse grained igneous gravel.				SCREEN: 13.28kg 0.1-0.4m NO FCF
	N = 13 5,6,7			FILL: Gravelly sand, fine to medium grained, brown and grey, fine to medium grained igneous gravel.				
			CH	Silty CLAY: high plasticity, orange brown, trace of fine to medium grained ironstone gravel.	w~PL	Hd	>600 400 460	RESIDUAL
				as above, but light grey and red brown.	w<PL			
	N = 26 7,12,14	1.5	-	Extremely Weathered sandstone: silty CLAY, low plasticity, light grey, trace of fine grained sand.	XW	Hd	580 >600 >600	HAWKESBURY SANDSTONE VERY LOW 'TC' BIT RESISTANCE
ON COMPLETION OF CORING	N = 26 7,9,17	3.0		Extremely Weathered sandstone: silty CLAY, low plasticity, light grey, with fine to medium grained sand, interbedded with extremely weathered siltstone and occasional ironstone bands.			>600 >600 >600	
		4.0		REFER TO CORED BOREHOLE LOG				

SAMPLES: ES, U50, DB, DS. RL (m AHD) scale: 24, 23, 22, 21, 20, 19, 18. Depth (m) scale: 1, 2, 3, 4, 5, 6.

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CORED BOREHOLE LOG

Borehole No.
2

Client: SCHOOL INFRASTRUCTURE NSW
Project: PROPOSED SCHOOL UPGRADE
Location: PARRAMATTA EAST PUBLIC SCHOOL, PARRAMATTA, NSW

Job No.: E35073LT | **Core Size:** NMLC | **R.L. Surface:** ~24.2 m
Date: 12/7/22 | **Inclination:** VERTICAL | **Datum:** AHD
Plant Type: JK309 | **Bearing:** N/A | **Logged/Checked By:** T.F./A.B.

Water Loss\Level	Depth (m)	RL (m AHD)	Core Description (Rock Type, grain characteristics, colour, texture and fabric, features, inclusions and minor components)	Weathering	Strength	Point Load Strength Index $I_s(50)$	Defect Details – Description (Type, orientation, defect shape and roughness, defect coatings and seams, openness and thickness)	Formation
ON COMPLETION OF CORING	0.00–4.00		START CORING AT 4.00m					
100% RETURN	4.00	20	SANDSTONE: fine to medium grained, light grey and orange brown, sub-horizontally bedded.	HW	M - H	1.2	(4.04m) CS, 0°, 40 mm.t; (4.24m) CS, 0°, 50 mm.t	Hawkesbury Sandstone
			NO CORE 0.15m				(4.49m) CS, 0°, 80 mm.t	
			SANDSTONE: fine to medium grained, light grey and red brown, sub-horizontally bedded.	HW	M / VL		(4.70m) XWS, 40 mm.t; (4.81m) CS, 0°, 80 mm.t; (4.92m) Be, 0°, P, R, Fe Sn	
	5		SILTSTONE: grey, bedded sub-horizontally.	MW	M	1.0, 1.2	(5.15m) Be, 0°, P, R, Clay Vn; (5.20m) CS, 0°, 30 mm.t	
		19	SANDSTONE: fine to medium grained, light grey and orange brown, bedded sub-horizontally.	HW	VL		(5.48m) XWS, 60 mm.t	
			LAMINITE: SILTSTONE: grey, interbedded with SANDSTONE: fine to medium grained, light grey and orange brown, with medium strength bands, bedded sub-horizontally.	MW	M	0.80		
	6	18	SANDSTONE: fine to medium grained, light grey and orange brown, bedded sub-horizontally.		L		(6.17m) CS, 10 mm.t; (6.29m) CS, 20 mm.t	
			SILTSTONE: dark grey, with fine grained, grey sandstone laminae.	SW	M	1.0	(6.59m) Be, 0°, P, R, Clay Vn	
100% RETURN			SANDSTONE: fine to medium grained, light grey and orange brown, bedded sub-horizontally.			0.60	(6.79m) Be, 5°, P, R, Clay Vn	
	7	17	as above, but medium grained and bedded at 5-10°.		H	1.4, 1.9	(7.74m) Be, 10°, P, R, Fe Sn; (7.92m) Be, 5°, R, Clay Vn	
	8	16	END OF BOREHOLE AT 8.00 m					
	9	15						

Point load strength index scale: VL -0.1, L -0.3, M -1, H -3, VH -10, EH
Spacing (mm): 600, 200, 60, 20

FRACTURES NOT MARKED ARE CONSIDERED TO BE DRILLING AND HANDLING BREAKS

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BOREHOLE LOG

Borehole No.
3
1 / 2

Client:	SCHOOL INFRASTRUCTURE NSW
Project:	PROPOSED SCHOOL UPGRADE
Location:	PARRAMATTA EAST PUBLIC SCHOOL, PARRAMATTA, NSW

Job No.: E35073LT **Method:** SPIRAL AUGER **R.L. Surface:** ~24.4 m
Date: 12/7/22 **Datum:** AHD
Plant Type: JK309 **Logged/Checked By:** T.F./A.B.

Groundwater Record	Field Tests	RL (m AHD)	Depth (m)	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel Density	Hand Penetrometer Readings (kPa)	Remarks
			0	-	ASPHALTIC CONCRETE: 40mm.t				
		24		CH	FILL: Sandy gravel, fine to medium grained, grey.	w>PL	Hd		SCREEN: 8.06kg 0.04-0.1m NO FCF
	N = 8 4,4,4				Silty CLAY: high plasticity, orange brown, trace of fine to medium grained ironstone gravel.			440 420 410	RESIDUAL
	N > 25 7,12,13/ 120mm REFUSAL	23	1		as above, but light grey and red brown.	w~PL		>600 >600 >600	
			2	-	Extremely Weathered sandstone: silty CLAY, low plasticity, light grey, trace of fine grained sand, and occasional ironstone bands.	XW	Hd		HAWKESBURY SANDSTONE
ON COMPLETION		22 / 21	3		SANDSTONE: fine to medium grained, light grey.	DW			VERY LOW 'TC' BIT RESISTANCE WITH BANDS OF LOW TO MODERATE RESISTANCE
			4						MODERATE TO HIGH RESISTANCE WITH BANDS OF VERY LOW TO LOW RESISTANCE
		20		-	LAMINITE: SANDSTONE: fine to medium grained, grey, interbedded with SILTSTONE: grey .		L		LOW TO MODERATE RESISTANCE
		19	5	-	SANDSTONE: fine to medium grained, light grey.		M		MODERATE RESISTANCE
		18	6				H		HIGH RESISTANCE
					END OF BOREHOLE AT 6.50 m				'TC' BIT REFUSAL GROUNDWATER MONITORING WELL

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BOREHOLE LOG

Borehole No.
3
2 / 2

Client: SCHOOL INFRASTRUCTURE NSW
Project: PROPOSED SCHOOL UPGRADE
Location: PARRAMATTA EAST PUBLIC SCHOOL, PARRAMATTA, NSW

Job No.: E35073LT **Method:** SPIRAL AUGER **R.L. Surface:** ~24.4 m
Date: 12/7/22 **Datum:** AHD
Plant Type: JK309 **Logged/Checked By:** T.F./A.B.

Groundwater Record	SAMPLES ES	U50	DB	DS	Field Tests	RL (m AHD)	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel Density	Hand Penetrometer Readings (kPa)	Remarks
						17								INSTALLED TO 6.1m. CLASS 18 MACHINE SLOTTED 50mm DIA. PVC STANDPIPE 6.1m TO 3.1m. CASING 3.0m TO 0.1m. 2mm SAND FILTER PACK 6.1m TO 2.8m. BENTONITE SEAL 2.8m TO 1.8m. BACKFILLED WITH SAND AND CUTTINGS TO THE SURFACE. COMPLETED WITH A CONCRETED GATIC COVER.
							8							
						16								
							9							
						15								
							10							
						14								
							11							
						13								
							12							
						12								
							13							
						11								

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BOREHOLE LOG

Borehole No.
4

Client: SCHOOL INFRASTRUCTURE NSW
Project: PROPOSED SCHOOL UPGRADE
Location: PARRAMATTA EAST PUBLIC SCHOOL, PARRAMATTA, NSW

Job No.: E35073LT **Method:** SPIRAL AUGER **R.L. Surface:** ~23.8 m
Date: 12/7/22 **Datum:** AHD
Plant Type: JK309 **Logged/Checked By:** T.F./A.B.

Groundwater Record	Field Tests	Depth (m)	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel Density	Hand Penetrometer Readings (kPa)	Remarks
DRY ON COMPLETION		0–0.04	-	ASPHALTIC CONCRETE: 40mm.t	D			SCREEN: 5.8kg 0.04-0.5m NO FCF
		0.04–0.5		FILL: Gravelly sand, fine to medium grained, grey brown, fine to coarse grained igneous gravel.				
	N = 11 4,5,6	0.5–1.2	CH	Silty CLAY: high plasticity, orange brown and red brown, trace of fine to medium grained ironstone gravel.	w<PL	Hd	>600 470 540	RESIDUAL
		1.2–1.5	CI	Silty CLAY: medium plasticity, red brown and light grey.				
	N > 16 10,10,6/ 20mm REFUSAL	1.5–2.8	-	Extremely Weathered sandstone: silty CLAY, low plasticity, light grey and red brown, trace of fine grained sand, with occasional ironstone gravel bands.	XW	Hd	>600 >600 >600	HAWKESBURY SANDSTONE VERY LOW 'TC' BIT RESISTANCE WITH BANDS OF LOW TO MODERATE RESISTANCE
		2.8–4.4		SANDSTONE: fine to medium grained, light grey.	DW	L - M VL - L L - M		LOW TO MODERATE 'TC' BIT RESISTANCE MODERATE TO HIGH RESISTANCE WITH BANDS TO VERY LOW TO LOW RESISTANCE
		4.4–5.7		LAMINITE: SILTSTONE: light grey, interbedded with SANDSTONE: fine grained, grey and brown.	DW	L - M		MODERATE RESISTANCE
		5.7–6.5		SANDSTONE: fine to medium grained, light grey.	DW	M H		MODERATE TO HIGH RESISTANCE HIGH RESISTANCE
		6.5		END OF BOREHOLE AT 6.50 m				'TC' BIT REFUSAL

RL (m AHD) scale: 23, 22, 21, 20, 19, 18, 17
SAMPLES: ES, U50, DB, DS

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BOREHOLE LOG

Borehole No.
5
1 / 2

Client: SCHOOL INFRASTRUCTURE NSW
Project: PROPOSED SCHOOL UPGRADE
Location: PARRAMATTA EAST PUBLIC SCHOOL, PARRAMATTA, NSW

Job No.: E35073LT **Method:** SPIRAL AUGER **R.L. Surface:** ~22.4 m
Date: 13/7/22 **Datum:** AHD
Plant Type: JK309 **Logged/Checked By:** T.F./A.B.

Groundwater Record	Field Tests	RL (m AHD)	Depth (m)	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel Density	Hand Penetrometer Readings (kPa)	Remarks
			0	-	ASPHALTIC CONCRETE: 40mm.t				SCREEN: 6.78kg 0.04-0.3m NO FCF
		22			FILL: Gravelly sand, fine to coarse grained, grey brown, fine to medium grained igneous gravel.				
	N = 16 4,5,11			CI-CH	Silty CLAY: medium to high plasticity, orange brown, trace of fine to medium grained ironstone gravel.	w<PL	Hd	570 540 >600	RESIDUAL
			1		as above, with with ironstone band.				
		21			as above, but light grey and red brown.				
	N > 6 7,6/ 50mm REFUSAL			-	Extremely Weathered sandstone: silty CLAY, low plasticity, light grey and red brown, trace of fine grained sand and occasional bands of ironstone.	XW	Hd	>600 >600 >600	HAWKESBURY SANDSTONE BANDED VERY LOW TO LOW 'TC' BIT RESISTANCE
ON COMPLETION OF CORING		20	2						
			3	-	LAMINITE: SANDSTONE: fine grained, light grey and red brown, interbedded with SILTSTONE: dark grey.	DW	VL - L		
		19							LOW TO MODERATE RESISTANCE
					REFER TO CORED BOREHOLE LOG				
		18	4						
		17	5						
		16	6						

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CORED BOREHOLE LOG

Borehole No.
5

Client: SCHOOL INFRASTRUCTURE NSW
Project: PROPOSED SCHOOL UPGRADE
Location: PARRAMATTA EAST PUBLIC SCHOOL, PARRAMATTA, NSW

Job No.: E35073LT | **Core Size:** NMLC | **R.L. Surface:** ~22.4 m
Date: 13/7/22 | **Inclination:** VERTICAL | **Datum:** AHD
Plant Type: JK309 | **Bearing:** N/A | **Logged/Checked By:** T.F./A.B.

Water Loss\Level	Barrel Lift	RL (m AHD)	Depth (m)	Graphic Log	CORE DESCRIPTION (Rock Type, grain characteristics, colour, texture and fabric, features, inclusions and minor components)	Weathering	Strength	POINT LOAD STRENGTH INDEX $I_s(50)$	DEFECT DETAILS – SPACING (mm)	DEFECT DETAILS – DESCRIPTION (Type, orientation, defect shape and roughness, defect coatings and seams, openness and thickness) Specific / General	Formation
		19			START CORING AT 3.50m						
100% RETURN		18	4		SANDSTONE: fine to medium grained, red brown and light grey, bedded at 5-15°.	MW	L - M	1.1		(3.54m) CS, 30 mm.t (3.57m) XWS, 10 mm.t (3.58m) CS, 70 mm.t (3.65m) XWS, 20 mm.t (3.67m) CS, 30 mm.t (3.80m) Be, 15°, P, R, Fe Sn (4.00m) XWS, 50 mm.t	Hawkesbury Sandstone
					LAMINITE: SILTSTONE: dark grey, interbedded with SANDSTONE: fine grained, grey and orange brown, bedded at 0-5°.	HW	VL - L	0.20			
		17	5		SANDSTONE: fine to medium grained, light grey and red brown, bedded at 0-5°.	MW	M	0.50		(4.29m) CS, 10 mm.t (4.30m) XWS, 30 mm.t (4.33m) CS, 30 mm.t (4.41m) CS, 20 mm.t (4.56m) Be, 2°, P, R, Fe Sn (4.60m) CS, 20 mm.t (4.69m) Be, 0°, P, R, Fe Sn (4.72m) CS, 10 mm.t (4.78m) Be, P, R, Fe Sn (4.81m) Be, P, R, Fe Sn (4.84m) XWS, 30 mm.t (4.92m) Be, 0°, P, R, Fe Sn (5.10m) Be, 0°, P, R, Fe Sn	
		16	6		as above, but light grey, with occasional grey laminae.	SW	M - H	2.1 1.0 0.90 2.3		(5.68m) Be, 5°, P, R, Fe Sn (6.07m) CS, 5 mm.t (6.26m) Be, 0°, P, R, Fe Sn	
100% RETURN		15	7			FR	H	1.3 1.9		(7.15m) CS, 2 mm.t	
		14	8		END OF BOREHOLE AT 8.00 m						
		13	9								

Point load strength scale: VL -0.1, L -0.3, M -1, H -3, VH -10, EH
Spacing scale (mm): 600, 200, 60, 20

FRACTURES NOT MARKED ARE CONSIDERED TO BE DRILLING AND HANDLING BREAKS

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BOREHOLE LOG

Borehole No. 6

Client: SCHOOL INFRASTRUCTURE NSW
Project: PROPOSED SCHOOL UPGRADE
Location: PARRAMATTA EAST PUBLIC SCHOOL, PARRAMATTA, NSW

Job No.: E35073LT **Method:** SPIRAL AUGER **R.L. Surface:** ~20.9 m
Date: 15/7/22 **Datum:** AHD
Plant Type: JK205 **Logged/Checked By:** T.F./A.B.

Groundwater Record	Field Tests	RL (m AHD)	Depth (m)	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel Density	Hand Penetrometer Readings (kPa)	Remarks
DRY ON COMPLETION			0		FILL: Silty sand, fine to medium grained, grey brown, fine to coarse grained igneous gravel, and root fibres.	M			GRASS COVER SCREEN: 10.30kg 0-0.4m NO FCF
	N = 12 4,5,7	20		CI-CH	Silty CLAY: medium to high plasticity, orange brown, trace of fine to coarse grained ironstone gravel.	w<PL	Hd	450 470 410	RESIDUAL
	N > 16 8,12,4/ 10mm REFUSAL	19	1	-	Extremely Weathered sandstone: silty CLAY, low plasticity, light grey, trace of fine to medium grained sand, with fine to medium grained sandstone bands and occasional ironstone gravel bands.	XW	Hd	>600 >600 >600	HAWKESBURY SANDSTONE LOW TO MODERATE 'TC' BIT RESISTANCE
		18	2		SANDSTONE: fine to medium grained, light grey and red brown.	DW	L - M		MODERATE TO HIGH RESISTANCE
			3		as above, but with interbedded siltstone, grey and dark grey.		M		BANDS OF LOW RESISTANCE
					SANDSTONE: fine to medium grained, light grey and grey.		H		MODERATE TO HIGH RESISTANCE HIGH RESISTANCE
		17	4		END OF BOREHOLE AT 3.80 m				'TC' BIT REFUSAL GROUNDWATER MONITORING WELL INSTALLED TO 3.7m. CLASS 18 MACHINE SLOTTED 50mm DIA. PVC STANDPIPE 3.7m TO 2.2m. CASING 2.3m TO 0m. 2mm SAND FILTER PACK 3.7m TO 2.2m. BENTONITE SEAL 2.2m TO 1.1m. BACKFILLED WITH SAND AND CUTTINGS TO THE SURFACE. COMPLETED WITH A CONCRETED GATIC COVER.
		16	5						
		15	6						
		14							

SAMPLES: ES, U50, DB, DS

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BOREHOLE LOG

Borehole No. 7

1 / 1

Client: SCHOOL INFRASTRUCTURE NSW

Project: PROPOSED SCHOOL UPGRADE

Location: PARRAMATTA EAST PUBLIC SCHOOL, PARRAMATTA, NSW

Job No.: E35073LT **Method:** SPIRAL AUGER **R.L. Surface:** ~21.7 m

Date: 15/7/22 **Datum:** AHD

Plant Type: JK205 **Logged/Checked By:** T.F./A.B.

Groundwater Record	Field Tests	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel Density	Hand Penetrometer Readings (kPa)	Remarks
DRY ON COMPLETION	N = 2 1,0,2		FILL: Silty clay, low plasticity, brown and grey, trace of fine grained sand, fine to medium grained igneous gravel, and root fibres.	w>PL			APPEARS POORLY COMPACTED SCREEN: 11.58kg 0-0.1m NO FCF
		CH	Silty CLAY: high plasticity, orange brown, trace of fine to medium grained ironstone gravel.	w<PL	St - VSt	270 180 310	SCREEN: 4.2kg 0.1-0.75m NO FCF RESIDUAL
	N = 20 4,8,12		as above, but light grey and red brown.		Hd	>600 570 610	
	N=SPT 12/ 150mm REFUSAL	-	Extremely Weathered sandstone: silty CLAY, low to medium plasticity, light grey and red brown, trace of fine grained sand, with occasional ironstone bands.	XW	Hd	>600 >600 >600	HAWKESBURY SANDSTONE VERY LOW TO LOW 'TC' BIT RESISTANCE
			SANDSTONE: fine to medium grained, grey and red brown.	DW	M - H		HIGH RESISTANCE
			END OF BOREHOLE AT 3.60 m				'TC' BIT REFUSAL

RL (m AHD): 21, 20, 19, 18, 17, 16, 15

Depth (m): 1, 2, 3, 4, 5, 6

JK 9.02.4 LIB.GLB Log JK AUGERHOLE - MASTER E35073LT PARRAMATTA.GPJ <<DrawingFile>> 22/08/2022 14:44 10.01.00.01 Datgel Lab and In Situ Tool - DGD | Lib: JK 9.02.4 2019-05-31 Prj: JK 9.01.0 2018-03-20

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BOREHOLE LOG

Borehole No.
8
1 / 1

Client: SCHOOL INFRASTRUCTURE NSW
Project: PROPOSED SCHOOL UPGRADE
Location: PARRAMATTA EAST PUBLIC SCHOOL, PARRAMATTA, NSW

Job No.: E35073LT **Method:** SPIRAL AUGER **R.L. Surface:** ~22.9 m
Date: 15/7/22 **Datum:** AHD
Plant Type: JK205 **Logged/Checked By:** T.F./A.B.

Groundwater Record	SAMPLES (ES, U50, DB, DS)	Field Tests	RL (m AHD)	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel Density	Hand Penetrometer Readings (kPa)	Remarks
DRY ON COMPLETION				0			FILL: Silty clay, low plasticity, grey brown, trace of fine grained sand, fine to medium grained igneous gravel, and root fibres.	w>PL			GRASS COVER SCREEN: 10.95kg 0-0.45m NO FCF
		N = 8 4,4,4	22			CH	Silty CLAY: high plasticity, orange brown, trace of fine to medium grained ironstone gravel.	w>PL	St	150 110 120	RESIDUAL
				1				w<PL	Hd	540 520	
		N = 20 5,9,11	21				as above, but light grey and red brown.			>600 >600 >600	
				2		-	Extremely Weathered sandstone: silty CLAY, low plasticity, red brown and light grey, with fine to coarse grained ironstone gravel bands.	XW	Hd		HAWKESBURY SANDSTONE VERY LOW 'TC' BIT RESISTANCE
			20	3			SANDSTONE: fine to medium grained, light grey and red brown.	DW	L - M H		HIGH RESISTANCE
			19	4			END OF BOREHOLE AT 3.70 m				'TC' BIT REFUSAL
			18	5							
			17	6							
			16								

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BOREHOLE LOG

Borehole No.
101
1/1

Client: SCHOOL INFRASTUCTURE NSW
Project: PROPOSED SCHOOL UPGRADE
Location: PARRAMATTA EAST PUBLIC SCHOOL, PARRAMATTA, NSW

Job No.: E35073B **Method:** HAND AUGER **R.L. Surface:** N/A
Date: 13/7/22 **Datum:** -
Plant Type: - **Logged/Checked by:** H.W./T.H.

Groundwater Record	SAMPLES ES	U50	DB	DS	Field Tests	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel. Density	Hand Penetrometer Readings (kPa.)	Remarks
DRY ON COMPLETION						0			FILL: Silty clay, low to medium plasticity, brown, trace of ironstone gravel, and root fibres.	w>PL			GRASS COVER SCREEN: 7.3kg 0-0.1m NO FCF
						0.5		CI-CH	Silty CLAY: medium to high plasticity, yellow brown mottled orange brown, trace of ironstone gravel, and root fibres.	w≈PL			SCREEN: 2.2kg 0.1-0.3m NO FCF RESIDUAL
									END OF BOREHOLE AT 0.7m				
						1							
						1.5							
						2							
						2.5							
						3							
						3.5							

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BOREHOLE LOG

Borehole No. **102**

1/1

SDUP3:ASB:PFAS: 0-0.1m

Client: SCHOOL INFRASTUCTURE NSW

Project: PROPOSED SCHOOL UPGRADE

Location: PARRAMATTA EAST PUBLIC SCHOOL, PARRAMATTA, NSW

Job No.: E35073B **Method:** HAND AUGER **R.L. Surface:** N/A

Date: 13/7/22 **Datum:** -

Plant Type: - **Logged/Checked by:** H.W./T.H.

Groundwater Record	SAMPLES (ES, U50, DB, DS)	Field Tests	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel. Density	Hand Penetrometer Readings (kPa.)	Remarks
DRY ON COMPLETION			0			FILL: Sandy clay, low plasticity, brown, fine grained sand, trace of ironstone gravel, and root fibres.	w>PL			GRASS COVER SCREEN: 10.05kg 0-0.1m NO FCF
			0.5		CI=CH	Silty CLAY: medium to high plasticity, yellow brown mottled orange brown, trace of ironstone gravel.	w<PL			SCREEN: 3.35kg 0.1-0.3m NO FCF RESIDUAL
			1 1.5 2 2.5 3 3.5			END OF BOREHOLE AT 0.7m				HAND AUGER REFUSAL

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BOREHOLE LOG

Borehole No.
103
1/1

Client: SCHOOL INFRASTUCTURE NSW
Project: PROPOSED SCHOOL UPGRADE
Location: PARRAMATTA EAST PUBLIC SCHOOL, PARRAMATTA, NSW

Job No.: E35073B **Method:** HAND AUGER **R.L. Surface:** N/A
Date: 13/7/22 **Datum:** -
Plant Type: - **Logged/Checked by:** H.W./T.H.

Groundwater Record	SAMPLES ES	U50	DB	DS	Field Tests	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel. Density	Hand Penetrometer Readings (kPa.)	Remarks
ON COMPLETION						0			FILL: Sandy clay, low plasticity, brown, fine grained sand, trace of ironstone gravel, and root fibres.	w>PL			GRASS COVER SCREEN: 9.2kg 0-0.3m NO FCF
SEEPAGE DURING DRILLING						0.5		CI-CH	Silty CLAY: medium to high plasticity, yellow brown mottled orange brown, trace of ironstone gravel.	w≈PL			RESIDUAL
									END OF BOREHOLE AT 0.6m				HAND AUGER REFUSAL DUE TO BOREHOLE COLLAPSE
						1							
						1.5							
						2							
						2.5							
						3							
						3.5							

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BOREHOLE LOG

Borehole No. **104**

1/1

Client: SCHOOL INFRASTUCTURE NSW

Project: PROPOSED SCHOOL UPGRADE

Location: PARRAMATTA EAST PUBLIC SCHOOL, PARRAMATTA, NSW

Job No.: E35073B **Method:** HAND AUGER **R.L. Surface:** N/A

Date: 13/7/22 **Datum:** -

Plant Type: - **Logged/Checked by:** H.W./T.H.

Groundwater Record	SAMPLES ES	U50	DB	DS	Field Tests	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel. Density	Hand Penetrometer Readings (kPa.)	Remarks
DRY ON COMPLETION						0			FILL: Sandy clay, low plasticity. brown, fine grained sand.	w>PL			GRASS COVER SCREEN: 10kg 0-0.1m NO FCF
						0.5		CI-CH	Silty CLAY: medium to high plasticity, yellow brown mottled orange brown, trace of ironstone gravel.	w≈PL			INSUFFICIENT RETURN FOR BULK SCREEN RESIDUAL
						1 1.5 2 2.5 3 3.5			END OF BOREHOLE AT 0.7m				

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BOREHOLE LOG

Borehole No. 105

1/1

Client: SCHOOL INFRASTUCTURE NSW
Project: PROPOSED SCHOOL UPGRADE
Location: PARRAMATTA EAST PUBLIC SCHOOL, PARRAMATTA, NSW

Job No.: E35073B **Method:** PUSH TUBE **R.L. Surface:** N/A
Date: 15/7/22 **Datum:** -
Plant Type: EZI PROBE **Logged/Checked by:** H.W./T.H.

Groundwater Record	SAMPLES ES / U50 / DB / DS	Field Tests	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel. Density	Hand Penetrometer Readings (kPa.)	Remarks
DRY ON COMPLET-ION	ES, DB		0		-	ASPHALTIC CONCRETE: 20mm.t	D			
	ES, DB					FILL: Sandy gravel, fine to medium grained, dark grey, sub-angular, igneous, fine to medium grained sand.				INSUFFICIENT RETURN FOR BULK SCREEN
			0.5		CL-CI	Sandy CLAY: low to medium plasticity, yellow brown mottled orange brown, fine grained sand, trace of ironstone gravel.	w>PL			RESIDUAL
	ES, DB		1		CI-CH	Silty CLAY: medium to high plasticity, yellow brown and grey, trace of ironstone gravel.	w≈PL			
			1.5			END OF BOREHOLE AT 1.5m				
			2							
			2.5							
			3							
			3.5							

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BOREHOLE LOG

Borehole No. **106**

1/1

Client: SCHOOL INFRASTUCTURE NSW

Project: PROPOSED SCHOOL UPGRADE

Location: PARRAMATTA EAST PUBLIC SCHOOL, PARRAMATTA, NSW

Job No.: E35073B **Method:** PUSH TUBE **R.L. Surface:** N/A

Date: 15/7/22 **Datum:** -

Plant Type: EZI PROBE **Logged/Checked by:** H.W./T.H.

Groundwater Record	Samples (ES, U50, DB, DS)	Field Tests	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel. Density	Hand Penetrometer Readings (kPa.)	Remarks
DRY ON COMPLETION			0		-	ASPHALTIC CONCRETE: 20mm.t				
						FILL: Sandy gravel, fine to medium grained, grey, sub-angular, igneous, fine to medium grained sand.	D			SCREEN: 1.45kg 0.02-0.1m NO FCF
					CI-CH	Silty CLAY: medium to high plasticity, yellow brown mottled orange brown, trace of sand and ironstone gravel.	w≈PL			RESIDUAL
			0.5							
			1		CH	Silty CLAY: high plasticity, grey mottled orange brown.				
						END OF BOREHOLE AT 1.3m				
			1.5							
			2							
			2.5							
			3							
			3.5							

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BOREHOLE LOG

Borehole No. 107

SDUP9: PFAS: ASB: 0-0.1m

Client: SCHOOL INFRASTUCTURE NSW

Project: PROPOSED SCHOOL UPGRADE

Location: PARRAMATTA EAST PUBLIC SCHOOL, PARRAMATTA, NSW

Job No.: E35073B **Method:** HAND AUGER **R.L. Surface:** N/A

Date: 15/7/22 **Datum:** -

Plant Type: - **Logged/Checked by:** H.W./T.H.

Groundwater Record	SAMPLES (ES, U50, DB, DS)	Field Tests	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel. Density	Hand Penetrometer Readings (kPa.)	Remarks
DRY ON COMPLETION			0			FILL: Sandy clay, low plasticity, brown, fine to medium grained sand, trace of igneous gravel and slag.	w>PL			SCREEN: 10.7kg 0-0.1m NO FCF SCREEN: 3.9kg 0.1-0.3m NO FCF
					CI-CH	Silty CLAY: medium to high plasticity, yellow brown, trace of ironstone gravel.	w≈PL			RESIDUAL
			0.5			END OF BOREHOLE AT 0.45m				HAND AUGER REFUSAL
			1							
			1.5							
			2							
			2.5							
			3							
			3.5							

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BOREHOLE LOG

Borehole No. **108**

1/1

SDUP4: ASB: 0-0.1m

Client: SCHOOL INFRASTUCTURE NSW

Project: PROPOSED SCHOOL UPGRADE

Location: PARRAMATTA EAST PUBLIC SCHOOL, PARRAMATTA, NSW

Job No.: E35073B **Method:** SPIRAL AUGER **R.L. Surface:** N/A

Date: 13/7/22 **Datum:** -

Plant Type: JK308 **Logged/Checked by:** H.W./T.H.

Groundwater Record	SAMPLES (ES, U50, DB, DS)	Field Tests	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel. Density	Hand Penetrometer Readings (kPa.)	Remarks
DRY ON COMPLETION			0			FILL: Silty sandy clay, low plasticity, brown, fine grained sand, trace of ironstone gravel, ceramic tile fragments and root fibres.	w>PL			GRASS COVER SCREEN: 10.05kg 0-0.1m NO FCF
					CI-CH	Silty CLAY: medium to high plasticity, yellow brown mottled orange brown, trace of ironstone gravel, and root fibres.	w<PL			SCREEN: 4.32kg 0.1-0.3m NO FCF RESIDUAL
		N = 11 4,4,7	0.5 – 1							
		N > 13 4,11/0mm REFUSAL	1.5			as above, but grey.				
					-	Extremely Weathered sandstone: silty SAND, fine to medium grained, grey.	XW			HAWKESBURY SANDSTONE
						END OF BOREHOLE AT 1.65m				
			2 – 3.5							

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BOREHOLE LOG

Borehole No. **109**

1/1

Client: SCHOOL INFRASTUCTURE NSW

Project: PROPOSED SCHOOL UPGRADE

Location: PARRAMATTA EAST PUBLIC SCHOOL, PARRAMATTA, NSW

Job No.: E35073B **Method:** PUSH TUBE **R.L. Surface:** N/A

Date: 15/7/22 **Datum:** -

Plant Type: EZI PROBE **Logged/Checked by:** H.W./T.H.

Groundwater Record	SAMPLES ES / U50 / DB / DS	Field Tests	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel. Density	Hand Penetrometer Readings (kPa.)	Remarks
DRY ON COMPLETION			0			ASPHALTIC CONCRETE: 15mm.t	D			
						FILL: Sandy gravel, fine to medium grained, dark grey, sub-angular, igneous gravel, fine to medium grained sand.	M			INSUFFICIENT RETURN FOR BULK SCREEN
						FILL: Clayey sand, fine to medium grained, yellow brown, trace of igneous gravel.				SCREEN: 3.4kg 0.1-0.3m NO FCF
			0.5		CI-CH	Silty CLAY: medium to high plasticity, yellow brown mottled orange brown, trace of ironstone gravel.	w≈PL			RESIDUAL
			1							
						END OF BOREHOLE AT 1.1m				
			1.5							
			2							
			2.5							
			3							
			3.5							

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BOREHOLE LOG

Borehole No.
110
1/1

Client: SCHOOL INFRASTUCTURE NSW
Project: PROPOSED SCHOOL UPGRADE
Location: PARRAMATTA EAST PUBLIC SCHOOL, PARRAMATTA, NSW

Job No.: E35073B **Method:** PUSH TUBE **R.L. Surface:** N/A
Date: 15/7/22 **Datum:** -
Plant Type: EZI PROBE **Logged/Checked by:** H.W./T.H.

Groundwater Record	SAMPLES (ES, U50, DB, DS)	Field Tests	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel. Density	Hand Penetrometer Readings (kPa.)	Remarks
DRY ON COMPLETION			0			ASPHALTIC CONCRETE: 40mm.t				
					-	FILL: Sandy gravel, fine to medium grained, grey, sub-angular, igneous grave, fine to medium grained sand.	D			INSUFFICIENT RETURN FOR BULK SCREEN
						FILL: Silty clay, low to medium plasticity, brown, trace of sand, igneous gravel and ash.	w>PL			SCREEN; 3.45kg 0.1-0.3m NO FCF
			0.5		CI-CH	Silty CLAY: medium to high plasticity, yellow brown mottled orange brown, trace of ironstone gravel.	w≈PL			RESIDUAL
			1			END OF BOREHOLE AT 1.0m				
			1.5							
			2							
			2.5							
			3							
			3.5							

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BOREHOLE LOG

Borehole No. 111

Client: SCHOOL INFRASTUCTURE NSW

Project: PROPOSED SCHOOL UPGRADE

Location: PARRAMATTA EAST PUBLIC SCHOOL, PARRAMATTA, NSW

Job No.: E35073B **Method:** HAND AUGER **R.L. Surface:** N/A

Date: 13/7/22 **Datum:** -

Plant Type: - **Logged/Checked by:** N.F./T.H.

Groundwater Record	Samples (ES / U50 / DB / DS)	Field Tests	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel. Density	Hand Penetrometer Readings (kPa.)	Remarks
DRY ON COMPLETION			0			FILL: Silty clay, medium to high plasticity, brown, trace of ironstone and siltstone gravel, ceramic and glass fragments, ash and root fibres.	w≈PL			GRASS COVER SCREEN: 11.67kg 0-0.1m NO FCF
			0.5		CI-CH	Silty CLAY: medium to high plasticity, yellow brown, trace of ironstone gravel.	w<PL			SCREEN: 4.89kg 0.1-0.3m NO FCF RESIDUAL
						END OF BOREHOLE AT 0.6m				
			1							
			1.5							
			2							
			2.5							
			3							
			3.5							

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BOREHOLE LOG

Borehole No. 112

1/1

SDUP2: 0-0.1m

Client: SCHOOL INFRASTUCTURE NSW

Project: PROPOSED SCHOOL UPGRADE

Location: PARRAMATTA EAST PUBLIC SCHOOL, PARRAMATTA, NSW

Job No.: E35073B **Method:** HAND AUGER **R.L. Surface:** N/A

Date: 12/7/22 **Datum:** -

Plant Type: - **Logged/Checked by:** H.W./T.H.

Groundwater Record	SAMPLES ES	SAMPLES U50	SAMPLES DB	SAMPLES DS	Field Tests	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel. Density	Hand Penetrometer Readings (kPa.)	Remarks
DRY ON COMPLETION						0			FILL: Clayey sand, fine to medium grained, brown, trace of igneous grave, plastic and ceramic fragments, and ash.	M			GRAVEL COVER
										w≈PL			SCREEN: 12kg 0-0.1m NO FCF
									FILL: Silty clay, low plasticity, brown, trace of sand and igneous gravel.				SCREEN: 3.75kg 0.1-0.4m NO FCF
						0.5		CI-CH	Silty CLAY: medium to high plasticity, yellow brown, trace of ironstone gravel.	w≈PL			RESIDUAL
									END OF BOREHOLE AT 0.6m				HAND AUGER REFUSAL
						1							
						1.5							
						2							
						2.5							
						3							
						3.5							

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BOREHOLE LOG

Borehole No. **113**

1/1

SDUP8: 0-0.1m

Client: SCHOOL INFRASTUCTURE NSW

Project: PROPOSED SCHOOL UPGRADE

Location: PARRAMATTA EAST PUBLIC SCHOOL, PARRAMATTA, NSW

Job No.: E35073B **Method:** PUSH TUBE **R.L. Surface:** N/A

Date: 15/7/22 **Datum:** -

Plant Type: EZI PROBE **Logged/Checked by:** H.W./T.H.

Groundwater Record	SAMPLES ES / U50 / DB / DS	Field Tests	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel. Density	Hand Penetrometer Readings (kPa.)	Remarks
DRY ON COMPLETION			0			FILL: Clayey sand, fine to medium grained, brown, trace of igneous and ironstone gravel, and root fibres.	M			GRASS COVER
						FILL: Silty clay, medium to high plasticity, yellow brown, trace of igneous gravel, and ash.	w>PL			SCREEN: 10.6kg 0-0.1m NO FCF SCREEN: 3.7kg 0.1-0.4m NO FCF
			0.5		CI-CH	Silty CLAY: medium to high plasticity, yellow brown mottled orange brown, trace of ironstone gravel.	w≈PL			RESIDUAL
			1			as above, but grey and orange brown.				
						END OF BOREHOLE AT 1.3m				
			1.5							
			2							
			2.5							
			3							
			3.5							

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BOREHOLE LOG

Borehole No. **114**

1/1

Client: SCHOOL INFRASTUCTURE NSW

Project: PROPOSED SCHOOL UPGRADE

Location: PARRAMATTA EAST PUBLIC SCHOOL, PARRAMATTA, NSW

Job No.: E35073B **Method:** HAND AUGER **R.L. Surface:** N/A

Date: 15/7/22 **Datum:** -

Plant Type: - **Logged/Checked by:** H.W./T.H.

Groundwater Record	SAMPLES ES	U50	DB	DS	Field Tests	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel. Density	Hand Penetrometer Readings (kPa.)	Remarks
DRY ON COMPLETION						0			FILL: Silty clay, low to medium plasticity, dark brown, trace of ironstone gravel, and root fibres.	w>PL			GRASS COVER SCREEN: 10.1kg 0-0.1m NO FCF
								CI-CH	Silty CLAY: medium to high plasticity, yellow brown mottled orange brown, trace of ironstone gravel.	w>PL			SCREEN: 4.3kg 0.1-0.2m NO FCF RESIDUAL
						0.5			END OF BOREHOLE AT 0.5m				

Depth scale: 0, 0.5, 1, 1.5, 2, 2.5, 3, 3.5

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BOREHOLE LOG

Borehole No.
115
1/1

Client: SCHOOL INFRASTUCTURE NSW
Project: PROPOSED SCHOOL UPGRADE
Location: PARRAMATTA EAST PUBLIC SCHOOL, PARRAMATTA, NSW

Job No.: E35073B **Method:** PUSH TUBE **R.L. Surface:** N/A
Date: 14/7/22 **Datum:** -
Plant Type: EZI PROBE **Logged/Checked by:** H.W./T.H.

Groundwater Record	SAMPLES (ES / U50 / DB / DS)	Field Tests	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel. Density	Hand Penetrometer Readings (kPa.)	Remarks
DRY ON COMPLETION			0			FILL: Clayey sand, fine to medium grained, brown, trace of ironstone gravel, bricks and brick fragments, steel, and root fibres.	M			GRAS COVER SCREEN: 15.18kg 0-0.15m NO FCF
			0.5		CI-CH	Silty CLAY: medium to high plasticity, yellow brown mottled orange brown, trace of ironstone gravel.	w≈PL			RESIDUAL
			1		-	Extremely Weathered sandstone: sandy CLAY, low to medium plasticity, grey, fine grained sand.	XW			HAWKESBURY SANDSTONE
						END OF BOREHOLE AT 1.0m				PUSHTUBE REFUSAL ON SANDSTONE BEDROCK
			1.5							
			2							
			2.5							
			3							
			3.5							

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BOREHOLE LOG

Borehole No. **116**

1/1

SDUP6: PFAS: ASB: 0-0.1m

Client: SCHOOL INFRASTUCTURE NSW

Project: PROPOSED SCHOOL UPGRADE

Location: PARRAMATTA EAST PUBLIC SCHOOL, PARRAMATTA, NSW

Job No.: E35073B **Method:** PUSH TUBE **R.L. Surface:** N/A

Date: 14/7/22 **Datum:** -

Plant Type: EZI PROBE **Logged/Checked by:** H.W./T.H.

Groundwater Record	SAMPLES ES	U50	DB	DS	Field Tests	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel. Density	Hand Penetrometer Readings (kPa.)	Remarks
DRY ON COMPLETION						0			FILL: Silty clay, low to medium plasticity, brown, trace of ironstone gravel, plastic and steel fragments, and root fibres.	w>PL			GRASS COVER SCREEN: 11.48kg 0-0.1m FCF1, FCF2 & FCF3
						0.5		CI-CH	Silty CLAY: medium to high plasticity, yellow brown, trace of ironstone gravel, and root fibres.	w≈PL			SCREEN: 11.13kg 0.1-0.3m NO FCF RESIDUAL
						1		-	Extremely Weathered sandstone: sandy CLAY, low to medium plasticity, yellow brown and grey, trace of ironstone gravel.	XW			HAWKESBURY SANDSTONE
									END OF BOREHOLE AT 1.2m				
						1.5							
						2							
						2.5							
						3							
						3.5							

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BOREHOLE LOG

Borehole No. 117

1/1

Client: SCHOOL INFRASTUCTURE NSW

Project: PROPOSED SCHOOL UPGRADE

Location: PARRAMATTA EAST PUBLIC SCHOOL, PARRAMATTA, NSW

Job No.: E35073B **Method:** PUSH TUBE **R.L. Surface:** N/A

Date: 14/7/22 **Datum:** -

Plant Type: EZI PROBE **Logged/Checked by:** H.W./T.H.

Groundwater Record	SAMPLES ES	U50	DB	DS	Field Tests	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel. Density	Hand Penetrometer Readings (kPa.)	Remarks
DRY ON COMPLETION						0			FILL: Silty gravelly clay, low plasticity, brown, fine to medium grained, sub-angular, igneous and ironstone gravel, trace of sand, slag and root fibres.	w>PL			GRASS COVER SCREEN: 11.2kg 0-0.1m NO FCF
								CI-CH	Silty CLAY: medium to high plasticity, yellow brown, trace of ironstone gravel, and root fibres.	w≈PL			SCREEN: 6.18kg 0.1-0.2m NO FCF RESIDUAL
						0.5							
						1			END OF BOREHOLE AT 1.0m				PUSH TUBE REFUSAL ON INFERRED SANDSTONE BEDROCK
						1.5							
						2							
						2.5							
						3							
						3.5							

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BOREHOLE LOG

Borehole No. **118**

1/1

SDUP7: PFAS: ASB: 0-0.1m

Client: SCHOOL INFRASTUCTURE NSW

Project: PROPOSED SCHOOL UPGRADE

Location: PARRAMATTA EAST PUBLIC SCHOOL, PARRAMATTA, NSW

Job No.: E35073B **Method:** PUSH TUBE **R.L. Surface:** N/A

Date: 14/7/22 **Datum:** -

Plant Type: EZI PROBE **Logged/Checked by:** H.W./T.H.

Groundwater Record	SAMPLES ES	U50	DB	DS	Field Tests	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel. Density	Hand Penetrometer Readings (kPa.)	Remarks
DRY ON COMPLETION						0			FILL: Clayey gravelly sand, fine to medium grained, brown, fine to medium grained, sub angular, ironstone gravel, trace of bricks and steel fragments, slag and root fibres.	M			GRASS COVER SCREEN: 11.88kg 0-0.1m FCF1 & FCF2
								CI-CH	Silty CLAY: medium to high plasticity, yellow brown, trace of ironstone gravel, and root fibres.	w≈PL			SCREEN: 5.2kg 0.1-0.2m NO FCF RESIDUAL
						0.5			as above, but grey mottled orange brown.				
						1			END OF BOREHOLE AT 1.0m				
						1.5							
						2							
						2.5							
						3							
						3.5							

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BOREHOLE LOG

Borehole No. **119**

1/1

Client: SCHOOL INFRASTUCTURE NSW

Project: PROPOSED SCHOOL UPGRADE

Location: PARRAMATTA EAST PUBLIC SCHOOL, PARRAMATTA, NSW

Job No.: E35073B **Method:** PUSH TUBE **R.L. Surface:** N/A

Date: 14/7/22 **Datum:** -

Plant Type: EZI PROBE **Logged/Checked by:** H.W./T.H.

Groundwater Record	SAMPLES (ES, U50, DB, DS)	Field Tests	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel. Density	Hand Penetrometer Readings (kPa.)	Remarks
DRY ON COMPLETION			0			FILL: Silty clay, low to medium plasticity, brown, trace of sand, ironstone gravel and slag.	w>PL			SCREEN: 10.55kg 0-0.15m NO FCF
					CI-CH	Silty CLAY: medium to high plasticity, yellow brown, trace of sand and ironstone gravel.	w>PL			RESIDUAL
			0.5							
			1			as above, but grey, without sand.	w≈PL			
						END OF BOREHOLE AT 1.3m				
			1.5							
			2							
			2.5							
			3							
			3.5							

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BOREHOLE LOG

Borehole No. **120**

Client: SCHOOL INFRASTUCTURE NSW

Project: PROPOSED SCHOOL UPGRADE

Location: PARRAMATTA EAST PUBLIC SCHOOL, PARRAMATTA, NSW

Job No.: E35073B **Method:** PUSH TUBE **R.L. Surface:** N/A

Date: 14/7/22 **Datum:** -

Plant Type: EZI PROBE **Logged/Checked by:** H.W./T.H.

Groundwater Record	SAMPLES ES	U50	DB	DS	Field Tests	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel. Density	Hand Penetrometer Readings (kPa.)	Remarks
DRY ON COMPLETION						0			FILL: Silty clay, low to medium plasticity, brown, trace of sand, ironstone gravel and root fibres.	w>PL			SCREEN: 11.6kg 0-0.1m FCF1 & FCF2; SCREEN: 11.06kg 0.1-0.4m FCF3 & FCF4
						0.5		CI-CH	Silty CLAY: medium to high plasticity, yellow brown, trace of ironstone gravel.	w≈PL			RESIDUAL
						1			as above, but grey and orange brown.				
									END OF BOREHOLE AT 1.3m				
						1.5							
						2							
						2.5							
						3							
						3.5							

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BOREHOLE LOG

Borehole No. **121**

1/1

SDUP5: PFAS: ASB: 0-0.1m

Client: SCHOOL INFRASTUCTURE NSW

Project: PROPOSED SCHOOL UPGRADE

Location: PARRAMATTA EAST PUBLIC SCHOOL, PARRAMATTA, NSW

Job No.: E35073B **Method:** PUSH TUBE **R.L. Surface:** N/A

Date: 14/7/22 **Datum:** -

Plant Type: EZI PROBE **Logged/Checked by:** H.W./T.H.

Groundwater Record	Field Tests	Depth (m)	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel. Density	Hand Penetrometer Readings (kPa.)	Remarks
DRY ON COMPLETION		0		FILL: Silty clay, medium to high plasticity, brown, trace of ironstone gravel and root fibres.	w>PL			SCREEN: 12.98kg 0-0.1m FCF1
			CI-CH	Silty CLAY: medium to high plasticity, yellow brown, trace of sand and ironstone gravel.	w≈PL			SCREEN: 4.36kg 0.1-0.2m NO FCF RESIDUAL
		0.5						
		1		as above, but without sand.				
		1.5		END OF BOREHOLE AT 1.4m				
		2						
		2.5						
		3						
		3.5						

Samples: ES, U50, DB, DS

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BOREHOLE LOG

Borehole No. 122
1/1

Client: SCHOOL INFRASTUCTURE NSW
Project: PROPOSED SCHOOL UPGRADE
Location: PARRAMATTA EAST PUBLIC SCHOOL, PARRAMATTA, NSW

Job No.: E35073B **Method:** PUSH TUBE **R.L. Surface:** N/A
Date: 14/7/22 **Datum:** -
Plant Type: EZI PROBE **Logged/Checked by:** H.W./T.H.

Groundwater Record	SAMPLES (ES, U50, DB, DS)	Field Tests	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel. Density	Hand Penetrometer Readings (kPa.)	Remarks
DRY ON COMPLETION			0			FILL: Silty clay, low to medium plasticity, brown, trace of igneous and ironstone gravel, concrete and brick fragments and root fibres.	w>PL			GRASS COVER SCREEN: 10.75kg 0-0.1m FCF1, FCF2 & FCF3
			0.5		CI-CH	Silty CLAY: medium to high plasticity, yellow brown, trace of ironstone gravel.	w≈PL			SCREEN: 5.49kg 0.1-0.3 NO FCF RESIDUAL
			1			as above, but grey.	w<PL			
			1.5			END OF BOREHOLE AT 1.4m				
			2							
			2.5							
			3							
			3.5							

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BOREHOLE LOG

Borehole No.
123
1/1

Client: SCHOOL INFRASTUCTURE NSW
Project: PROPOSED SCHOOL UPGRADE
Location: PARRAMATTA EAST PUBLIC SCHOOL, PARRAMATTA, NSW

Job No.: E35073B **Method:** HAND AUGER **R.L. Surface:** N/A
Date: 20/7/22 **Datum:** -
Plant Type: - **Logged/Checked by:** A.D./T.H.

Groundwater Record	SAMPLES ES	U50	DB	DS	Field Tests	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel. Density	Hand Penetrometer Readings (kPa.)	Remarks
DRY ON COMPLETION						0			FILL: Silty sandy clay, medium to high plasticity, brown, fine to medium grained sand, trace of ironstone gravel, and root fibres.	w≈PL			MULCH COVER SCREEN: 10.61kg 0-0.1m NO FCF
						0.5		CI-CH	Silty CLAY: medium to high plasticity, yellow brown mottled orange brown, trace of ironstone gravel and ash.	w≈PL			RESIDUAL
									END OF BOREHOLE AT 0.8m				
						1							
						1.5							
						2							
						2.5							
						3							
						3.5							

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BOREHOLE LOG

Borehole No. **124**

1/1

Client: SCHOOL INFRASTUCTURE NSW

Project: PROPOSED SCHOOL UPGRADE

Location: PARRAMATTA EAST PUBLIC SCHOOL, PARRAMATTA, NSW

Job No.: E35073B **Method:** HAND AUGER **R.L. Surface:** N/A

Date: 20/7/22 **Datum:** -

Plant Type: - **Logged/Checked by:** N.F./

Groundwater Record	SAMPLES ES	SAMPLES U50	SAMPLES DB	SAMPLES DS	Field Tests	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel. Density	Hand Penetrometer Readings (kPa.)	Remarks
DRY ON COMPLETION						0			FILL: Silty clay, medium to high plasticity, brown, trace of sand, ironstone and sandstone gravel, brick fragments, ash, and root fibres.	w≈PL			GRASS COVER SCREEN: 12.11kg 0-0.1m NO FCF
						0.5		CI-CH	Silty CLAY: medium to high plasticity, yellow brown mottled orange brown, trace of sand, ironstone gravel, and ash.	w≈PL			RESIDUAL
									END OF BOREHOLE AT 0.6m				
						1							
						1.5							
						2							
						2.5							
						3							
						3.5							

REPORT EXPLANATION NOTES

INTRODUCTION

These notes have been provided to amplify the geotechnical report in regard to classification methods, field procedures and certain matters relating to the Comments and Recommendations section. Not all notes are necessarily relevant to all reports.

The ground is a product of continuing natural and man-made processes and therefore exhibits a variety of characteristics and properties which vary from place to place and can change with time. Geotechnical engineering involves gathering and assimilating limited facts about these characteristics and properties in order to understand or predict the behaviour of the ground on a particular site under certain conditions. This report may contain such facts obtained by inspection, excavation, probing, sampling, testing or other means of investigation. If so, they are directly relevant only to the ground at the place where and time when the investigation was carried out.

DESCRIPTION AND CLASSIFICATION METHODS

The methods of description and classification of soils and rocks used in this report are based on Australian Standard 1726:2017 *'Geotechnical Site Investigations'*. In general, descriptions cover the following properties – soil or rock type, colour, structure, strength or density, and inclusions. Identification and classification of soil and rock involves judgement and the Company infers accuracy only to the extent that is common in current geotechnical practice.

Soil types are described according to the predominating particle size and behaviour as set out in the attached soil classification table qualified by the grading of other particles present (eg. sandy clay) as set out below:

Soil Classification	Particle Size
Clay	< 0.002mm
Silt	0.002 to 0.075mm
Sand	0.075 to 2.36mm
Gravel	2.36 to 63mm
Cobbles	63 to 200mm
Boulders	> 200mm

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

Relative Density	SPT 'N' Value (blows/300mm)
Very loose (VL)	< 4
Loose (L)	4 to 10
Medium dense (MD)	10 to 30
Dense (D)	30 to 50
Very Dense (VD)	> 50

Cohesive soils are classified on the basis of strength (consistency) either by use of a hand penetrometer, vane shear, laboratory testing and/or tactile engineering examination. The strength terms are defined as follows.

Classification	Unconfined Compressive Strength (kPa)	Indicative Undrained Shear Strength (kPa)
Very Soft (VS)	≤ 25	≤ 12
Soft (S)	> 25 and ≤ 50	> 12 and ≤ 25
Firm (F)	> 50 and ≤ 100	> 25 and ≤ 50
Stiff (St)	> 100 and ≤ 200	> 50 and ≤ 100
Very Stiff (VSt)	> 200 and ≤ 400	> 100 and ≤ 200
Hard (Hd)	> 400	> 200
Friable (Fr)	Strength not attainable – soil crumbles	

Rock types are classified by their geological names, together with descriptive terms regarding weathering, strength, defects, etc. Where relevant, further information regarding rock classification is given in the text of the report. In the Sydney Basin, 'shale' is used to describe fissile mudstone, with a weakness parallel to bedding. Rocks with alternating inter-laminations of different grain size (eg. siltstone/claystone and siltstone/fine grained sandstone) is referred to as 'laminite'.

SAMPLING

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

Disturbed samples taken during drilling provide information on plasticity, grain size, colour, moisture content, minor constituents and, depending upon the degree of disturbance, some information on strength and structure. Bulk samples are similar but of greater volume required for some test procedures.

Undisturbed samples are taken by pushing a thin-walled sample tube, usually 50mm diameter (known as a U50), into the soil and withdrawing it with a sample of the soil contained in a relatively undisturbed state. Such samples yield information on structure and strength, and are necessary for laboratory determination of shrink-swell behaviour, strength and compressibility. Undisturbed sampling is generally effective only in cohesive soils.

Details of the type and method of sampling used are given on the attached logs.

INVESTIGATION METHODS

The following is a brief summary of investigation methods currently adopted by the Company and some comments on their use and application. All methods except test pits, hand auger drilling and portable Dynamic Cone Penetrometers require the use of a mechanical rig which is commonly mounted on a truck chassis or track base.

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

Hand Auger Drilling: A borehole of 50mm to 100mm diameter is advanced by manually operated equipment. Refusal of the hand auger can occur on a variety of materials such as obstructions within any fill, tree roots, hard clay, gravel or ironstone, cobbles and boulders, and does not necessarily indicate rock level.

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

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

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

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

Continuous Core Drilling: A continuous core sample is obtained using a diamond tipped core barrel. Provided full core recovery is achieved (which is not always possible in very low strength rocks and granular soils), this technique provides a very reliable (but relatively expensive) method of investigation. In rocks, NMLC or HQ triple tube core barrels, which give a core of about 50mm and 61mm diameter, respectively, is usually used with water flush. The length of core recovered is compared to the length drilled and any length not recovered is shown as NO CORE. The location of NO CORE recovery is determined on site by the supervising engineer; where the location is uncertain, the loss is placed at the bottom of the drill run.

Standard Penetration Tests: Standard Penetration Tests (SPT) are used mainly in non-cohesive soils, but can also be used in cohesive soils, as a means of indicating density or strength and also of obtaining a relatively undisturbed sample. The test procedure is described in Australian Standard 1289.6.3.1–2004 (R2016) *'Methods of Testing Soils for Engineering Purposes, Soil Strength and Consolidation Tests – Determination of the Penetration Resistance of a Soil – Standard Penetration Test (SPT)'*.

The test is carried out in a borehole by driving a 50mm diameter split sample tube with a tapered shoe, under the impact of a 63.5kg hammer with a free fall of 760mm. It is normal for the tube to be driven in three successive 150mm increments and the 'N' value is taken as the number of blows for the last 300mm. In dense sands, very hard clays or weak rock, the full 450mm penetration may not be practicable and the test is discontinued.

The test results are reported in the following form:

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

  N = 13
  4, 6, 7

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

  N > 30
  15, 30/40mm

The results of the test can be related empirically to the engineering properties of the soil.

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

Cone Penetrometer Testing (CPT) and Interpretation: The cone penetrometer is sometimes referred to as a Dutch Cone. The test is described in Australian Standard 1289.6.5.1–1999 (R2013) *'Methods of Testing Soils for Engineering Purposes, Soil Strength and Consolidation Tests – Determination of the Static Cone Penetration Resistance of a Soil – Field Test using a Mechanical and Electrical Cone or Friction-Cone Penetrometer'*.

In the tests, a 35mm or 44mm diameter rod with a conical tip is pushed continuously into the soil, the reaction being provided by a specially designed truck or rig which is fitted with a hydraulic ram system. Measurements are made of the end bearing resistance on the cone and the frictional resistance on a separate 134mm or 165mm long sleeve, immediately behind the cone. Transducers in the tip of the assembly are electrically connected by wires passing through the centre of the push rods to an amplifier and recorder unit mounted on the control truck. The CPT does not provide soil sample recovery.

As penetration occurs (at a rate of approximately 20mm per second), the information is output as incremental digital records every 10mm. The results given in this report have been plotted from the digital data.

The information provided on the charts comprise:

- Cone resistance – the actual end bearing force divided by the cross sectional area of the cone – expressed in MPa. There are two scales presented for the cone resistance. The lower scale has a range of 0 to 5MPa and the main scale has a range of 0 to 50MPa. For cone resistance values less than 5MPa, the plot will appear on both scales.
- Sleeve friction – the frictional force on the sleeve divided by the surface area – expressed in kPa.
- Friction ratio – the ratio of sleeve friction to cone resistance, expressed as a percentage.

  The ratios of the sleeve resistance to cone resistance will vary with the type of soil encountered, with higher relative friction in clays than in sands. Friction ratios of 1% to 2% are commonly encountered in sands and occasionally very soft clays, rising to 4% to 10% in stiff clays and peats. Soil descriptions based on cone resistance and friction ratios are only inferred and must not be considered as exact.

Correlations between CPT and SPT values can be developed for both sands and clays but may be site specific.

Interpretation of CPT values can be made to empirically derive modulus or compressibility values to allow calculation of foundation settlements.

Stratification can be inferred from the cone and friction traces and from experience and information from nearby boreholes etc. Where shown, this information is presented for general guidance, but must be regarded as interpretive. The test method provides a continuous profile of engineering properties but, where precise information on soil classification is required, direct drilling and sampling may be preferable.

There are limitations when using the CPT in that it may not penetrate obstructions within any fill, thick layers of hard clay and very dense sand, gravel and weathered bedrock. Normally a 'dummy' cone is pushed through fill to protect the equipment. No information is recorded by the 'dummy' probe.

Flat Dilatometer Test: The flat dilatometer (DMT), also known as the Marchetti Dilometer comprises a stainless steel blade having a flat, circular steel membrane mounted flush on one side.

The blade is connected to a control unit at ground surface by a pneumatic-electrical tube running through the insertion rods. A gas tank, connected to the control unit by a pneumatic cable, supplies the gas pressure required to expand the membrane. The control unit is equipped with a pressure regulator, pressure gauges, an audio-visual signal and vent valves.

The blade is advanced into the ground using our CPT rig or one of our drilling rigs, and can be driven into the ground using an SPT hammer. As soon as the blade is in place, the membrane is inflated, and the pressure required to lift the membrane (approximately 0.1mm) is recorded. The pressure then required to lift the centre of the membrane by an additional 1mm is recorded. The membrane is then deflated before pushing to the next depth increment, usually 200mm down. The pressure readings are corrected for membrane stiffness.

The DMT is used to measure material index (I_D), horizontal stress index (K_D), and dilatometer modulus (E_D). Using established correlations, the DMT results can also be used to assess the 'at rest' earth pressure coefficient (K_o), over-consolidation ratio (OCR), undrained shear strength (C_u), friction angle (ϕ), coefficient of consolidation (C_h), coefficient of permeability (K_h), unit weight (γ), and vertical drained constrained modulus (M).

The seismic dilatometer (SDMT) is the combination of the DMT with an add-on seismic module for the measurement of shear wave velocity (V_s). Using established correlations, the SDMT results can also be used to assess the small strain modulus (G_o).

Portable Dynamic Cone Penetrometers: Portable Dynamic Cone Penetrometer (DCP) tests are carried out by driving a 16mm diameter rod with a 20mm diameter cone end with a 9kg hammer dropping 510mm. The test is described in Australian Standard 1289.6.3.2–1997 (R2013) *'Methods of Testing Soils for Engineering Purposes, Soil Strength and Consolidation Tests – Determination of the Penetration Resistance of a Soil – 9kg Dynamic Cone Penetrometer Test'*.

The results are used to assess the relative compaction of fill, the relative density of granular soils, and the strength of cohesive soils. Using established correlations, the DCP test results can also be used to assess California Bearing Ratio (CBR).

Refusal of the DCP can occur on a variety of materials such as obstructions within any fill, tree roots, hard clay, gravel or ironstone, cobbles and boulders, and does not necessarily indicate rock level.

Vane Shear Test: The vane shear test is used to measure the undrained shear strength (C_u) of typically very soft to firm fine grained cohesive soils. The vane shear is normally performed in the bottom of a borehole, but can be completed from surface level, the bottom and sides of test pits, and on recovered undisturbed tube samples (when using a hand vane).

The vane comprises four rectangular blades arranged in the form of a cross on the end of a thin rod, which is coupled to the bottom of a drill rod string when used in a borehole. The size of the vane is dependent on the strength of the fine grained cohesive soils; that is, larger vanes are normally used for very low strength soils. For borehole testing, the size of the vane can be limited by the size of the casing that is used.

For testing inside a borehole, a device is used at the top of the casing, which suspends the vane and rods so that they do not sink under self-weight into the 'soft' soils beyond the depth at which the test is to be carried out. A calibrated torque head is used to rotate the rods and vane and to measure the resistance of the vane to rotation.

With the vane in position, torque is applied to cause rotation of the vane at a constant rate. A rate of 6° per minute is the common rotation rate. Rotation is continued until the soil is sheared and the maximum torque has been recorded. This value is then used to calculate the undrained shear strength. The vane is then rotated rapidly a number of times and the operation repeated until a constant torque reading is obtained. This torque value is used to calculate the remoulded shear strength. Where appropriate, friction on the vane rods is measured and taken into account in the shear strength calculation.

LOGS

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

The terms and symbols used in preparation of the logs are defined in the following pages.

Interpretation of the information shown on the logs, and its application to design and construction, should therefore take into account the spacing of boreholes or test pits, the method of drilling or excavation, the frequency of sampling and testing and the possibility of other than 'straight line' variations between the boreholes or test pits. Subsurface conditions between boreholes or test pits may vary significantly from conditions encountered at the borehole or test pit locations.

GROUNDWATER

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

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

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

FILL

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

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

LABORATORY TESTING

Laboratory testing is normally carried out in accordance with Australian Standard 1289 *'Methods of Testing Soils for Engineering Purposes'* or appropriate NSW Government Roads & Maritime Services (RMS) test methods. Details of the test procedure used are given on the individual report forms.

ENGINEERING REPORTS

Engineering reports are prepared by qualified personnel and are based on the information obtained and on current engineering standards of interpretation and analysis. Where the report has been prepared for a specific design proposal (eg. a three storey building) the information and interpretation may not be relevant if the design proposal is changed (eg. to a twenty storey building). If this happens, the Company will be pleased to review the report and the sufficiency of the investigation work.

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

- Unexpected variations in ground conditions – the potential for this will be partially dependent on borehole spacing and sampling frequency as well as investigation technique.
- Changes in policy or interpretation of policy by statutory authorities.
- The actions of persons or contractors responding to commercial pressures.
- Details of the development that the Company could not reasonably be expected to anticipate.

If these occur, the Company will be pleased to assist with investigation or advice to resolve any problems occurring.

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, the Company requests that it immediately be notified. Most problems are much more readily resolved when conditions are exposed rather than at some later stage, well after the event.

REPRODUCTION OF INFORMATION FOR CONTRACTUAL PURPOSES

Where information obtained from this investigation 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. The Company would be pleased to assist in this regard and/or to make additional report copies available for contract purposes at a nominal charge.

Copyright in all documents (such as drawings, borehole or test pit logs, reports and specifications) provided by the Company shall remain the property of Jeffery and Katauskas Pty Ltd. Subject to the payment of all fees due, the Client alone shall have a licence to use the documents provided for the sole purpose of completing the project to which they relate. Licence to use the documents may be revoked without notice if the Client is in breach of any obligation to make a payment to us.

REVIEW OF DESIGN

Where major civil or structural developments are proposed <u>or</u> where only a limited investigation has been completed <u>or</u> where the geotechnical conditions/constraints are quite complex, it is prudent to have a joint design review which involves an experienced geotechnical engineer/engineering geologist.

SITE INSPECTION

The Company will always be pleased to provide engineering inspection services for geotechnical aspects of work to which this report is related.

Requirements could range from:

i) a site visit to confirm that conditions exposed are no worse than those interpreted, to

ii) a visit to assist the contractor or other site personnel in identifying various soil/rock types and appropriate footing or pile founding depths, or

iii) full time engineering presence on site.

SYMBOL LEGENDS

SOIL

- FILL
- TOPSOIL
- CLAY (CL, CI, CH)
- SILT (ML, MH)
- SAND (SP, SW)
- GRAVEL (GP, GW)
- SANDY CLAY (CL, CI, CH)
- SILTY CLAY (CL, CI, CH)
- CLAYEY SAND (SC)
- SILTY SAND (SM)
- GRAVELLY CLAY (CL, CI, CH)
- CLAYEY GRAVEL (GC)
- SANDY SILT (ML, MH)
- PEAT AND HIGHLY ORGANIC SOILS (Pt)

ROCK

- CONGLOMERATE
- SANDSTONE
- SHALE/MUDSTONE
- SILTSTONE
- CLAYSTONE
- COAL
- LAMINITE
- LIMESTONE
- PHYLLITE, SCHIST
- TUFF
- GRANITE, GABBRO
- DOLERITE, DIORITE
- BASALT, ANDESITE
- QUARTZITE

OTHER MATERIALS

- BRICKS OR PAVERS
- CONCRETE
- ASPHALTIC CONCRETE

CLASSIFICATION OF COARSE AND FINE GRAINED SOILS

Major Divisions		Group Symbol	Typical Names	Field Classification of Sand and Gravel	Laboratory Classification	
Coarse grained soil (more than 65% of soil excluding oversize fraction is greater than 0.075mm)	GRAVEL (more than half of coarse fraction is larger than 2.36mm	GW	Gravel and gravel-sand mixtures, little or no fines	Wide range in grain size and substantial amounts of all intermediate sizes, not enough fines to bind coarse grains, no dry strength	≤ 5% fines	$C_u > 4$ $1 < C_c < 3$
		GP	Gravel and gravel-sand mixtures, little or no fines, uniform gravels	Predominantly one size or range of sizes with some intermediate sizes missing, not enough fines to bind coarse grains, no dry strength	≤ 5% fines	Fails to comply with above
		GM	Gravel-silt mixtures and gravel-sand-silt mixtures	'Dirty' materials with excess of non-plastic fines, zero to medium dry strength	≥ 12% fines, fines are silty	Fines behave as silt
		GC	Gravel-clay mixtures and gravel-sand-clay mixtures	'Dirty' materials with excess of plastic fines, medium to high dry strength	≥ 12% fines, fines are clayey	Fines behave as clay
	SAND (more than half of coarse fraction is smaller than 2.36mm)	SW	Sand and gravel-sand mixtures, little or no fines	Wide range in grain size and substantial amounts of all intermediate sizes, not enough fines to bind coarse grains, no dry strength	≤ 5% fines	$C_u > 6$ $1 < C_c < 3$
		SP	Sand and gravel-sand mixtures, little or no fines	Predominantly one size or range of sizes with some intermediate sizes missing, not enough fines to bind coarse grains, no dry strength	≤ 5% fines	Fails to comply with above
		SM	Sand-silt mixtures	'Dirty' materials with excess of non-plastic fines, zero to medium dry strength	≥ 12% fines, fines are silty	N/A
		SC	Sand-clay mixtures	'Dirty' materials with excess of plastic fines, medium to high dry strength	≥ 12% fines, fines are clayey	

Major Divisions		Group Symbol	Typical Names	Field Classification of Silt and Clay			Laboratory Classification
				Dry Strength	Dilatancy	Toughness	% < 0.075mm
ine grained soils (more than 35% of soil excluding oversize fraction is less than 0.075mm)	SILT and CLAY (low to medium plasticity)	ML	Inorganic silt and very fine sand, rock flour, silty or clayey fine sand or silt with low plasticity	None to low	Slow to rapid	Low	Below A line
		CL, CI	Inorganic clay of low to medium plasticity, gravelly clay, sandy clay	Medium to high	None to slow	Medium	Above A line
		OL	Organic silt	Low to medium	Slow	Low	Below A line
	SILT and CLAY (high plasticity)	MH	Inorganic silt	Low to medium	None to slow	Low to medium	Below A line
		CH	Inorganic clay of high plasticity	High to very high	None	High	Above A line
		OH	Organic clay of medium to high plasticity, organic silt	Medium to high	None to very slow	Low to medium	Below A line
	Highly organic soil	Pt	Peat, highly organic soil	–	–	–	–

Laboratory Classification Criteria

A well graded coarse grained soil is one for which the coefficient of uniformity $Cu > 4$ and the coefficient of curvature $1 < C_c < 3$. Otherwise, the soil is poorly graded. These coefficients are given by:

$$C_U = \frac{D_{60}}{D_{10}} \quad and \quad C_C = \frac{(D_{30})^2}{D_{10}\,D_{60}}$$

Where D_{10}, D_{30} and D_{60} are those grain sizes for which 10%, 30% and 60% of the soil grains, respectively, are smaller.

NOTES:

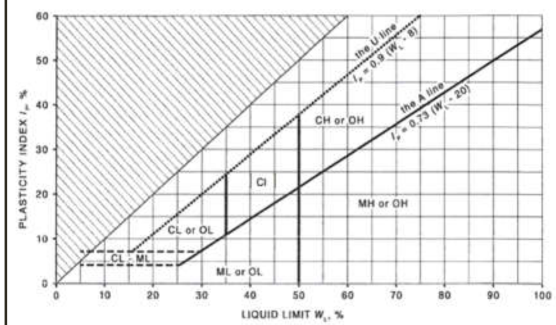
1 For a coarse grained soil with a fines content between 5% and 12%, the soil is given a dual classification comprising the two group symbols separated by a dash; for example, for a poorly graded gravel with between 5% and 12% silt fines, the classification is GP-GM.

2 Where the grading is determined from laboratory tests, it is defined by coefficients of curvature (C_c) and uniformity (C_u) derived from the particle size distribution curve.

3 Clay soils with liquid limits > 35% and ≤ 50% may be classified as being of medium plasticity.

4 The U line on the Modified Casagrande Chart is an approximate upper bound for most natural soils.

Modified Casagrande Chart for Classifying Silts and Clays according to their Behaviour



LOG SYMBOLS

Log Column	Symbol	Definition
Groundwater Record		Standing water level. Time delay following completion of drilling/excavation may be shown.
	C	Extent of borehole/test pit collapse shortly after drilling/excavation.
		Groundwater seepage into borehole or test pit noted during drilling or excavation.
Samples	ES	Sample taken over depth indicated, for environmental analysis.
	U50	Undisturbed 50mm diameter tube sample taken over depth indicated.
	DB	Bulk disturbed sample taken over depth indicated.
	DS	Small disturbed bag sample taken over depth indicated.
	ASB	Soil sample taken over depth indicated, for asbestos analysis.
	ASS	Soil sample taken over depth indicated, for acid sulfate soil analysis.
	SAL	Soil sample taken over depth indicated, for salinity analysis.
Field Tests	N = 17 4, 7, 10	Standard Penetration Test (SPT) performed between depths indicated by lines. Individual figures show blows per 150mm penetration. 'Refusal' refers to apparent hammer refusal within the corresponding 150mm depth increment.
	N_c = 5 7 3R	Solid Cone Penetration Test (SCPT) performed between depths indicated by lines. Individual figures show blows per 150mm penetration for 60° solid cone driven by SPT hammer. 'R' refers to apparent hammer refusal within the corresponding 150mm depth increment.
	VNS = 25	Vane shear reading in kPa of undrained shear strength.
	PID = 100	Photoionisation detector reading in ppm (soil sample headspace test).
Moisture Condition (Fine Grained Soils)	*w* > PL	Moisture content estimated to be greater than plastic limit.
	w ≈ PL	Moisture content estimated to be approximately equal to plastic limit.
	w < PL	Moisture content estimated to be less than plastic limit.
	w ≈ LL	Moisture content estimated to be near liquid limit.
	w > LL	Moisture content estimated to be wet of liquid limit.
(Coarse Grained Soils)	D	DRY – runs freely through fingers.
	M	MOIST – does not run freely but no free water visible on soil surface.
	W	WET – free water visible on soil surface.
Strength (Consistency) Cohesive Soils	VS	VERY SOFT – unconfined compressive strength ≤ 25kPa.
	S	SOFT – unconfined compressive strength > 25kPa and ≤ 50kPa.
	F	FIRM – unconfined compressive strength > 50kPa and ≤ 100kPa.
	St	STIFF – unconfined compressive strength > 100kPa and ≤ 200kPa.
	VSt	VERY STIFF – unconfined compressive strength > 200kPa and ≤ 400kPa.
	Hd	HARD – unconfined compressive strength > 400kPa.
	Fr	FRIABLE – strength not attainable, soil crumbles.
	( )	Bracketed symbol indicates estimated consistency based on tactile examination or other assessment.

Log Column	Symbol		Density Index (I_D) Range (%)	SPT 'N' Value Range (Blows/300mm)
Density Index/ Relative Density (Cohesionless Soils)	VL	VERY LOOSE	≤ 15	0 – 4
	L	LOOSE	> 15 and ≤ 35	4 – 10
	MD	MEDIUM DENSE	> 35 and ≤ 65	10 – 30
	D	DENSE	> 65 and ≤ 85	30 – 50
	VD	VERY DENSE	> 85	> 50
	( )	Bracketed symbol indicates estimated density based on ease of drilling or other assessment.		

Log Column	Symbol	Definition
Hand Penetrometer Readings	300 250	Measures reading in kPa of unconfined compressive strength. Numbers indicate individual test results on representative undisturbed material unless noted otherwise.

Log Column	Symbol	Definition	
Remarks	'V' bit	Hardened steel 'V' shaped bit.	
	'TC' bit	Twin pronged tungsten carbide bit.	
	T_{60}	Penetration of auger string in mm under static load of rig applied by drill head hydraulics without rotation of augers.	
	Soil Origin	The geological origin of the soil can generally be described as:	
		RESIDUAL	– soil formed directly from insitu weathering of the underlying rock. No visible structure or fabric of the parent rock.
		EXTREMELY WEATHERED	– soil formed directly from insitu weathering of the underlying rock. Material is of soil strength but retains the structure and/or fabric of the parent rock.
		ALLUVIAL	– soil deposited by creeks and rivers.
		ESTUARINE	– soil deposited in coastal estuaries, including sediments caused by inflowing creeks and rivers, and tidal currents.
		MARINE	– soil deposited in a marine environment.
		AEOLIAN	– soil carried and deposited by wind.
		COLLUVIAL	– soil and rock debris transported downslope by gravity, with or without the assistance of flowing water. Colluvium is usually a thick deposit formed from a landslide. The description 'slopewash' is used for thinner surficial deposits.
		LITTORAL	– beach deposited soil.

Classification of Material Weathering

<table>
<tr><th colspan="2">Term</th><th colspan="2">Abbreviation</th><th>Definition</th></tr>
<tr><td colspan="2">Residual Soil</td><td colspan="2">RS</td><td>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.</td></tr>
<tr><td colspan="2">Extremely Weathered</td><td colspan="2">XW</td><td>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.</td></tr>
<tr><td>Highly Weathered</td><td rowspan="2">Distinctly Weathered (Note 1)</td><td>HW</td><td rowspan="2">DW</td><td>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.</td></tr>
<tr><td>Moderately Weathered</td><td>MW</td><td>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.</td></tr>
<tr><td colspan="2">Slightly Weathered</td><td colspan="2">SW</td><td>Rock is partially discoloured with staining or bleaching along joints but shows little or no change of strength from fresh rock.</td></tr>
<tr><td colspan="2">Fresh</td><td colspan="2">FR</td><td>Rock shows no sign of decomposition of individual minerals or colour changes.</td></tr>
</table>

NOTE 1: The term 'Distinctly Weathered' is used where it is not practicable to distinguish between 'Highly Weathered' and 'Moderately Weathered' rock. 'Distinctly Weathered' is defined as follows: *'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 weathering products in pores'*. There is some change in rock strength.

Rock Material Strength Classification

Term	Abbreviation	Uniaxial Compressive Strength (MPa)	Guide to Strength	
			Point Load Strength Index $Is_{(50)}$ (MPa)	Field Assessment
Very Low Strength	VL	0.6 to 2	0.03 to 0.1	Material crumbles under firm blows with sharp end of pick; can be peeled with knife; too hard to cut a triaxial sample by hand. Pieces up to 30mm thick can be broken by finger pressure.
Low Strength	L	2 to 6	0.1 to 0.3	Easily scored with a knife; indentations 1mm to 3mm show in the specimen with firm blows of the pick point; has dull sound under hammer. A piece of core 150mm long by 50mm diameter may be broken by hand. Sharp edges of core may be friable and break during handling.
Medium Strength	M	6 to 20	0.3 to 1	Scored with a knife; a piece of core 150mm long by 50mm diameter can be broken by hand with difficulty.
High Strength	H	20 to 60	1 to 3	A piece of core 150mm long by 50mm diameter cannot be broken by hand but can be broken by a pick with a single firm blow; rock rings under hammer.
Very High Strength	VH	60 to 200	3 to 10	Hand specimen breaks with pick after more than one blow; rock rings under hammer.
Extremely High Strength	EH	> 200	> 10	Specimen requires many blows with geological pick to break through intact material; rock rings under hammer.

Abbreviations Used in Defect Description

Cored Borehole Log Column		Symbol Abbreviation	Description
Point Load Strength Index		• 0.6	Axial point load strength index test result (MPa)
		x 0.6	Diametral point load strength index test result (MPa)
Defect Details	– Type	Be	Parting – bedding or cleavage
		CS	Clay seam
		Cr	Crushed/sheared seam or zone
		J	Joint
		Jh	Healed joint
		Ji	Incipient joint
		XWS	Extremely weathered seam
	– Orientation	Degrees	Defect orientation is measured relative to normal to the core axis (ie. relative to the horizontal for a vertical borehole)
	– Shape	P	Planar
		C	Curved
		Un	Undulating
		St	Stepped
		Ir	Irregular
	– Roughness	Vr	Very rough
		R	Rough
		S	Smooth
		Po	Polished
		Sl	Slickensided
	– Infill Material	Ca	Calcite
		Cb	Carbonaceous
		Clay	Clay
		Fe	Iron
		Qz	Quartz
		Py	Pyrite
	– Coatings	Cn	Clean
		Sn	Stained – no visible coating, surface is discoloured
		Vn	Veneer – visible, too thin to measure, may be patchy
		Ct	Coating ≤ 1mm thick
		Filled	Coating > 1mm thick
	– Thickness	mm.t	Defect thickness measured in millimetres

Appendix E: Waste and Imported Materials Tracking Spreadsheet Examples

Imported Materials Register

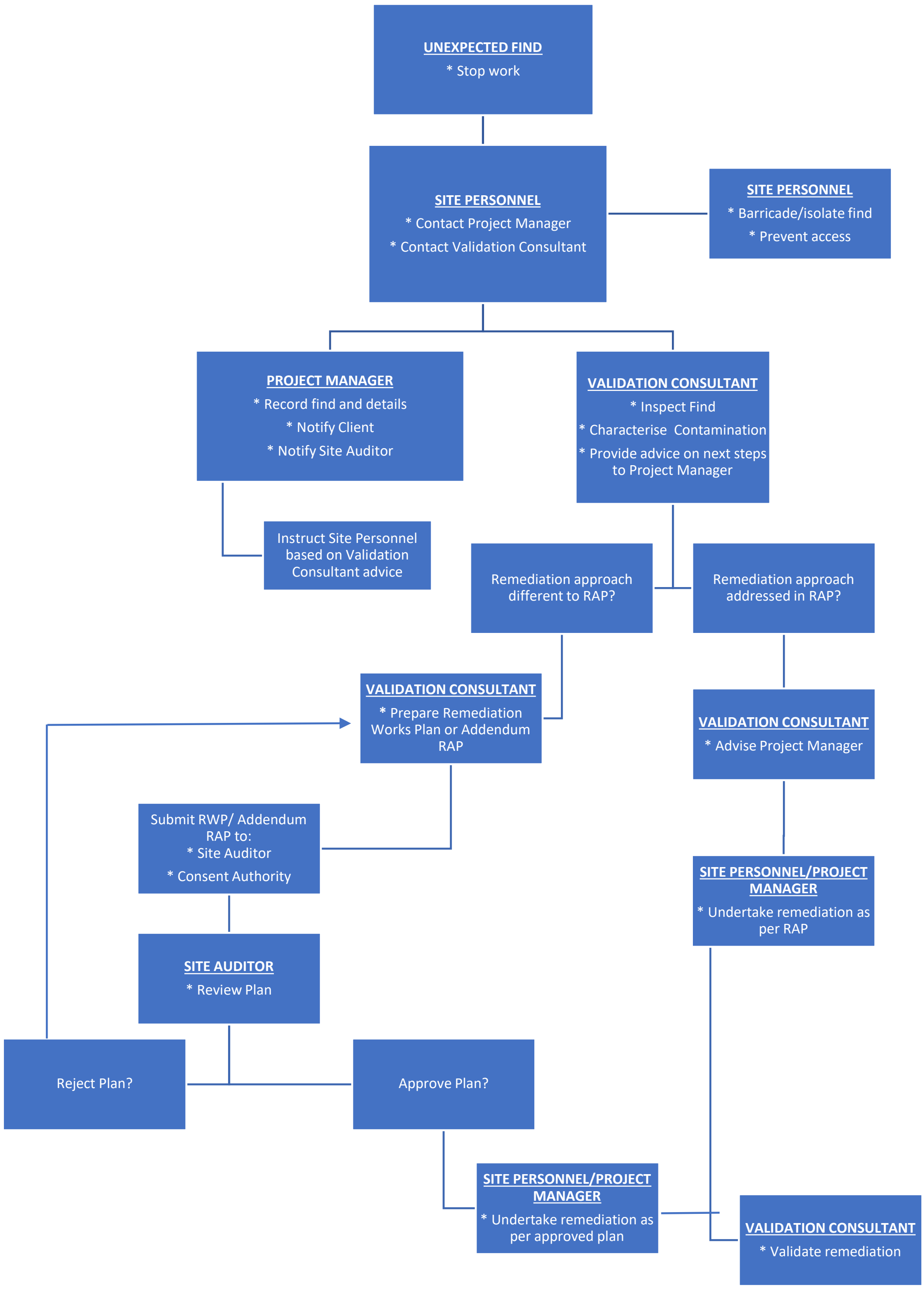
Supplier	Date	Docket/Invoice #	Product Type	Quantity (specify m3 or tonnes)	Area where Material was Placed

Exported (Waste) Materials Register

Load	Date	Material Type / Classification	Site Area where Waste was Generated	Waste Classification Report Reference	Disposal Facility	Tipping Receipt/Docket Number	Tracking Number (where relevant)	Tonnage

Appendix F: Unexpected Finds Protocol

UNEXPECTED FINDS PROTOCOL FLOW-CHART



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