Douglas Partners
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Report on
Detailed Site Investigation (Contamination) with Limited Sampling

Proposed Educational & Research Facility
Campbelltown Hospital, Campbelltown, NSW

Prepared for
Western Sydney University - Office of Estate and Commercial c/- Walker Corporation

Project 34275.27
August 2021

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Geotechnics / Environment / Groundwater

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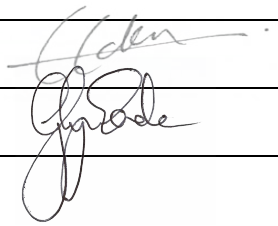
The undersigned, on behalf of Douglas Partners Pty Ltd, confirm that this document and all attached drawings, logs and test results have been checked and reviewed for errors, omissions and inaccuracies.

Signature	Date
Author	19 August 2021
Reviewer	19 August 2021



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Executive Summary

Douglas Partners Pty Ltd (DP) has been engaged by Western Sydney University - Office of Estate and Commercial c/- Walker Corporation to complete this Detailed Site Investigation for Contamination with limited sampling (DSI) for a proposed Medical Research Centre (MMRC) at Campbelltown Hospital, Campbelltown, NSW, NSW. The objective of the DSI is to assess the suitability of the site for the proposed development and whether further investigation and/or management is required. It is understood that the report will be used to inform the developing Preliminary Cost Plan and Function Design Brief as well as upcoming design and documentation work for the MMRC. It is also understood that fill present on site is unlikely to be reused as part of the development, so some form of advice on the likely waste classification of the fill is required.

The scope of the DSI included review of previous contamination investigations undertaken by DP at the site, summary of site geology, hydrogeology, topography and acid sulphate soil risk maps, review of historical aerial photographs and a search of NSW EPA public registers. A geotechnical investigation was also undertaken by DP (reported under separate cover) and nine boreholes were drilled, from which six soil samples were analysed for a range of common contaminants of potential concern. Soil analytical results were compared against NSW EPA endorsed contamination assessment and waste criteria and the findings documented in this report.

A total of six samples were collected and sent for analytical testing. The analytical results for all contaminants tested in all samples were below the laboratory practical quantitation limit (PQL) and/or the adopted SAC. No asbestos was recorded in the soil samples analysed.

All soil analytical results pass EPA (2014) CT1 criteria and appear to contain minimal putrescible material. Soil analytical results indicate a good likelihood that fill is suitable for disposal as General Solid Waste (GSW) non-putrescible.

Alternatively, the analysed soil is suitable for re use as part of the MMRC development.

Further testing will be required to establish whether the soil is suitable for reuse on another site under the Excavated Natural Materials (ENM) Exemption under the POEO Act. This form of testing is best undertaken once the material is being excavated to observe soil conditions and assess whether any further anthropogenic material is present in the soil.

Based on the findings of the current investigation, it is considered that the site is suitable for the proposed MMRC (commercial / industrial type) development. No further investigation is currently necessary. Notwithstanding the findings of this investigation and noting the limitations inherent (see Section 15), an Unexpected Finds Protocol (UFP) should be developed and referred to during construction should suspected contamination be identified at that time.

In regard to a UPSS to the north of the site, review of previous reports established that the likelihood of UPSS impacting the current site is low. However, the condition of the UPSS may have changed since the previous reports were prepared. As such, if suspected petroleum hydrocarbon type odours and staining are observed during development near or below the groundwater table, the UFP should be followed including seeking advice from a suitably qualified (with reference to NEPC, 2013) Environmental Consultant.

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Report on Detailed Site Investigation (Contamination) with Limited Sampling Proposed Educational & Research Facility Campbelltown Hospital, Campbelltown, NSW

1. Introduction

Douglas Partners Pty Ltd (DP) has been engaged by Western Sydney University - Office of Estate and Commercial c/- Walker Corporation to complete this Detailed Site Investigation for Contamination with limited sampling (DSI) for a proposed Medical Research Centre (MMRC) at Campbelltown Hospital, Campbelltown, NSW, NSW (hereinafter referred to as 'the site'). The site is shown on Drawing 1, Appendix A.

The objective of the DSI is to assess the suitability of the site for the proposed development and whether further investigation and/or management is required. It is understood that the report will be used to inform the developing Preliminary Cost Plan and Function Design Brief as well as upcoming design and documentation work for the MMRC. It is also understood that fill present on site is unlikely to be reused as part of the development, so some form of advice on the likely waste classification of the fill is required.

This investigation was undertaken in conjunction with a geotechnical investigation, also undertaken by DP and reported under separate cover (project reference 34275.31).

The site has previously been subject to contamination investigations undertaken by DP to inform the current site (helipad) and surrounding development. The findings of these reports of relevance to the current investigation are summarised in Sections 6.1 and 6.2. The site has since been subject to filling to raise the site levels to the necessary levels to build the helipad. As such, the primary change to site conditions since the previous reports were completed is likely the introduction of fill at the site. This has been considered accordingly in preparing this DSI report.

This report must be read in conjunction with all appendices including the notes provided in Appendix B.

The following key guidelines were consulted in the preparation of this report:

- NEPC *National Environment Protection (Assessment of Site Contamination) Measure 1999 (as amended 2013) [the 'NEPM']* (NEPC, 2013);
- NSW EPA *Waste Classification Guidelines – Part 1: Classification of Waste* (EPA, 2014); and
- NSW EPA *Guidelines for Consultants Reporting on Contaminated Land* (NSW EPA, 2020).

2. Current and Proposed Development

The site currently comprises the helipad for Campbelltown Hospital.

DP understands WSU proposes to redevelop the site into a multistorey medical research facility, i.e. MMRC.

3. Scope of Work

DP carried out the following scope of work as part of the DSI:

- Review of previous contamination investigations undertaken by DP at the site;
- Summary of site geology, hydrogeology, topography and acid sulphate soil risk maps;
- Review of historical aerial photography provided in previous reports of relevance to the site, and more recent aerial photographs obtained through Metromap and Nearmap since 2012;
- Carry out an updated search of the NSW EPA public registers established under the Contaminated Land Management Act 1997 (CLM) and the Protection of the Environment Operations Act 1997 (POEO);
- Review of soil logs from nine boreholes drilled as part of the geotechnical investigation;
- Schedule six soil samples for the analysis of a range of common contaminants of potential concern (CoPC) including metals/metalloids, total recoverable hydrocarbons (TRH), benzene, toluene, ethylbenzene and total xylenes (BTEX), polycyclic aromatic hydrocarbons (PAH), total phenols, organochlorine and organophosphorus pesticides (OC/OP), polychlorinated biphenyls (PCBs) and asbestos;
- Compare soil analytical results against relevant Site Assessment Criteria (SAC) for the development, as defined in NEPC (2013) as well as waste classification criteria as presented in EPA (2014) and
- Preparation of this DSI report outlining the methodology and results of the investigation, and an assessment of the site's suitability for the proposed development.

No review of Land Titles or Planning Certificates has been undertaken as part of the current investigation because the site has not changed ownership since the previous reports were completed.

4. Site Information

Site Address	Campbelltown Hospital, Campbelltown, NSW
Legal Description	Lot 6 Deposited Plan 1058047
Area	3,930 m^2
Zoning	Zone SP2 Infrastructure
Local Council Area	Campbelltown City Council
Current Use	Helipad for Campbelltown Hospital
Surrounding Uses	North – Campbelltown Hospital East – Hospital car park and main building to hospital South – Macarthur Clinical School West – Parkside Crescent, Marsden Park open space riparian corridor and Birunji Creek, followed by residential

The site layout and boundary is shown on Figure 1 below.

Figure 1: Site Layout

5. Environmental Setting

Regional and Site Topography	Regional topography mapping predates the current helipad which (based on RL elevations at boreholes undertaken as part of the geotechnical investigation) ranges between 82 and 83 m relative to Australian Height Datum (AHD). Beyond the edge of the helipad, the topography slopes in all directions to approximately 73 m AHD in the north east and 79 mAHD in the south west. The site therefore slopes towards the north east, i.e. towards Birunji Creek.
Soil Landscape	Reference to the Soil Conservation Service of NSW (1990) Soil Landscapes of the Wollongong-Port Hacking 1:100 000 Sheet indicates that the site is underlain by the Blacktown soil landscape (mapping unit bt), characterised by gently undulating rises on Wianamatta Group shales and Hawkesbury shale, with local relief to 30 m and slopes usually less than 5%. The landscape is typically represented by broad rounded crests and ridges with gently inclined slopes. Soils range from shallow (<1 m) red-brown podzolic soils - comprising mostly clayey soils on crests and upper slopes - to deep (1.5 m - 3 m) yellow-brown clay soils on lower slopes and areas of poor drainage. These soils are typically moderately reactive with low fertility, poor soil drainage and highly plastic subsoil.
Geology	Reference to the Geological Survey of New South Wales (1985), Wollongong-Port Hacking 1:100 000 Geological Sheet 9029 - 9129 indicates the site is underlain by Ashfield Shale and Minchinbury Sandstone (mapping units Rwa and Rwm) of the Wianamatta Group of the Triassic age. This formation typically comprises laminite and dark grey siltstone and fine to medium-grained lithic sandstone.

Acid Sulfate Soils	Reference to the NSW acid sulfate soils (ASS) risk map indicates that the site is located within an area of no known occurrence of ASS.
Surface Water	Surface water is anticipated to follow the topographical slope, towards Birunji Creek, located approximately 50 m west of the site and ultimately flows into Bow Bowing Creek, some 900 m north east of the site and a tributary of Georges River.
Groundwater	Groundwater of a low yield is anticipated to be present in underlying regolith and bedrock. Groundwater is anticipated to primarily flow towards the north west.

6. Previous Reports

The following previous reports are relevant to the current investigation:

- DP *Report on Phase 1 Contamination Assessment (P1CA), Campbelltown Hospital Redevelopment, Therry Road, Campbelltown,* Reference 34275.01 (DP, 2011); and
- DP *Report on Phase 2 Contamination Assessment, Proposed Hospital Redevelopment, Campbelltown Hospital, Therry Road, Campbelltown,* Project 34275.02 (DP, 2012 – the P2 CA).

The findings of relevance to the site are summarised below in Sections 6.1 and 6.2.

6.1 DP (2011) Phase 1 Contamination Assessment (P1CA)

- The 2011 (P1CA) investigation was undertaken at the same time as a geotechnical investigation, also undertaken by DP. A total of 37 bores were drilled across the wider Campbelltown Hospital site to inform the geotechnical investigation, of which three boreholes (BH1, BH2 and BH41) were completed within the footprint of the site.
    - Soil conditions observed in BH1 comprised 3.7 m of fill (grey brown mottled orange brown clayey fine to coarse grained siltstone gravel with some gravelly clay bands) above silty clay and siltstone at depth. DP did not observe any obvious non-soil anthropogenic material in the fill layer. The RL at the time of the investigation was 81.8 mAHD.
    - Soil conditions observed in BH2 comprised 5.0 m of fill (brown grey silty fine to coarse grained siltstone gravel with trace concrete fragments and fine to coarse grained sand above brown fine to coarse grained siltstone gravelly clay with some fine to coarse grained sand) above silty clay and siltstone at depth. The RL at the time of the investigation was 81.8 mAHD.
    - Soil conditions observed in BH41 comprised 0.1 m of fill (green grey silty fine to coarse grained sandy fine to medium grained igneous gravel) above silty clay and siltstone. DP did not observe anthropogenic material in the fill layer. The RL at the time of the investigation was 76.7 mAHD.

- No obvious staining or odours were encountered in any of the bores.
- Based on the findings of the desk top study and review of the bore logs from the geotechnical investigation, DP concluded that the 'site' (as defined in the same report) had a moderate risk of contamination being present within the identified Areas of Environmental Concern (AEC) and their associated contaminants including (in the current site) fill at the current site.

6.2 DP (2012) Phase 2 Contamination Assessment (P2CA)

- The 2012 investigation (P2CA) included the current site to inform the development of the proposed helipad.
- Two underground petroleum storage system tanks (UPSS) were identified in the P2CA – one 'current' (at the time of reporting) and one historical. The locations of both UPSS are not within the current site, with the nearest located more than 50 m north east of the current site.
- To inform the P2CA, DP drilled 45 deep and shallow bores and installed seven monitoring wells. Five of the bores (BH133, BH135, BH137, BH138 and BH139) are located in the current site. Three monitoring wells (MW104 to MW106) were also installed 70 m north of the site (cross and up hydraulic gradient[1]) to monitor groundwater conditions associated with the 'current' and historical UPSS.
    - Soil conditions observed in BH133 comprised 4.6 m of fill (brown orange grey gravelly silty clay above brown grey clayey gravelly silty with some concrete fragments and trace medium to coarse grained orange sand above red brown orange clay with grey gravelly silty clay bands) above clay.
    - Soil conditions observed in BH135 comprised 0.2 of topsoil (brown clayey silty with rootlets and trace fine grained ironstone gravel) above silty clay and clay. The borehole was terminated at the 3.0 m limit of investigation. DP did not observe any obvious non-soil anthropogenic material in the topsoil layer.
    - Soil conditions observed in BH137 comprised 0.2 m topsoil (brown gravelly silt with some siltstone gravel fragments and rootlets) above gravelly silty clay. The borehole was terminated at the 0.6 m limit of investigation. DP did not observe any obvious non-soil anthropogenic material in the topsoil layer.
    - Soil conditions observed in BH138 comprised 0.2 m of topsoil (brown gravelly silt with some fine to medium grained ironstone and siltstone gravels) above silty clay. The borehole was terminated at the 0.6 m limit of investigation. DP did not observe any obvious non-soil anthropogenic material in the topsoil layer.
    - Soil conditions observed in BH139 comprised 2.5 m of fill (brown to dark grey gravelly silty clay with shale, ironstone and igneous gravels and rootlets. The borehole was terminated at the 2.5 m limit of investigation. White plastic tape was observed in the fill layer.
- The scope of the P2CA included investigating soil and groundwater conditions associated with the two UPSS located north of the current site.
- No staining or olfactory indicators of contamination were noted in soils from any of the bore logs. Soil samples were collected from all bores and analysed for metals, TRH, BTEX, PAH, OC/OP, PCBs, total phenols and asbestos.

[1]Based on observed groundwater levels in the P2CA, groundwater is inferred to flow towards the north west.

  - All reported concentrations of soil and groundwater were below the laboratory limits of detection and/or their relevant NSW EPA criteria which was current at that time. No asbestos was detected in soil samples analysed.
- The P2CA concluded that the 'site' (as defined in the same report) is suitable for continued hospital use and no further contamination investigations were necessary, including in relation to the two UPSS' north of the site.

7. Site History Summary

7.1 Review of Historical Aerial Photographs

The following is a summary of the review of historical aerial photographs undertaken in the previous reports and of relevance to the current site only.

- In 1947 and 1961 the site appeared to comprise cleared grazing land and land scarring, possibly a drainage line is evident. Nearby dirt tracks and Appin Road are also visible.
- Some development of the south eastern portion of the site is evident in 1984 and 1988, likely an access road constructed for the early layout of adjacent Campbelltown Hospital.
- In 1994 the site and the wider Campbelltown Hospital site appeared to have been subject to clearing, and a batter slope appears to run north to south across the site. Little discernible change occurs to the site until post-2011 when the current helipad was constructed.
- **2012 to current** – Key findings of the historical aerial photographs from 29 December 2012 to resent for the site are summarised below:
  - Earthworks for the current helipad appear to have commenced by 17 October 2012 and were completed by 12 May 2013. It is apparent that fill material of unknown quantity and quality was imported and placed as part of the construction works; and,
  - The site has remained largely unchanged to present day, except for possible staining (the origins of which cannot be confirmed from a desktop study) present on the concrete hardstand surface.

7.2 Search of EPA Register

A search of the NSW EPA website was undertaken on 21 June 2021 for sites recorded as licenced or notified under the Contaminated Land Management Act 1997 (CLM Act) and the Protection of the Environment Operations Act 1997 (POEO Act). The findings are summarised below:

- The site and adjacent properties have not been included in the list of NSW contaminated sites notified to EPA;
- No notices or orders made under the CLM Act 1997 have been issued for the site or adjacent properties; and
- No licences under Schedule 1 of the POEO Act 1997 have been issued for the site or adjacent properties.

The NSW EPA search results are presented in Appendix B.

8. Preliminary Conceptual Site Model

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

Potential Sources

Based on the current investigation, the following potential source of contamination and associated CoPC have been identified.

- S1: Fill: Associated with any residual filling present from prior to 2012 and construction of the helipad and levelling.
  - Various CoPC and may include metals/metalloids, TRH, BTEX, PAH, PCB, OC/OP, total phenols and asbestos.

It is noted that DP carried out a clearance of the site following demolition of a former building and the remains prior to construction of current helipad in 2012 and reported in (DP, 2012 – the P2 CA).

Potential Receptors

The following potential human receptors have been identified:

- R1: Current site users [Hospital staffs, patients, visitors, construction and maintenance workers];
- R2: End site users [Staffs and students of WSU, patients, and their families]; and
- R3: Adjacent site users [Hospital staffs, patients, and visitors].

The following potential environmental receptors have been identified:

- R4: Surface water [Birunji Creek];
- R5: Local groundwater; and
- R6: Terrestrial ecology.

Potential Pathways

The following potential pathways have been identified:

- P1: Ingestion and dermal contact;
- P2: Inhalation of dust and/or vapours;
- P3: Leaching of contaminants and vertical migration into groundwater;
- P4: Surface water run-off;
- P5: Lateral migration of groundwater providing base flow to water bodies; and
- P6: Contact with terrestrial ecology.

Summary of Potentially Complete Exposure Pathways

A 'source–pathway–receptor' approach has been used to assess the potential risks of harm being caused to human or environmental receptors from contamination sources on or in the vicinity of the site, via exposure pathways (potential complete pathways). The possible pathways between the above sources (S1 to S2) and receptors (R1 to R7) are provided in below Table 1.

Table 1: Summary of Potentially Complete Exposure Pathways

Source and COPC	Transport Pathway	Receptor	Risk Management Action
S1: Fill - Metals/metalloids, TRH, BTEX, PAH, OCP and asbestos	P1: Ingestion and dermal contact P2: Inhalation of dust and/or vapours	R1: Current site users [Hospital staffs, patients, visitors, construction, and maintenance workers] R2: End site users [Staffs and students of WSU, patients, and their families].	An intrusive soil investigation is recommended to assess possible contamination and suitability of the site for the proposed development. The findings of the soil investigation will inform the requirement (or not) for a groundwater investigation.
	P2: Inhalation of dust and/or vapours	R3: Land users in adjacent site [Hospital staffs, patients, and visitors]	
	P3: Leaching of contaminants and vertical migration into groundwater	R4: Local groundwater	
	P4: Surface water run-off P5: Lateral migration of groundwater providing base flow to water bodies	R5: Surface water bodies	
	P6: Contact with terrestrial ecology	R6: Terrestrial ecology	

9. Sampling and Analysis Quality Plan

9.1 Data Quality Objectives

The DSI was devised with reference to the seven-step data quality objective process which is provided in Appendix B Schedule B2, NEPC (2013). The DQO process is outlined in Appendix C.

9.2 Soil Sampling Rationale

The bore holes undertaken to inform the current investigation were positioned as part the geotechnical investigation which provided a reasonable coverage of the site conditions. Soil samples were collected from each bore hole at select depths targeting fill, in particular any fill containing anthropogenic material.

The general sampling methods are described in the field work methodology, included in Appendix D.

10. Site Assessment Criteria

The site assessment criteria (SAC) applied in the current investigation are informed by the CSM (Section 8) which identified human and environmental receptors to potential contamination on the site. Analytical results are assessed (as a Tier 1 assessment) against the SAC comprising primarily the investigation and screening levels of Schedule B1 of NEPC (2013).

The investigation and screening levels applied in the current investigation comprise levels adopted for a generic commercial/industrial land use scenario. The derivation of the SAC is included in Appendix E and the adopted SAC are listed on the summary analytical results tables in Appendix F.

11. Results

11.1 Field Work Results

The bore hole logs for this assessment are included in Appendix G. The logs recorded the following general sub-surface profile:

- Concrete Hardstand: In TP208 and TP 209, to depths of between 0.23 m and 0.25 m below ground level (bgl).
- Fill: Silty clay with siltstone gravel, was observed in test pit 201/1-1.45, 203/0.5-0.95, 207/1-1.45 to depths of 5.2 m, 4.8 m and 6.7 m bgl respectively.
- Fill: Gravelly clay with siltstone, gravel, trace brick fragments, sandstone gravels in TP 205-0-0.1 and TP208/2.5-2.95 to depths of 1.45 m and 5.5 m bgl respectively.
- Fill: Sandy gravel with igneous gravel was observed in TP209/0.3-0.4 to a depth of 0.4 m bgl.

There were no other apparent records of visual or olfactory evidence (eg: staining, odours, free phase product) to suggest the presence of contamination within the soils encountered in the investigation.

No free groundwater was observed during drilling or logging. It should be noted that groundwater levels are affected by climatic conditions and soil permeability and will therefore vary spatially, and with time.

11.2 Laboratory Analytical Results

The results of laboratory analysis are summarised in Tables 1 to 3 in Appendix F. The laboratory certificate(s) of analysis together with the chain of custody and sample receipt information are provided in Appendix H.

12. Discussion

A total of six samples were collected and sent for analytical testing. The analytical results for all contaminants tested in all samples were below the laboratory practical quantitation limit (PQL) and/or the adopted SAC. No asbestos was recorded in the soil samples analysed.

All soil analytical results pass EPA (2014) CT1 criteria and appear to contain minimal putrescible material. Soil analytical results indicate a good likelihood that fill is suitable for disposal as General Solid Waste (GSW) non-putrescible.

Alternatively, the analysed soil is suitable for re use as part of the MMRC development.

Further testing will be required to establish whether the soil is suitable for reuse on another site under the Excavated Natural Materials (ENM) Exemption under the POEO Act. This form of testing is best undertaken once the material is being excavated to observe soil conditions and assess whether any further anthropogenic material is present in the soil.

12.1 Data Quality Assurance and Quality Control

The data quality assurance and quality control (QA/QC) results are included in Appendix I. Based on the results of the field QA and field and laboratory QC, and evaluation against the data quality indicators (DQI) it is concluded that the field and laboratory test data obtained are reliable and useable for this assessment.

13. Conclusions and Recommendations

This DSI included a review of site history information, previous investigations and soil testing for contamination investigation purposes. The historical aerial photograph review indicated that the site has been used as a hospital since 2002 and prior to this for farming (pastoral) purposes. The areas near the site have been subject to various stages of redevelopment since the 1970's and previous investigations have indicated the presence of filling at the site.

Based on the findings of the current investigation, it is considered that the site is suitable for the proposed MMRC (commercial / industrial type) development. No further investigation is currently necessary. Notwithstanding the findings of this investigation and noting the limitations inherent (see Section 15), an Unexpected Finds Protocol (UFP) should be developed and referred to during construction should suspected contamination be identified at that time.

In regard to the UPSS to the north of the site, review of previous reports established that the likelihood of UPSS impacting the current site is low. However, the condition of the UPSS may have changed since the previous reports were prepared. As such, if suspected petroleum hydrocarbon type odours and staining are observed during development near or below the groundwater table, the UFP should be followed including seeking advice from a suitably qualified (with reference to NEPC, 2013) Environmental Consultant.

14. Limitations

Douglas Partners Pty Ltd (DP) has prepared this report for this project at Campbelltown Hospital, Campbelltown, NSW in accordance with DP's proposal MAC200380 dated 11 February 2021 and Contract reference MAC200380.P001.Rev2. This report is provided for the exclusive use of Western Sydney University - Office of Estate and Commercial for this project only and for the purposes as described in the report. It should not be used by or relied upon for other projects or purposes on the same or other site or by a third party. Any party so relying upon this report beyond its exclusive use and purpose as stated above, and without the express written consent of DP, does so entirely at its own risk and without recourse to DP for any loss or damage. In preparing this report DP has necessarily relied upon information provided by the client and/or their agents.

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

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

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

Douglas Partners Pty Ltd

Appendix A

Drawing 1
About this Report

Douglas Partners Geotechnics / Environment / Groundwater	CLIENT: Western Sydney University		TITLE: **Site Location, Layout and Investigation Locations** **Macarthur Medical Research Centre** **Campbelltown Hospital, Campbelltown, NSW**
	OFFICE: Macarthur	DRAWN BY: EM	
	SCALE: As shown	DATE: June 2021	

N
MGA

PROJ. #:	34275.27
DRAWING No:	1
REVISION:	0

About this Inspection Report

Introduction

These notes are provided to amplify DP's inspection report in regard to the limitations of carrying out inspection work. Not all notes are necessarily relevant to this report.

Standards

This inspection report has been prepared by qualified personnel to current engineering standards of interpretation and analysis.

Copyright and Limits of Use

This inspection report is the property of DP and is provided for the exclusive use of the client for the specific project and purpose as described in the report. It should not be used by a third party for any purpose other than to confirm that the construction works addressed in the report have been inspected as described. Use of the inspection report is limited in accordance with the Conditions of Engagement for the commission.

DP does not undertake to guarantee the works of the contractors or relieve them of their responsibility to produce a completed product conforming to the design.

Reports

This inspection report may include advice or opinion that is based on engineering and/or geological interpretation, information provided by the client or the client's agent, and information gained from:

- an investigation report for the project (if available to DP);
- inspection of the work, exposed ground conditions, excavation spoil and performance of excavating equipment while DP was on site;
- investigation and testing that was carried out during the site inspection;
- anecdotal information provided by authoritative site personnel; and
- DP's experience and knowledge of local geology.

Such information may be limited by the frequency of any inspection or testing that was able to be practically carried out, including possible site or cost constraints imposed by the client/ contractor(s). For these reasons, the reliability of this inspection report is limited by the scope of information on which it relies.

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

- unexpected variations in subsurface conditions that are not evident from the inspection; and
- the actions of contractors responding to commercial pressures.

Should these issues occur, then additional advice should be sought from DP and, if required, amendments made.

This inspection report must be read in conjunction with any attached information. This inspection report should be kept in its entirety without separation of individual pages or sections. DP cannot be held responsible for interpretations or conclusions from review by others of this inspection report or test data, which are not otherwise supported by an expressed statement, interpretation, outcome or conclusion stated in this inspection report.

Appendix B

EPA Public Register Results

Search results

Your search for:Suburb: CAMPBELLTOWN

Matched 3 notices relating to 1 site.

Search Again

Refine Search

Suburb	Address	Site Name	Notices related to this site
CAMPBELLTOWN	62 Blaxland ROAD	Chemical Storage	3 former

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21 June 2021

Number	Name	Location	Type	Status	Issued date
1593918		Campbelltown Road Upgrade between East Town Centre Road and New MacDonald Road, CAMPBELLTOWN, NSW 2560	s.80 Surrender of a Licence	Issued	31-Aug-20
21040	BURTON CONTRACTORS PTY LTD	Campbelltown Road Upgrade between East Town Centre Road and New MacDonald Road, CAMPBELLTOWN, NSW 2560	POEO licence	Surrendered	21-Feb-18
1005522	CAMDEN SOIL MIX PTY LTD	GLENLEE ROAD, CAMPBELLTOWN, NSW 2560	s.58 Licence Variation	Issued	24-May-01
1016427	CAMDEN SOIL MIX PTY LTD	GLENLEE ROAD, CAMPBELLTOWN, NSW 2560	s.58 Licence Variation	Issued	29-Jul-02
1019778	CAMDEN SOIL MIX PTY LTD	GLENLEE ROAD, CAMPBELLTOWN, NSW 2560	s.58 Licence Variation	Issued	19-Sep-02
1025207	CAMDEN SOIL MIX PTY LTD	GLENLEE ROAD, CAMPBELLTOWN, NSW 2560	s.58 Licence Variation	Issued	7-Mar-03
1032889	CAMDEN SOIL MIX PTY LTD	GLENLEE ROAD, CAMPBELLTOWN, NSW 2560	s.58 Licence Variation	Issued	2-Dec-03
1034270	CAMDEN SOIL MIX PTY LTD	GLENLEE ROAD, CAMPBELLTOWN, NSW 2560	s.58 Licence Variation	Issued	4-Feb-04
1043014	CAMDEN SOIL MIX PTY LTD	GLENLEE ROAD, CAMPBELLTOWN, NSW 2560	s.58 Licence Variation	Issued	10-Dec-04
1052990	CAMDEN SOIL MIX PTY LTD	GLENLEE ROAD, CAMPBELLTOWN, NSW 2560	s.58 Licence Variation	Issued	24-Oct-05
6651	CAMPBELLTOWN CITY COUNCIL	CAMPBELLTOWN CITY COUNCIL, CAMPBELLTOWN, NSW 2560	POEO licence	Surrendered	8-May-00
1667	CAMPBELLTOWN CITY COUNCIL	THE PARKWAY, CAMPBELLTOWN, NSW 2560	POEO licence	Surrendered	21-Jun-00
1009602	CAMPBELLTOWN CITY COUNCIL	CAMPBELLTOWN CITY COUNCIL, CAMPBELLTOWN, NSW 2560	s.58 Licence Variation	Issued	2-Oct-01
1012603	CAMPBELLTOWN CITY COUNCIL	THE PARKWAY, CAMPBELLTOWN, NSW 2560	s.80 Surrender of a Licence	Issued	27-Nov-01
1507186	CAMPBELLTOWN CITY COUNCIL	CAMPBELLTOWN CITY COUNCIL, CAMPBELLTOWN, NSW 2560	s.80 Surrender of a Licence	Issued	25-Jul-12
3109	DULMISON PTY LTD	BADGALLY ROAD, CAMPBELLTOWN, NSW 2560	POEO licence	Surrendered	1-May-00
1035315	DULMISON PTY LTD	BADGALLY ROAD, CAMPBELLTOWN, NSW 2560	s.80 Surrender of a Licence	Issued	15-Mar-04
1341	HANSON CONSTRUCTION MATERIALS PTY LTD	66 BLAXLAND ROAD, CAMPBELLTOWN, NSW 2560	POEO licence	No longer in force	24-May-00
1006343	HANSON CONSTRUCTION MATERIALS PTY LTD	66 BLAXLAND ROAD, CAMPBELLTOWN, NSW 2560	s.58 Licence Variation	Issued	15-Jun-01
6721	HCOA OPERATIONS (AUSTRALIA) PTY LIMITED	92-96 DUMARESQ ST, CAMPBELLTOWN, NSW 2560	POEO licence	No longer in force	1-May-00
1044534	HCOA OPERATIONS (AUSTRALIA) PTY LIMITED	92-96 DUMARESQ ST, CAMPBELLTOWN, NSW 2560	s.58 Licence Variation	Issued	15-Feb-05
1018720	PRUINOSA PTY LTD	92-96 DUMARESQ ST, CAMPBELLTOWN, NSW 2560	s.58 Licence Variation	Issued	22-Oct-02
5647	SUEZ RECYCLING & RECOVERY PTY LTD	GLENLEE ROAD, CAMPBELLTOWN, NSW 2560	POEO licence	Issued	6-Jan-00
1129416	SUEZ RECYCLING & RECOVERY PTY LTD	GLENLEE ROAD, CAMPBELLTOWN, NSW 2560	s.58 Licence Variation	Issued	15-Jun-11
1505549	SUEZ RECYCLING & RECOVERY PTY LTD	GLENLEE ROAD, CAMPBELLTOWN, NSW 2560	s.58 Licence Variation	Issued	22-May-13

3085774295	SUEZ RECYCLING & RECOVERY PTY LTD	GLENLEE ROAD, CAMPBELLTOWN, NSW 2560	Penalty Notice	Issued	10-Jun-14
3085775166	SUEZ RECYCLING & RECOVERY PTY LTD	GLENLEE ROAD, CAMPBELLTOWN, NSW 2560	Penalty Notice	Issued	28-Oct-14
3085776798	SUEZ RECYCLING & RECOVERY PTY LTD	GLENLEE ROAD, CAMPBELLTOWN, NSW 2560	Penalty Notice	Issued	17-Jun-15
1524788	SUEZ RECYCLING & RECOVERY PTY LTD	GLENLEE ROAD, CAMPBELLTOWN, NSW 2560	s.58 Licence Variation	Issued	2-May-18
7457	SYDNEY SOUTH WEST AREA HEALTH SERVICE	THERRY ROAD, CAMPBELLTOWN, NSW 2560	POEO licence	No longer in force	31-Mar-00
1027194	SYDNEY SOUTH WEST AREA HEALTH SERVICE	THERRY ROAD, CAMPBELLTOWN, NSW 2560	s.58 Licence Variation	Issued	9-May-03
1051870	SYDNEY SOUTH WEST AREA HEALTH SERVICE	THERRY ROAD, CAMPBELLTOWN, NSW 2560	s.58 Licence Variation	Issued	13-Sep-05
1096555	WSN ENVIRONMENTAL SOLUTIONS PTY LIMITED	GLENLEE ROAD, CAMPBELLTOWN, NSW 2560	s.58 Licence Variation	Issued	3-Feb-09
1109891	WSN ENVIRONMENTAL SOLUTIONS PTY LIMITED	GLENLEE ROAD, CAMPBELLTOWN, NSW 2560	s.58 Licence Variation	Issued	16-Dec-09
1114416	WSN ENVIRONMENTAL SOLUTIONS PTY LIMITED	GLENLEE ROAD, CAMPBELLTOWN, NSW 2560	s.58 Licence Variation	Issued	27-Jul-10
1119461	WSN ENVIRONMENTAL SOLUTIONS PTY LIMITED	GLENLEE ROAD, CAMPBELLTOWN, NSW 2560	s.58 Licence Variation	Issued	15-Sep-10

Appendix C

DQO

Appendix C
Data Quality Objectives
Campbelltown Hospital, Campbelltown, NSW

C1.0 Data Quality Objectives

The DSI has been devised broadly in accordance with the seven-step data quality objective (DQO) process which is provided in Appendix B, Schedule B2 of NEPC *National Environment Protection (Assessment of Site Contamination) Measure 1999 (as amended 2013) [NEPM]* (NEPC, 2013).

Step	Summary
1. State the problem	The objective of the investigation is to confirm the contamination status of the site with respect to the proposed land use. The report is being undertaken as the land is to be redeveloped to provide a medical research facility. The requirements of the regulator, Campbelltown city Council, will also be considered by consulting their Development Control Plan (DCP), Local Environment Plan (LEP) and any other requirements based on our recent experience with Council on similar sites. A preliminary conceptual site model (CSM) has been prepared (Section 8) for the proposed development. The project team consisted of experienced environmental engineers and scientists working in the roles of Project Principal, Project Reviewer, Project Manager, Field staff. The scope of the intrusive investigation comprised (and was limited to) soil bores undertaken to inform a geotechnical investigation also being undertaken by DP.
2. Identify the decisions / goal of the study	The site history has identified possible contamination associated with historical and recent filling of the site, as outlined in the CSM (Section 8). The CSM identifies the associated contaminants of potential concern (COPC) and the likely impacted media. The site assessment criteria (SAC) for each of the COPC are detailed in Section 10 and Appendix E and with reference to NEPC (2013). The decision is to establish whether or not the results fall below the SAC and (if any exceedances are noted, and the dataset is suitable to assess accordingly) or whether or not the 95% upper confidence limit of the sample population falls below the SAC. On this basis, an assessment of the site's suitability from a contamination perspective and whether (or not) further assessment and / or remediation will be derived.
3. Identify the information inputs	Inputs to the investigation will be the results of analysis of samples to measure the concentration of COPC identified in the CSM using NATA accredited laboratories and methods, where possible. A photoionization detector (PID) was made available to screen soils for VOC if visual / olfactory indicators of possible contamination were observed (none were).

Step	Summary
4. Define the study boundaries	The lateral boundaries of the investigation area are shown on Drawing 1, Appendix A. The vertical boundaries are to the base of the filling and in the top of underlying natural strata. The assessment is limited to the timeframe over which the field investigation was undertaken. Constraints to the assessment are identified and discussed in the conclusions of the report, Section 13.
5. Develop the analytical approach (or decision rule)	The decision rule is to compare all analytical results with SAC. Where guideline values are absent, other sources of guideline values accepted by NEPC (2013) shall be adopted where possible. It is noted that for the purpose of a preliminary assessment of waste classification for the soil, soil analytical results were also compared with EPA (2014) waste classification guidelines. Where a sample result exceeds the adopted criterion, a further site-specific assessment will be made as to the risk posed by the presence of that contaminant(s). Initial comparisons will be with individual results then, if and where required, summary statistics (including mean, standard deviation and 95% upper confidence limit (UCL) of the arithmetic mean (95% UCL) to assess potential risks posed by the site contamination. Quality control results are to be assessed according to their relative percent difference (RPD) values.
6. Specify the performance or acceptance criteria	Baseline condition: Contaminants at the site exceed human health and environmental SAC and poses a potentially unacceptable risk to receptors (null hypothesis). Alternative condition: Contaminants at the site complies with human health and environmental SAC and as such, does not pose a potentially unacceptable risk to receptors (alternative hypothesis). Unless conclusive information from the collected data is sufficient to reject the null hypothesis, it is assumed that the baseline condition is true. Decision errors for the proposed assessment will be minimised and measured by the following: C1.0 Compare new data with available previous investigations to determine the possible range of the parameters of interest; Systematic soil sample numbers will comply (where possible) with those recommended in the NSW EPA Sampling Design Guidelines (1995), which have risk probabilities already incorporated; The sampling regime will target each stratum identified to account for site variability; Sample collection and handling techniques will be in accordance with DP's Field Procedures Manual; Samples will be prepared and analysed by a NATA-accredited laboratory with the acceptance limits for laboratory QA/QC parameters based on the laboratory reported acceptance limits and those stated in NEPC (2013); The SAC will be adopted from established and NSW EPA endorsed guidelines. Where not available, recognised national and international guidelines were used. The SAC have risk probabilities already incorporated;

	A significance level of 0.05 will be adopted for data with statistical analysis of 95% Upper Confidence Limit (95% UCL) of average concentrations; and Only NATA accredited laboratories using NATA endorsed methods are used to perform laboratory analysis. Where NATA endorsed methods are not used, the reasons are stated. The effect of using non-NATA methods on the decision making process are explained.
7. Optimise the design for obtaining data	The positioning of bore holes was undertaken to inform the geotechnical investigation, however fill conditions across the site were not considered likely to vary significantly given the nature of the recent development (helipad). As the purpose of the sampling program of fill soil is to assess for potential contamination across the site, the sampling program is reliant on professional judgement to identify and sample the potentially impacted fill based on visual and olfactory observations. Further details regarding the proposed sampling plan are presented in Section 9.

Appendix D

Field Work Methodology

Appendix D
Field Work Methodology
Campbelltown Hospital, Campbelltown, NSW

D1.0 Guidelines

The field work methodology was prepared with reference to NEPC (2013) as referenced in the main body report.

D2.0 Soil Sampling

Soil sampling is carried out in accordance with DP standard operating procedures. The general sampling and sample management procedures comprise:

- Collect soil samples directly from the core sample extracted during drilling;
- Transfer samples in laboratory-prepared glass jars with Teflon lined lids by hand, capping immediately and minimising headspace within the sample jar;
- Collect replicate samples in zip-lock bags for PID screening;
- Collect ~40 g to 50 g samples in zip-lock bags for asbestos (presence / absence) analysis;
- Wear a new disposable nitrile glove for each sample point thereby minimising potential for cross-contamination;
- Label sample containers with individual and unique identification details, including project number, sample location and sample depth (where applicable);
- Place samples into a cooled, insulated and sealed container for transport to the laboratory; and
- Use chain of custody documentation.

D3.0 Field Testing

Field testing including headspace tests (with a Photoionization Detector – PID) and gravimetric analysis of soils for asbestos containing materials (ACM) was not required for this project because no visual or olfactory indicators of possible volatile contamination or suspected asbestos was observed in the soil sampled from each bore hole.

Appendix E

SAC

Appendix E
Site Assessment Criteria
Campbelltown Hospital, Campbelltown, NSW

E1.0 Introduction

E1.1 Guidelines

The site assessment criteria (SAC) were prepared with reference to NEPC (2013) as referenced in the main body report.

E1.2 General

The SAC applied in the current investigation are informed by the CSM which identified human and environmental receptors to potential contamination at the site. Analytical results are assessed (as a Tier 1 assessment) against the SAC comprising primarily the investigation and screening levels of Schedule B1 of NEPC (2013).

The following inputs are relevant to the selection and/or derivation of the SAC:

- Land use: Commercial/Industrial. Corresponding to land use category 'D', commercial / industrial such as shops, offices, factories and industrial sites; and
- Soil type: clay.

E2.0 Soils

E2.1 Health Investigation and Screening Levels

The generic health investigation levels (HIL) and health screening levels (HSL) are considered to be appropriate for the assessment of human health risk via all relevant pathways of exposure associated with contamination at the site. The adopted soil HIL and HSL for the contaminants of concern are in Table 1 and 2.

Table 1: Health Investigation Levels (mg/kg)

Contaminant	HIL-D
Metals	
Arsenic	3000
Cadmium	900
Chromium (VI)	3600
Copper	240 000
Lead	1500
Mercury (inorganic)	730
Nickel	6000
Zinc	400 000
PAH	
B(a)P TEQ	40
Total PAH	4000
Phenols	
Phenol	240 000
Pentachlorophenol	660
OCP	
DDT+DDE+DDD	3600
Aldrin and dieldrin	45
Chlordane	530
Endosulfan	2000
Endrin	100
Heptachlor	50
HCB	80
Methoxychlor	2500
OPP	
Chlorpyrifos	2000
PCB	
PCB	7

Table 2: Health Screening Levels (mg/kg)

Contaminant	HSL-D	HSL-D	HSL-D	HSL-D
SAND	**0 m to <1 m**	**1 m to <2 m**	**2 m to <4 m**	**4 m+**
Benzene	3	3	3	3
Toluene	NL	NL	NL	NL
Ethylbenzene	NL	NL	NL	NL
Xylenes	230	NL	NL	NL
Naphthalene	NL	NL	NL	NL
TRH F1	260	370	630	NL
TRH F2	NL	NL	NL	NL
SILT	**0 m to <1 m**	**1 m to <2 m**	**2 m to <4 m**	**4 m+**
Benzene	4	4	6	10
Toluene	NL	NL	NL	NL
Ethylbenzene	NL	NL	NL	NL
Xylenes	NL	NL	NL	NL
Naphthalene	NL	NL	NL	NL
TRH F1	250	360	590	NL
TRH F2	NL	NL	NL	NL
CLAY	**0 m to <1 m**	**1 m to <2 m**	**2 m to <4 m**	**4 m+**
Benzene	4	6	9	20
Toluene	NL	NL	NL	NL
Ethylbenzene	NL	NL	NL	NL
Xylenes	NL	NL	NL	NL
Naphthalene	NL	NL	NL	NL
TRH F1	310	480	NL	NL
TRH F2	NL	NL	NL	NL

Notes: TRH F1 is TRH C_6-C_{10} minus BTEX

TRH F2 is TRH >C_{10}-C_{16} minus naphthalene

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

The HSL for direct contact derived from CRC CARE (2011) are in Table 3.

Table 3: Health Screening Levels for Direct Contact (mg/kg)

Contaminant	DC HSL-D	DC HSL-IMW
Benzene	430	1100
Toluene	99 000	120 000
Ethylbenzene	27 000	85 000
Xylenes	81 000	130 000
Naphthalene	11 000	29 000
TRH F1	26 000	82 000
TRH F2	20 000	62 000
TRH F3	27 000	85 000
TRH F4	38 000	12 000

Notes: TRH F1 is TRH C_6-C_{10} minus BTEX
TRH F2 is TRH >C_{10}-C_{16} minus naphthalene
IMW intrusive maintenance worker

E2.2 Asbestos in Soil

Based on the CSM and/or current site access limitations, a detailed asbestos assessment was not considered to be warranted at this stage. However, due to the history of widespread use of ACM products across Australia, ACM can be encountered unexpectedly and sporadically at a site. Therefore, the presence or absence of asbestos at a limit of reporting of 0.1 g/kg (AS:4964) has been adopted for this investigation/assessment as an initial screen.

E2.3 Ecological Investigation Levels

Ecological investigation levels (EIL) and added contaminant limits (ACL), where appropriate, have been derived in NEPC (2013) for arsenic, copper, chromium (III), nickel, lead, zinc, DDT and naphthalene. The adopted EIL, derived using the interactive (excel) calculation spreadsheet on the NEPM toolbox website are shown in Table 5, with inputs into their derivation shown in Table 4.

Table 4: Inputs to the Derivation of the Ecological Investigation Levels

Variable	Input	Rationale
Age of contaminants	"Aged" (>2 years)	No 'new' spill has occurred at site as far is reasonably known. The fill is the 'source' and has been present for some time; minor constituents in the fill is unlikely to be a 'fresh' source.
pH	4	Conservative presumption for initial screening purposes
CEC	5 $cmol_c/kg$	Conservative presumption for initial screening purposes
Clay content	40 %	Reasonable presumption for soils that are primarily clays.
Traffic volumes	High	Conservative presumption for initial screening purposes
State / Territory	NSW	-

Table 5: Ecological Investigation Levels (mg/kg)

Contaminant	EIL-D
Metals	
Arsenic	160
Copper	85
Nickel	60
Chromium	1100
Lead	1800
Zinc	230
PAH	
Naphthalene	370
OCP	
DDT	640

Notes: EIL-AES area of ecological significance

E2.4 Ecological Screening Levels

Ecological screening levels (ESL) are used to assess the risk of selected petroleum hydrocarbon compounds, BTEX and benzo(a)pyrene to terrestrial ecosystems. The adopted ESL are shown in Table 6.

Table 6: Ecological Screening Levels (mg/kg)

Contaminant	Soil Type	EIL-D
Benzene	Coarse	75
Toluene	Coarse	135
Ethylbenzene	Coarse	165
Xylenes	Coarse	180
TRH F1	Coarse/ Fine	215*
TRH F2	Coarse/ Fine	170*
TRH F3	Coarse	1700
TRH F4	Coarse	3300
B(a)P	Coarse	1.4
Benzene	Fine	95
Toluene	Fine	135
Ethylbenzene	Fine	185
Xylenes	Fine	95
TRH F1	Coarse/ Fine	215*
TRH F2	Coarse/ Fine	170*
TRH F3	Fine	2500
TRH F4	Fine	6600
B(a)P	Fine	1.4

Notes: ESL are of low reliability except where indicated by * which indicates that the ESL is of moderate reliability
TRH F1 is TRH C_6-C_{10} minus BTEX
TRH F2 is TRH >C_{10}-C_{16} including naphthalene
EIL-AES is area of ecological significance

E2.5 Management Limits

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

- Formation of observable light non-aqueous phase liquids (LNAPL);
- Fire and explosion hazards; and
- Effects on buried infrastructure eg: penetration of, or damage to, in-ground services.

The adopted management limits are in Table 7.

Table 7: Management Limits (mg/kg)

Contaminant	Soil Type	ML-A-B-C	ML-D
TRH F1	Coarse	700	700
TRH F2	Coarse	1000	1000
TRH F3	Coarse	2500	3500
TRH F4	Coarse	10 000	10 000
TRH F1	Fine	800	800
TRH F2	Fine	1000	1000
TRH F3	Fine	3500	5000
TRH F4	Fine	10 000	10 000

Notes: TRH F1 is TRH C_6-C_{10} including BTEX
TRH F2 is TRH >C_{10}-C_{16} including naphthalene

Appendix F

Summary Tables

Douglas Partners
Geotechnics / Environment / Groundwater

Table 1: Summary of Laboratory Results – Metals, TRH, BTEX, PAH

		Metals								TRH		TRH						BTEX				PAH				OCP		OPP	PCB
		Arsenic	Cadmium	Total Chromium	Copper	Lead	Mercury (inorganic)	Nickel	Zinc	TRH C6 - C9	C10-C36 recoverable hydrocarbons	TRH C6 - C10	TRH >C10-C16	F1 ((C6-C10)-BTEX)	F2 (>C10-C16 less Naphthalene)	F3 (>C16-C34)	F4 (>C34-C40)	Benzene	Toluene	Ethylbenzene	Total Xylenes	Naphthalene [b]	Benzo(a)pyrene (BaP)	Benzo(a)pyrene TEQ	Total PAHs	Total Endosulfan	Total Analysed OCP	Total Analysed OPP	Total PCB
	PQL	4	0.4	1	1	1	0.1	1	1	25	50	25	50	25	50	100	100	0.2	0.5	1	1	1	0.05	0.5	0.05	0.1	0.1	0.1	0.1
Sample ID	Sample Date	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg		mg/kg	
201/1-1.45	05/05/2021	<4	<0.4	4	34	17	<0.1	15	59	<25	<50	<25	<50	<25	<50	<100	<100	<0.2	<0.5	<1	<1	<1	<0.05	<0.5	<0.05	<0.1	<0.1	<0.1	<0.1
		3000 160	900 -	3600 1100	240000 85	1500 1800	730 -	6000 60	400000 230	-	-	- -	- 170	310 215	NL -	- 2500	- 6600	4 95	NL 135	NL 185	NL 95	NL 370	- 1.4	40 -	4000 -	-	-	-	-
203/0.5-0.95	05/05/2021	<4	<0.4	7	19	14	<0.1	10	39	<25	<50	<25	<50	<25	<50	<100	<100	<0.2	<0.5	<1	<1	<1	<0.05	<0.5	<0.05	<0.1	<0.1	<0.1	<0.1
		3000 160	900 -	3600 1100	240000 85	1500 1800	730 -	6000 60	400000 230	-	-	- -	- 170	310 215	NL -	- 2500	- 6600	4 95	NL 135	NL 185	NL 95	NL 370	- 1.4	40 -	4000 -	-	-	-	-
205/0-0.1	06/05/2021	<4	<0.4	7	24	14	0.1	12	44	<25	<50	<25	<50	<25	<50	<100	<100	<0.2	<0.5	<1	<1	<1	<0.05	<0.5	<0.05	<0.1	<0.1	<0.1	<0.1
		3000 160	900 -	3600 1100	240000 85	1500 1800	730 -	6000 60	400000 230	-	-	- -	- 170	310 215	NL -	- 2500	- 6600	4 95	NL 135	NL 185	NL 95	NL 370	- 1.4	40 -	4000 -	-	-	-	-
207/1-1.45	06/05/2021	4	<0.4	14	36	20	<0.1	20	86	<25	<50	<25	<50	<25	<50	<100	<100	<0.2	<0.5	<1	<1	<1	<0.05	<0.5	<0.05	<0.1	<0.1	<0.1	<0.1
		3000 160	900 -	3600 1100	240000 85	1500 1800	730 -	6000 60	400000 230	-	-	- -	- 170	310 215	NL -	- 2500	- 6600	4 95	NL 135	NL 185	NL 95	NL 370	- 1.4	40 -	4000 -	-	-	-	-
208/2.5-2.95	10/05/2021	<4	<0.4	7	20	16	<0.1	8	32	<25	<50	<25	<50	<25	<50	<100	<100	<0.2	<0.5	<1	<1	<1	<0.05	<0.5	<0.05	<0.1	<0.1	<0.1	<0.1
		3000 160	900 -	3600 1100	240000 85	1500 1800	730 -	6000 60	400000 230	-	-	- -	- 170	310 215	NL -	- 2500	- 6600	4 95	NL 135	NL 185	NL 95	NL 370	- 1.4	40 -	4000 -	-	-	-	-
209/0.3-0.4	11/05/2021	<4	<0.4	5	24	14	<0.1	4	90	<25	<50	<25	<50	<25	<50	280	220	<0.2	<0.5	<1	<1	<1	1.4	2.1	12	<0.1	<0.1	<0.1	<0.1
		3000 160	900 -	3600 1100	240000 85	1500 1800	730 -	6000 60	400000 230	-	-	- -	- 170	310 215	NL -	- 2500	- 6600	4 95	NL 135	NL 185	NL 95	NL 370	- 1.4	40 -	4000 -	-	-	-	-
CT1		100	20	100	NC	100	4	40	NC	650	10000	NC	NC	NC	NC	NC	NC	10	288	600	1000	NC	0.8	NC	200	60	<50	4	<50
SCC1		500	100	1900	NC	1500	50	1050	NC	650	10000	NC	NC	NC	NC	NC	NC	18	518	1080	1800	NC	10	NC	200	108	<50	7.5	<50
TCLP1		N/A	N/A	N/A	NC	N/A	N/A	N/A	NC	N/A	N/A	NC	NC	NC	NC	NC	NC	N/A	N/A	N/A	N/A	NC	N/A	NC	N/A	N/A	N/A	N/A	N/A
CT2		400	80	400	NC	400	16	160	NC	2600	40000	NC	NC	NC	NC	NC	NC	40	1152	2400	4000	NC	3.2	NC	800	240	<50	16	<50
SCC2		2000	400	7600	NC	6000	200	4200	NC	2600	40000	NC	NC	NC	NC	NC	NC	72	2073	4320	7200	NC	23	NC	800	432	<50	30	<50
TCLP2		N/A	N/A	N/A	NC	N/A	N/A	N/A	NC	N/A	N/A	NC	NC	NC	NC	NC	NC	N/A	N/A	N/A	N/A	NC	N/A	NC	N/A	N/A	N/A	N/A	N/A

Lab result
HIL/HSL value EIL/ESL value

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

Indicates that asbestos has been detected by the lab, refer to the lab report **Blue** = DC exceedance HSL 0-<1 Exceedance

Bold = Lab detections - = Not tested or No HIL/HSL/EIL/ESL (as applicable) or Not applicable NL = Non limiting AD = Asbestos detected NAD = No Asbestos detected

HIL = Health investigation level HSL = Health screening level (excluding DC) EIL = Ecological investigation level ESL = Ecological screening level ML = Management Limit DC = Direct Contact H

Notes:

a QA/QC replicate of sample listed directly below the primary sample

b Reported naphthalene laboratory result obtained from BTEXN suite

c Criteria applies to DDT only

Site Assessment Criteria (SAC):

Refer to the SAC section of report for information of SAC sources and rationale. Summary information as follows:

SAC based on generic land use thresholds for Commercial/ industrial D

HIL D	Commercial / Industrial (NEPC, 2013)
HSL D	Commercial / Industrial (vapour intrusion) (NEPC, 2013)
DC HSL D	Direct contact HSL D Commercial/Industrial (direct contact) (CRC CARE, 2011)
EIL/ESL C/Ind	Commercial and Industrial (NEPC, 2013)
ML C/Ind	Commercial and Industrial (NEPC, 2013)

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Table 2: Summary of Laboratory Results – Phenol, OCP, OPP, PCB, Asbestos

			Phenol	OCP											OPP	PCB	Asbestos		
			Phenol	DDD	DDT+DDE+DDD [c]	DDE	DDT	Aldrin & Dieldrin	Total Chlordane	Endrin	Total Endosulfan	Heptachlor	Hexachlorobenzene	Methoxychlor	Chlorpyriphos	Total PCB	Asbestos ID in soil >0.1g/kg	Trace Analysis	Asbestos (50 g)
		PQL	5	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1			
Sample ID		Sample Date	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	-	-	-
201/1-1.45		05/05/2021	-	-	-	-	-	-	-	-	-	-	-	-	-	-	NAD	NAD	NAD
			660 -	- -	3600 640	- -	- 640	45 -	530 -	100 -	2000 -	50 -	80 -	2500 -	2000 -	7 -			
203/0.5-0.95		05/05/2021	<5	-	-	-	-	-	-	-	-	-	-	-	-	-	NAD	NAD	NAD
			660 -	- -	3600 640	- -	- 640	45 -	530 -	100 -	2000 -	50 -	80 -	2500 -	2000 -	7 -			
205/0-0.1		06/05/2021	<5	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	NAD	NAD	NAD
			660 -	- -	3600 640	- -	- 640	45 -	530 -	100 -	2000 -	50 -	80 -	2500 -	2000 -	7 -			
207/1-1.45		06/05/2021	<5	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	NAD	NAD	NAD
			660 -	- -	3600 640	- -	- 640	45 -	530 -	100 -	2000 -	50 -	80 -	2500 -	2000 -	7 -			
208/2.5-2.95		10/05/2021	<5	-	-	-	-	-	-	-	-	-	-	-	-	-	NAD	NAD	NAD
			660 -	- -	3600 640	- -	- 640	45 -	530 -	100 -	2000 -	50 -	80 -	2500 -	2000 -	7 -			
209/0.3-0.4		11/05/2021	-	-	-	-	-	-	-	-	-	-	-	-	-	-	NAD	NAD	NAD
			660 -	- -	3600 640	- -	- 640	45 -	530 -	100 -	2000 -	50 -	80 -	2500 -	2000 -	7 -			

Lab result

HIL/HSL value EIL/ESL value

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

Indicates that asbestos has been detected by the lab, refer to the lab report **Blue** = DC exceedance HSL 0-<1 Exceedance

Bold = Lab detections - = Not tested or No HIL/HSL/EIL/ESL (as applicable) or Not applicable NL = Non limiting AD = Asbestos detected NAD = No Asbestos detected

HIL = Health investigation level HSL = Health screening level (excluding DC) EIL = Ecological investigation level ESL = Ecological screening level ML = Management Limit D

Notes:

a QA/QC replicate of sample listed directly below the primary sample

b Reported naphthalene laboratory result obtained from BTEXN suite

c Criteria applies to DDT only

Site Assessment Criteria (SAC):

Refer to the SAC section of report for information of SAC sources and rationale. Summary information as follows:

SAC based on generic land use thresholds for Commercial/ industrial D

HIL D	Commercial / Industrial (NEPC, 2013)
HSL D	Commercial / Industrial (vapour intrusion) (NEPC, 2013)
DC HSL D	Direct contact HSL D Commercial/Industrial (direct contact) (CRC CARE, 2011)
EIL/ESL C/Ind	Commercial and Industrial (NEPC, 2013)
ML C/Ind	Commercial and Industrial (NEPC, 2013)

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Table 3: Summary of Laboratory Results – Metals, TRH, BTEX, PAH, Phenol, OCP, OPP, PCB, Asbestos

		Metals								TRH						BTEX				PAH				Phenol	OCP												OPP	PCB	Asbestos		
		Arsenic	Cadmium	Total Chromium	Copper	Lead	Mercury (inorganic)	Nickel	Zinc	TRH C6 - C10	TRH >C10-C16	F1 ((C6-C10)-BTEX)	F2 (>C10-C16 less Naphthalene)	F3 (>C16-C34)	F4 (>C34-C40)	Benzene	Toluene	Ethylbenzene	Total Xylenes	Naphthalene [b]	Benzo(a)pyrene (BaP)	Benzo(a)pyrene TEQ	Total PAHs	Phenol	DDD	DDT+DDE+DDD [c]	DDE	DDT	Aldrin & Dieldrin	Total Chlordane	Endrin	Total Endosulfan	Heptachlor	Hexachlorobenzene	Methoxychlor	Chlorpyriphos	Total PCB	Asbestos ID in soil >0.1g/Kg	Trace Analysis	Asbestos (50 g)
	PQL	4	0.4	1	1	1	0.1	1	1	25	50	25	50	100	100	0.2	0.5	1	1	1	0.05	0.5	0.05	5	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1			
Sample ID	Sample Date	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	-	-	-
201/1-1.45	05/05/2021	<4	<0.4	4	34	17	<0.1	15	59	<25	<50	<25	<50	<100	<100	<0.2	<0.5	<1	<1	<1	<0.05	<0.5	<0.05	-	-	-	-	-	-	-	-	-	-	-	-	-	-	NAD	NAD	NAD
		3000 160	900 -	3600 1100	240000 85	1500 1800	730 -	6000 60	400000 230	- -	- 170	310 215	NL -	- 2500	- 6600	4 95	NL 135	NL 185	NL 95	NL 370	- 1.4	40 -	4000 -	660 -	- -	3600 640	- -	- 640	45 -	530 -	100 -	2000 -	50 -	80 -	2500 -	2000 -	7 -			
203/0.5-0.95	05/05/2021	<4	<0.4	7	19	14	<0.1	10	39	<25	<50	<25	<50	<100	<100	<0.2	<0.5	<1	<1	<1	<0.05	<0.5	<0.05	<5	-	-	-	-	-	-	-	-	-	-	-	-	-	NAD	NAD	NAD
		3000 160	900 -	3600 1100	240000 85	1500 1800	730 -	6000 60	400000 230	- -	- 170	310 215	NL -	- 2500	- 6600	4 95	NL 135	NL 185	NL 95	NL 370	- 1.4	40 -	4000 -	660 -	- -	3600 640	- -	- 640	45 -	530 -	100 -	2000 -	50 -	80 -	2500 -	2000 -	7 -			
205/0-0.1	06/05/2021	<4	<0.4	7	24	14	0.1	12	44	<25	<50	<25	<50	<100	<100	<0.2	<0.5	<1	<1	<1	<0.05	<0.5	<0.05	<5	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	NAD	NAD	NAD
		3000 160	900 -	3600 1100	240000 85	1500 1800	730 -	6000 60	400000 230	- -	- 170	310 215	NL -	- 2500	- 6600	4 95	NL 135	NL 185	NL 95	NL 370	- 1.4	40 -	4000 -	660 -	- -	3600 640	- -	- 640	45 -	530 -	100 -	2000 -	50 -	80 -	2500 -	2000 -	7 -			
207/1-1.45	06/05/2021	4	<0.4	14	36	20	<0.1	20	86	<25	<50	<25	<50	<100	<100	<0.2	<0.5	<1	<1	<1	<0.05	<0.5	<0.05	<5	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	NAD	NAD	NAD
		3000 160	900 -	3600 1100	240000 85	1500 1800	730 -	6000 60	400000 230	- -	- 170	310 215	NL -	- 2500	- 6600	4 95	NL 135	NL 185	NL 95	NL 370	- 1.4	40 -	4000 -	660 -	- -	3600 640	- -	- 640	45 -	530 -	100 -	2000 -	50 -	80 -	2500 -	2000 -	7 -			
208/2.5-2.95	10/05/2021	<4	<0.4	7	20	16	<0.1	8	32	<25	<50	<25	<50	<100	<100	<0.2	<0.5	<1	<1	<1	<0.05	<0.5	<0.05	<5	-	-	-	-	-	-	-	-	-	-	-	-	-	NAD	NAD	NAD
		3000 160	900 -	3600 1100	240000 85	1500 1800	730 -	6000 60	400000 230	- -	- 170	310 215	NL -	- 2500	- 6600	4 95	NL 135	NL 185	NL 95	NL 370	- 1.4	40 -	4000 -	660 -	- -	3600 640	- -	- 640	45 -	530 -	100 -	2000 -	50 -	80 -	2500 -	2000 -	7 -			
209/0.3-0.4	11/05/2021	<4	<0.4	5	24	14	<0.1	4	90	<25	<50	<25	<50	280	220	<0.2	<0.5	<1	<1	<1	1.4	2.1	12	-	-	-	-	-	-	-	-	-	-	-	-	-	-	NAD	NAD	NAD
		3000 160	900 -	3600 1100	240000 85	1500 1800	730 -	6000 60	400000 230	- -	- 170	310 215	NL -	- 2500	- 6600	4 95	NL 135	NL 185	NL 95	NL 370	- 1.4	40 -	4000 -	660 -	- -	3600 640	- -	- 640	45 -	530 -	100 -	2000 -	50 -	80 -	2500 -	2000 -	7 -			

Lab result
HIL/HSL value EIL/ESL value

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

Indicates that asbestos has been detected by the lab, refer to the lab report Blue = DC exceedance HSL 0-<1 Exceedance

Bold = Lab detections - = Not tested or No HIL/HSL/EIL/ESL (as applicable) or Not applicable NL = Non limiting AD = Asbestos detected NAD = No Asbestos detected

HIL = Health investigation level HSL = Health screening level (excluding DC) EIL = Ecological investigation level ESL = Ecological screening level ML = Management Limit DC = Direct Contact HSL

Notes:

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DC HSL D	Direct contact HSL D Commercial/Industrial (direct contact) (CRC CARE, 2011)
EIL/ESL C/Ind	Commercial and Industrial (NEPC, 2013)
ML C/Ind	Commercial and Industrial (NEPC, 2013)

Appendix G

Bore Logs

BOREHOLE LOG

CLIENT: Western Sydney University
PROJECT: Proposed Medical Research Centre
LOCATION: Therry Road, Campbelltown, NSW

SURFACE LEVEL: 82.3 mAHD
EASTING: 297391
NORTHING: 6227038
DIP/AZIMUTH: 90°/--

BORE No: 201
PROJECT No: 34275.31
DATE: 4/5/2021
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing: Type	Depth	Sample	Results & Comments	Water	Well Construction Details
82	0.15	FILL/TOPSOIL: Gravelly CLAY CL-CI, low to medium plasticity, dark brown, shale gravel, trace rootlets, w<<PL,		A/E	0.0–0.15				
		FILL/Silty CLAY CI: medium plasticity, dark brown then grey, with siltstone gravel, w<PL, poorly compacted		A/E	0.4–0.5				
				A/E	0.9–1.0				
81	1			S/E	1.45		4,3,6 N = 9		
				A/E	1.9–2.0				
80	2			S/E	2.5–2.95		3,4,7 N = 11		
79	3			S/E	3.5–3.95		3,4,5 N = 9		
78	4			S/E	4.5–4.95		3,4,6 N = 10	▼ 04-05-21	
77	5			S/E	5.5–5.95		5,13,13 N = 26		
76	6			S	6.5–6.95		5,15,34 N = 49		
75	7								
74	8								
73	9								
	5.2	CLAY CI-CH: medium to high plasticity, brown, with ironstone gravel, trace rootlets, w<PL, very stiff, residual							
	6.75	SILTSTONE: grey, very low strength, moderately weathered, Bringelly Shale							
	7.5	Bore discontinued at 7.5m - limit of investigation							

RIG: Hanjin 8D drill rig **DRILLER:** Rockwell **LOGGED:** RB **CASING:** Uncased
TYPE OF BORING: SFA to 7.5m
WATER OBSERVATIONS: Perched groundwater observed whilst augering at 4.6m
REMARKS: Location coordinates are in MGA94 Zone 56.

SAMPLING & IN SITU TESTING LEGEND

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

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BOREHOLE LOG

CLIENT: Western Sydney University
PROJECT: Proposed Medical Research Centre
LOCATION: Therry Road, Campbelltown, NSW

SURFACE LEVEL: 82.9 mAHD
EASTING: 297374
NORTHING: 6227035
DIP/AZIMUTH: 90°/--

BORE No: 202
PROJECT No: 34275.31
DATE: 5 - 7/5/2021
SHEET 1 OF 2

RL	Depth (m)	Description of Strata	Degree of Weathering (EW HW MW SW FS FR)	Graphic Log	Rock Strength (Ex Low, Very Low, Low, Medium, High, Very High, Ex High)	Water	Fracture Spacing (m) (0.01, 0.05, 0.10, 0.50, 1.00)	Discontinuities (B - Bedding J - Joint S - Shear F - Fault)	Sampling & In Situ Testing: Type	Core Rec. %	RQD %	Test Results & Comments
	0.21	CONCRETE: 210mm thick, 8mm reo at 100mm depth, up to 20mm aggregate										
	0.5	FILL/Gravelly CLAY CI-CH: medium to high plasticity, dark brown, igneous gravel, with sand							A/E			
82	1	FILL/Gravelly CLAY CI-CH: medium to high plasticity, dark brown and grey, siltstone gravel, w<PL, poorly compacted							A/E S/E			3,5,5 N = 10
81	2								A/E			
80	3								S/E			3,3,3 N = 6
		- trace sandstone gravel below 3.4m							S/E			2,4,5 N = 9
79	4											
78	5								S/E			5,7,7 N = 14
									S/E			3,4,4 N = 8
77	6											
	6.7	CLAY CI:CH: medium to high plasticity, brown mottled pale grey, trace ironstone gravel, w<PL, apparently stiff, residual							S E			3,3,4 N = 7
76	7											
	7.4	(possibly disturbed)										
75	8	SILTSTONE: grey, with 1-2% fine sandstone lamination, medium strength with very low strength bands, fresh stained then fresh, fractured, Ashfield Shale						7.6-7.64: Jx2, 60°, pl 7.71-7.83: Csx2, 10mm 7.91m: J, 60°, pl 8m: J, 20°, pl, fe 8.22-8.29m: Jx3, 60-90°, pl 8.31m: B, 15°, pl, clay 5mm 8.41-8.53m: Csx2 10mm, fe 8.76-9.41m: Bx7, 0-10°, pl, clay up to 7mm 8.85-9.41m: Jx3, 40-70°, pl, clay vn 9.48m: Cs 10mm, fe 9.88m: B, 5°, pl, clay vn	C	100	51	PL(A) = 0.63 PL(A) = 0.45 PL(A) = 0.81
74	9											
73												

RIG: Hanjin 8D drill rig **DRILLER:** Rockwell **LOGGED:** RB **CASING:** HQ to 7.5m

TYPE OF BORING: Diacore to 0.21m, SFA to 7.5m, rotary to 7.0m, NMLC coring to 12.84m

WATER OBSERVATIONS: No free groundwater observed whilst augering

REMARKS: Location coordinates are in MGA94 Zone 56.

SAMPLING & IN SITU TESTING LEGEND

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

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BOREHOLE LOG

CLIENT: Western Sydney University
PROJECT: Proposed Medical Research Centre
LOCATION: Therry Road, Campbelltown, NSW

SURFACE LEVEL: 82.9 mAHD
EASTING: 297374
NORTHING: 6227035
DIP/AZIMUTH: 90°/--

BORE No: 202
PROJECT No: 34275.31
DATE: 5 - 7/5/2021
SHEET 2 OF 2

RL	Depth (m)	Description of Strata	Degree of Weathering (EW HW MW SW FS FR)	Graphic Log	Rock Strength (Ex Low / Very Low / Low / Medium / High / Very High / Ex High)	Water	Fracture Spacing (m) (0.01 / 0.05 / 0.10 / 0.50 / 1.00)	Discontinuities (B - Bedding J - Joint S - Shear F - Fault)	Sampling & In Situ Testing: Type	Core Rec. %	RQD %	Test Results & Comments
72	10	SILTSTONE: (continued)						10.05-10.37m: Bx5, 0-10°, pl, fe				PL(A) = 0.84
	10.42	SILTSTONE: grey, with 10-15% fine sandstone lamination, high strength, unbroken, Ashfield Shale										
71	11											PL(A) = 1.31
	12								C	100	100	PL(A) = 1.34
70	12.84	Bore discontinued at 12.84m - limit of investigation										PL(A) = 1.45
69	13											
	14											
68	15											
67	16											
66	17											
65	18											
64	19											
63												

RIG: Hanjin 8D drill rig **DRILLER:** Rockwell **LOGGED:** RB **CASING:** HQ to 7.5m

TYPE OF BORING: Diacore to 0.21m, SFA to 7.5m, rotary to 7.0m, NMLC coring to 12.84m

WATER OBSERVATIONS: No free groundwater observed whilst augering

REMARKS: Location coordinates are in MGA94 Zone 56.

SAMPLING & IN SITU TESTING LEGEND

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

Douglas Partners
Geotechnics / Environment / Groundwater

BOREHOLE LOG

CLIENT: Western Sydney University
PROJECT: Proposed Medical Research Centre
LOCATION: Therry Road, Campbelltown, NSW

SURFACE LEVEL: 82.9 mAHD
EASTING: 297404
NORTHING: 6227030
DIP/AZIMUTH: 90°/--

BORE No: 203
PROJECT No: 34275.31
DATE: 4/5/2021
SHEET 1 OF 2

RL	Depth (m)	Description of Strata	Degree of Weathering (EW HW MW SW FS FR)	Graphic Log	Rock Strength (Ex Low / Very Low / Low / Medium / High / Very High / Ex High)	Water	Fracture Spacing (m) (0.01 / 0.05 / 0.10 / 0.50 / 1.00)	Discontinuities (B - Bedding J - Joint S - Shear F - Fault)	Type	Core Rec. %	RQD %	Test Results & Comments
	0.2	FILL/Silty SAND: fine to medium grained, dark brown, with siltstone gravel and clay, dry							A/E*			
		FILL/Silty CLAY CI-CH: medium to high plasticity, dark brown to brown, with siltstone gravel, w<PL, poorly compacted							A/E			
82	1								S/E			4,6,6 N = 12
									S/E			3,6,9 N = 15
81	2								E/A			
									S/E			4,4,2 N = 6
80	3											
									S/E			2,3,2 N = 5
79	4											
	4.8	CLAY CI-CH: medium to high plasticity, brown mottled pale grey, trace ironstone gravel, w<PL, very stiff, residual							S E			3,8,10 N = 18
78	5											
									S			6,8,9 N = 17
77	6											
									S			4,7,11 N = 18
76	7											
	7.4	SILTSTONE: grey, with up to 5% fine sandstone lamination, low strength with very low strength bands, slightly weathered, fractured, Ashfield Shale							S			11,25/10mm,- refusal
75	8							7.8m: J, 45°, cu, clay vn 7.87m: J, 70-80°, ir, clay vn 7.93m: J, 60°, cu 8.05m: Cs 30mm, fe 8.17m: Cs 10mm 8.22m: Cs 10mm 8.28m: Ds 40mm, fe 8.42m: Cs 10mm 8.47m: B, 0-20°, ir 8.52m: B, 10°, pl, clay 7mm	C	100	36	PL(A) = 0.21
	8.32	SILTSTONE: grey, with up to 5% fine sandstone lamination, medium strength, slightly weathered, fractured, Ashfield Shale										
74	9											PL(A) = 0.51
	9.4	SILTSTONE: grey, with up to 10% fine sandstone lamination, high strength, fresh, slightly fractured, Ashfield Shale						8.88-9.36m: Jx5, 30-60°, pl, fe 9.39m: B, 0°, pl, clay 2mm	C	100	97	PL(A) = 1.24
73												

RIG: Hanjin 8D drill rig **DRILLER:** Rockwell **LOGGED:** RB **CASING:** HQ to 7.7m
TYPE OF BORING: SFA to 7.5m, rotary to 7.75m, NMLC coring to 12.6m
WATER OBSERVATIONS: No free groundwater observed whilst augering
REMARKS: Location coordinates are in MGA94 Zone 56. * Replicate sample BD1/040521 collected

SAMPLING & IN SITU TESTING LEGEND

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

Douglas Partners
Geotechnics / Environment / Groundwater

BOREHOLE LOG

CLIENT: Western Sydney University
PROJECT: Proposed Medical Research Centre
LOCATION: Therry Road, Campbelltown, NSW

SURFACE LEVEL: 82.9 mAHD
EASTING: 297404
NORTHING: 6227030
DIP/AZIMUTH: 90°/--

BORE No: 203
PROJECT No: 34275.31
DATE: 4/5/2021
SHEET 2 OF 2

RL	Depth (m)	Description of Strata	Degree of Weathering (EW HW MW SW FS FR)	Graphic Log	Rock Strength (Ex Low / Very Low / Low / Medium / High / Very High / Ex High)	Water	Fracture Spacing (m) (0.01 / 0.05 / 0.10 / 0.50 / 1.00)	Discontinuities (B - Bedding J - Joint S - Shear F - Fault)	Sampling & In Situ Testing: Type	Core Rec. %	RQD %	Test Results & Comments
72	11	SILTSTONE: grey, with up to 10% fine sandstone lamination, high strength, fresh, slightly fractured, Ashfield Shale *(continued)*										PL(A) = 1.37
									C	100	97	
71	12							J, 30°, pl				PL(A) = 1.41
	12.6							12.4-12.44: Jx2, 45°. [; 12.5m: Cs 10mm				PL(A) = 1.12
70	13	Bore discontinued at 12.6m - limit of investigation										
69	14											
68	15											
67	16											
66	17											
65	18											
64	19											
63												

RIG: Hanjin 8D drill rig **DRILLER:** Rockwell **LOGGED:** RB **CASING:** HQ to 7.7m

TYPE OF BORING: SFA to 7.5m, rotary to 7.75m, NMLC coring to 12.6m

WATER OBSERVATIONS: No free groundwater observed whilst augering

REMARKS: Location coordinates are in MGA94 Zone 56. * Replicate sample BD1/040521 collected

SAMPLING & IN SITU TESTING LEGEND

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

Douglas Partners
Geotechnics / Environment / Groundwater

BOREHOLE LOG

CLIENT: Western Sydney University
PROJECT: Proposed Medical Research Centre
LOCATION: Therry Road, Campbelltown, NSW

SURFACE LEVEL: 82.8 mAHD
EASTING: 297363
NORTHING: 6227031
DIP/AZIMUTH: 90°/--

BORE No: 204
PROJECT No: 34275.31
DATE: 10/5/2021
SHEET 1 OF 2

RL	Depth (m)	Description of Strata	Degree of Weathering (EW HW MW SW FS FR)	Graphic Log	Rock Strength (Ex Low / Very Low / Low / Medium / High / Very High / Ex High)	Water	Fracture Spacing (m) (0.01 / 0.05 / 0.10 / 0.50 / 1.00)	Discontinuities (B - Bedding J - Joint S - Shear F - Fault)	Type	Core Rec. %	RQD %	Test Results & Comments
82	0.27	CONCRETE: 270mm thick, 8mm reo at 120mm depth, up to 20mm aggregate										
	0.4	FILL/Sandy GRAVEL: fine to coarse grained, dark brown, igneous gravel, moist							A/E			
82	1	FILL/Gravelly CLAY CI-CH: medium to high plasticity, brown and pale grey, siltstone gravel, trace sandstone and igneous gravel, w~PL, poorly compacted							A/E			
									S/E			2,3,3 N = 6
81	2											
									E*			
									S/E			3,3,6 N = 9
80	3											
									S/E			3,3,4 N = 7
79	4											
78	5	- becoming w<PL below 5.0m										
									S/E			6,7,11 N = 18
77	6											
76	7								S/E			5,7,7 N = 14
	7.3	CLAY CI-CH: medium to high plasticity brown and grey, trace rootlets, w<PL, stiff, residual (possibly disturbed between 7.3 - 7.45m)										
75	8											
	8.14	SILTSTONE: grey, with 3-5% fine sandstone lamination, medium strength with low to very low strength bands, slightly weathered, fractured, Ashfield Shale						8.16m: B, 0°, pl, clay 7mm 8.22-10.03m: Bx13, 0-10°, clay 0-9mm, fe 8.32-8.34m: Cs 20mm, fe 8.35-9.94m: Jx10, 30-60°, pl & ir, clay 0-5mm, fe 8.66-8.67m: Cs 10mm 9.12-9.20m: Ds 80mm 9.3-9.32m: Cs 20mm, fe	S			~~15,50,-~~ refusal PL(A) = 0.43
74	9								C	100		PL(A) = 0.64
73												

RIG: Hanjin 8D drill rig **DRILLER:** Rockwell **LOGGED:** RB **CASING:** HQ to 8.0m

TYPE OF BORING: Diacore to 0.27m, SFA to 8.0m, rotary to 8.14m, NMLC coring to 13.54m

WATER OBSERVATIONS: No free groundwater observed whilst augering

REMARKS: Location coordinates are in MGA94 Zone 56. * Replicate sample BD4/100521 collected

SAMPLING & IN SITU TESTING LEGEND

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

Douglas Partners
Geotechnics / Environment / Groundwater

BOREHOLE LOG

CLIENT: Western Sydney University
PROJECT: Proposed Medical Research Centre
LOCATION: Therry Road, Campbelltown, NSW

SURFACE LEVEL: 82.8 mAHD
EASTING: 297363
NORTHING: 6227031
DIP/AZIMUTH: 90°/--

BORE No: 204
PROJECT No: 34275.31
DATE: 10/5/2021
SHEET 2 OF 2

RL	Depth (m)	Description of Strata	Degree of Weathering (EW HW MW SW FS FR)	Graphic Log	Rock Strength (Ex Low, Very Low, Low, Medium, High, Very High, Ex High)	Water	Fracture Spacing (m) (0.01, 0.05, 0.10, 0.50, 1.00)	Discontinuities (B - Bedding J - Joint S - Shear F - Fault)	Sampling & In Situ Testing: Type	Core Rec. %	RQD %	Test Results & Comments
72	10.03	SILTSTONE: grey, with 5-7% fine sandstone lamination, medium strength then high strength, fresh stained then fresh, slightly fractured, Ashfield Shale						10.0-10.03m: Ds 30mm				PL(A) = 0.46 PL(A) = 0.56
	11							10.51m: B, 0°, pl, clay 2mm 10.53m: B, 0°, pl, fe 10.72m: B, 10°, pl, clay 2mm	C	100		
71	12							11.29-11.8m: Jx4, 45-70°, pl, ir & cu, clay vn	C	100		PL(A) = 2.34
70	13							12.58m: J, 80°, ir				PL(A) = 1.43 PL(A) = 1.44
	13.54	Bore discontinued at 13.54m - limit of investigation										
69	14											
68	15											
67	16											
66	17											
65	18											
64	19											
63												

RIG: Hanjin 8D drill rig **DRILLER:** Rockwell **LOGGED:** RB **CASING:** HQ to 8.0m

TYPE OF BORING: Diacore to 0.27m, SFA to 8.0m, rotary to 8.14m, NMLC coring to 13.54m

WATER OBSERVATIONS: No free groundwater observed whilst augering

REMARKS: Location coordinates are in MGA94 Zone 56. * Replicate sample BD4/100521 collected

SAMPLING & IN SITU TESTING LEGEND

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

Douglas Partners
Geotechnics / Environment / Groundwater

BOREHOLE LOG

CLIENT: Western Sydney University
PROJECT: Proposed Medical Research Centre
LOCATION: Therry Road, Campbelltown, NSW

SURFACE LEVEL: 82.8 mAHD
EASTING: 297363
NORTHING: 6227031
DIP/AZIMUTH: 90°/--

BORE No: 204
PROJECT No: 34275.31
DATE: 10/5/2021
SHEET 2 OF 2

RL	Depth (m)	Description of Strata	Degree of Weathering (EW HW MW SW FS FR)	Graphic Log	Rock Strength (Ex Low, Very Low, Low, Medium, High, Very High, Ex High)	Water	Fracture Spacing (m) (0.01, 0.05, 0.10, 0.50, 1.00)	Discontinuities (B - Bedding J - Joint S - Shear F - Fault)	Sampling & In Situ Testing: Type	Core Rec. %	RQD %	Test Results & Comments
72	10.03	SILTSTONE: grey, with 5-7% fine sandstone lamination, medium strength then high strength, fresh stained then fresh, slightly fractured, Ashfield Shale						10.0-10.03m: Ds 30mm				PL(A) = 0.46 PL(A) = 0.56
	11							10.51m: B, 0°, pl, clay 2mm 10.53m: B, 0°, pl, fe 10.72m: B, 10°, pl, clay 2mm	C	100		
71	12							11.29-11.8m: Jx4, 45-70°, pl, ir & cu, clay vn	C	100		PL(A) = 2.34
70	13							12.58m: J, 80°, ir				PL(A) = 1.43 PL(A) = 1.44
	13.54	Bore discontinued at 13.54m - limit of investigation										
69	14											
68	15											
67	16											
66	17											
65	18											
64	19											
63												

RIG: Hanjin 8D drill rig **DRILLER:** Rockwell **LOGGED:** RB **CASING:** HQ to 8.0m

TYPE OF BORING: Diacore to 0.27m, SFA to 8.0m, rotary to 8.14m, NMLC coring to 13.54m

WATER OBSERVATIONS: No free groundwater observed whilst augering

REMARKS: Location coordinates are in MGA94 Zone 56. * Replicate sample BD4/100521 collected

SAMPLING & IN SITU TESTING LEGEND

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

Douglas Partners
Geotechnics / Environment / Groundwater

BOREHOLE LOG

CLIENT: Western Sydney University
PROJECT: Proposed Medical Research Centre
LOCATION: Therry Road, Campbelltown, NSW

SURFACE LEVEL: 82.8 mAHD
EASTING: 297396
NORTHING: 6227018
DIP/AZIMUTH: 90°/--

BORE No: 205
PROJECT No: 34275.31
DATE: 5/5/2021
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing: Type	Depth	Sample	Results & Comments	Water	Well Construction Details
82	0	FILL/Gravelly CLAY CI-CH: medium to high plasticity, brown to dark brown, siltstone gravel, with silt, trace brick fragments, sandstone gravel and rootlets, w~PL, poorly compacted, first 100mm topsoil		A/E	0.0 - 0.1				
		- becoming w<PL below 0.4m		A/E	0.4 - 0.5				
81	1			A/E	0.9 - 1.0				
				S/E					
	1.5	- asphaltic concrete at 1.3m			1.45				
		FILL/Gravelly CLAY CI-CH: medium to high plasticity, grey, siltstone gravel, with silt, w<PL, poorly compacted		A/E	1.9 - 2.0		2,3,4 N = 7		
80	2			S/E	2.5		3,4,4 N = 8		
	3				2.95				
79		- becoming dark brown, PVC fragments below 3.6m		S/E	3.5		2,4,5 N = 9		
	4				3.95				
78		- igneous gravel below 4.7m		S/E	4.5		6,8,7 N = 15		
	5				4.95				
	5.3	CLAY CI-CH: medium to high plasticity, brown, trace ironstone gravel, apparently stiff, residual			5.45		21/150mm,-,- refusal		
	5.5	SILTSTONE: grey, low strength, slightly weathered		S	5.5				
77	6								
	6.0	Bore discontinued at 6.0m - limit of investigation							
76	7								
75	8								
74	9								
73									

RIG: Hanjin 8D drill rig **DRILLER:** Rockwell **LOGGED:** RB **CASING:** Uncased
TYPE OF BORING: SFA to 6.0m
WATER OBSERVATIONS: No free groundwater observed whilst augering
REMARKS: Location coordinates are in MGA94 Zone 56.

SAMPLING & IN SITU TESTING LEGEND

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

Douglas Partners
Geotechnics / Environment / Groundwater

BOREHOLE LOG

CLIENT: Western Sydney University
PROJECT: Proposed Medical Research Centre
LOCATION: Therry Road, Campbelltown, NSW

SURFACE LEVEL: 82.8 mAHD
EASTING: 297359
NORTHING: 6227017
DIP/AZIMUTH: 90°/--

BORE No: 206
PROJECT No: 34275.31
DATE: 10/5/2021
SHEET 1 OF 2

RL	Depth (m)	Description of Strata	Degree of Weathering (EW HW MW SW FS FR)	Graphic Log	Rock Strength (Ex Low / Very Low / Low / Medium / High / Very High / Ex High)	Water	Fracture Spacing (m) (0.01 / 0.05 / 0.10 / 0.50 / 1.00)	Discontinuities (B - Bedding J - Joint S - Shear F - Fault)	Sampling & In Situ Testing: Type	Core Rec. %	RQD %	Test Results & Comments
	0.22	CONCRETE: 220mm thick, 3 x 8mm reinforcement at 120mm depth, up to ~20mm aggregate										
82	1	FILL/Gravelly CLAY CI-CH: medium to high plasticity, brown and gey, siltstone gravel, trace igneous and sandstone gravel, w<PL, poorly compacted							E/A*			
									A/E			
									S/E			2,2,4 N = 6
81	2											
									S/E			2,2,4 N = 6
80	3											
79	4								S/E			3,9,8 N = 17
		- asphaltic concrete at 4.3m										
78	5											
									S/E			6,6,13 N = 19
77	6	- concrete fragments at 5.9m										
	6.9	CLAY CI-CH: medium to high plasticity, brown mottled pale grey, w<PL, very stiff, residual							S/E			6,9,13 N = 22
76	7											
75	8											
	8.4	SILTSTONE: grey, with 3-5% fine sandstone lamination, medium strength, with very low strength bands, fresh stained, fractured, Ashfield Shale							S			24/140mm,-,- refusal
74	9							8.67m: J, 45°, pl, clay vn 8.7m: B, 0°, pl, clay 3mm 8.73-8.84: Ds 110mm 8.87m: Cs 10mm 8.90-9.12m: B, 0-10°, pl, clay 3-5mm 9.10-9.15m: Ds 50mm 9.16-9.42m: Jx6,	C	100	21	PL(A) = 0.55 PL(A) = 0.46
73												

RIG: Hanjin 8D drill rig **DRILLER:** Rockwell **LOGGED:** RB **CASING:** HQ to 8.5m

TYPE OF BORING: Diacore to 0.22m, SFA to 8.5m, rotary to 8.67m, NMLC coring to 14.28m

WATER OBSERVATIONS: No free groundwater observed whilst augering

REMARKS: Location coordinates are in MGA94 Zone 56. * Replicate sample BD3/100521 collected

SAMPLING & IN SITU TESTING LEGEND

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

Douglas Partners
Geotechnics / Environment / Groundwater

BOREHOLE LOG

CLIENT: Western Sydney University
PROJECT: Proposed Medical Research Centre
LOCATION: Therry Road, Campbelltown, NSW

SURFACE LEVEL: 82.8 mAHD
EASTING: 297359
NORTHING: 6227017
DIP/AZIMUTH: 90°/--

BORE No: 206
PROJECT No: 34275.31
DATE: 10/5/2021
SHEET 2 OF 2

RL	Depth (m)	Description of Strata	Degree of Weathering (EW HW MW SW FS FR)	Graphic Log	Rock Strength (Ex Low, Very Low, Low, Medium, High, Very High, Ex High)	Water	Fracture Spacing (m) (0.01, 0.05, 0.10, 0.50, 1.00)	Discontinuities (B - Bedding J - Joint S - Shear F - Fault)	Sampling & In Situ Testing: Type	Core Rec. %	RQD %	Test Results & Comments
72		SILTSTONE: grey, with 3-5% fine sandstone lamination, medium strength, with very low strength bands, fresh stained, fractured, Ashfield Shale *(continued)*						20-60°, pl, clay vn 9.37-9.41m: Ds 40mm 9.47m: B, 0-10°, pl, fe 9.48m: B, 0-10°, pl, fe 9.5-9.53m: Ds 30mm 9.54-10.58m: Bx12, 0-10°, clay 0-5mm, fe 9.87-10.74m: Jx4, 0-45°, fe, clay vn 10.85m: B, 0-5°, pl, fe	C	100	21	PL(A) = 0.59 PL(A) = 1.14
	10.85											
71	11	SILTSTONE: grey, with 5-10% fine sandstone lamination, high strength, fresh, unbroken then fractured to slightly fractured, Ashfield Shale										PL(A) = 1.41
	12							12.17m: J, 45°, cu, fe				PL(A) = 1.74
70	13							12.87m: J, 45°, pl 13.0-13.1m: Jx3, 45°, pl 13.2-13.3m: Jx6, 30-45°, pl, cu, st 13.49-13.52m: Jx2, 30-45°, pl 13.72-13.85m: Jx2, pl, 30-45°	C	100	92	PL(A) = 2.08
69	14											
	14.28	Bore discontinued at 14.28m - limit of investigation										PL(A) = 1.25
68	15											
67	16											
66	17											
65	18											
64	19											
63												

RIG: Hanjin 8D drill rig **DRILLER:** Rockwell **LOGGED:** RB **CASING:** HQ to 8.5m

TYPE OF BORING: Diacore to 0.22m, SFA to 8.5m, rotary to 8.67m, NMLC coring to 14.28m

WATER OBSERVATIONS: No free groundwater observed whilst augering

REMARKS: Location coordinates are in MGA94 Zone 56. * Replicate sample BD3/100521 collected

SAMPLING & IN SITU TESTING LEGEND

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

Douglas Partners
Geotechnics / Environment / Groundwater

BOREHOLE LOG

CLIENT: Western Sydney University
PROJECT: Proposed Medical Research Centre
LOCATION: Therry Road, Campbelltown, NSW

SURFACE LEVEL: 82.8 mAHD
EASTING: 297361
NORTHING: 6227007
DIP/AZIMUTH: 90°/--

BORE No: 207
PROJECT No: 34275.31
DATE: 5/5/2021
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing: Type	Depth	Sample	Results & Comments	Water	Well Construction Details
82	0.2	FILL/TOPSOIL: Silty SAND, fine to medium grained, dark brown, with siltstone gravel and rootlets, moist		A/E	0.0–0.1				
		FILL/Silty CLAY CI: medium plasticity, dark brown, with siltstone gravel, trace sandstone gravel, w<PL, poorly compacted		A/E	0.4–0.5				
	1			A/E	0.9–1.0				
				S/E			4,6,8 N = 14		
		- bitumen fragment at 1.3m			1.45				
81	2			A/E	1.9–2.0				
					2.15		2,5,7 N = 12		
				S/E	2.5				
80	3								
79	4								
78	5			S/E	5.0		7,11,15 N = 26		
		- brick fragment at 5.45m			5.45				
77	6			S/E	6.0		3,5,11 N = 16		
					6.45				
76	6.7	CLAY CI-CH: medium to high plasticity, brown mottled pale grey, w<PL, stiff to very stiff, residual							
	7			S/E	7.0		4,8,16 N = 24		
75					7.45				
	8			S	8.0		4,7,8 N = 15		
74					8.75				
	8.9								
	9	SILTSTONE: grey, very low strength, slightly weathered, Ashfield Shale		S	9.0		11,20/50mm,- refusal bouncing		
	9.2	Bore discontinued at 9.2m - limit of investigation			9.2				
73									

RIG: Hanjin 8D drill rig **DRILLER:** Rockwell **LOGGED:** RB **CASING:** Uncased
TYPE OF BORING: SFA to 9.2m
WATER OBSERVATIONS: No free groundwater observed whilst augering
REMARKS: Location coordinates are in MGA94 Zone 56.

SAMPLING & IN SITU TESTING LEGEND

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

Douglas Partners
Geotechnics / Environment / Groundwater

BOREHOLE LOG

CLIENT: Western Sydney University
PROJECT: Proposed Medical Research Centre
LOCATION: Therry Road, Campbelltown, NSW

SURFACE LEVEL: 82.9 mAHD
EASTING: 297371
NORTHING: 6227004
DIP/AZIMUTH: 90°/--

BORE No: 208
PROJECT No: 34275.31
DATE: 7/5/2021
SHEET 1 OF 2

RL	Depth (m)	Description of Strata	Degree of Weathering (EW HW MW SW FS FR)	Graphic Log	Rock Strength (Ex Low / Very Low / Low / Medium / High / Very High / Ex High)	Water	Fracture Spacing (m) (0.01 / 0.05 / 0.10 / 0.50 / 1.00)	Discontinuities (B - Bedding J - Joint S - Shear F - Fault)	Sampling & In Situ Testing: Type	Core Rec. %	RQD %	Test Results & Comments
	0.25	CONCRETE: 250mm thick, 8mm reo at 110mm depth, up to 20mm aggregate										
	0.35	FILL/Sandy GRAVEL: fine to coarse grained, dark brown, igneous gravel, with clay							A/E			
82	1	FILL/Gravelly CLAY CI-CH: medium to high plasticity, dark brown and grey, siltstone gravel, trace igneous and sandstone gravel, w<PL, poorly compacted							A/E			
									S/E			2,3,5 N = 8
81	2											
									S/E			4,4,4 N = 8
80	3											
									S/E			3,7,7 N = 14
79	4											
									S/E			4,4,4 N = 8
78	5											
		- grey sandy gravel band between 5.65-5.75m							S/E			4,10,7 N = 17
77	6											
	6.3	CLAY CI-CH: medium to high plasticity, brown mottled pale grey, trace ironstone and rootlets, w<PL, stiff to very stiff, residual							S/E			3,7,9 N = 16
76	7											
									S			8,11,12 N = 23
75	8											
	8.8								S			10,12,20/100mm refusal
74	9	SILTSTONE: grey, with 15-20% fine sandstone lamination, medium strength, with very low strength bands, slightly weathered then fresh stained, fractured, Ashfield Shale						8.9m: J, 60°, pl, ti 8.96-9.03m: Cs 70mm, fe 9.09m: J, 60°, pl, fe 9.3m: B, 10°, pl, fe 9.34m: J, 55°, pl, he 9.39-9.40m: Cs 10mm, fe	C	100	71	PL(A) = 0.67 PL(A) = 1.58
	9.46											
73												

RIG: Hanjin 8D drill rig **DRILLER:** Rockwell **LOGGED:** RB **CASING:** HQ to 8.8m

TYPE OF BORING: Diacore to 0.25m, Hand auger to 1.5m, SFA to 8.5m, rotary to 8.8m, NMLC coring to 14.3m

WATER OBSERVATIONS: No free groundwater observed whilst augering

REMARKS: Location coordinates are in MGA94 Zone 56.

SAMPLING & IN SITU TESTING LEGEND

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

Douglas Partners
Geotechnics / Environment / Groundwater

BOREHOLE LOG

CLIENT: Western Sydney University
PROJECT: Proposed Medical Research Centre
LOCATION: Therry Road, Campbelltown, NSW

SURFACE LEVEL: 82.9 mAHD
EASTING: 297371
NORTHING: 6227004
DIP/AZIMUTH: 90°/--

BORE No: 208
PROJECT No: 34275.31
DATE: 7/5/2021
SHEET 2 OF 2

RL	Depth (m)	Description of Strata	Degree of Weathering (EW HW MW SW FS FR)	Graphic Log	Rock Strength (Ex Low / Very Low / Low / Medium / High / Very High / Ex High)	Water	Fracture Spacing (m) (0.01 / 0.05 / 0.10 / 0.50 / 1.00)	Discontinuities (B - Bedding J - Joint S - Shear F - Fault)	Type	Core Rec. %	RQD %	Test Results & Comments
72	11	SILTSTONE: grey, with 2-10% fine sandstone lamination, high strength, fresh stained then fresh, slightly fractured, Ashfield Shale *(continued)*						9.44m: B, 0-10°, pl, clay 7mm 9.45m: J, 10°, pl, clay vn 9.64-10.38m: Bx5, 0-5°, pl, fe 10.72m: B, 0°, pl, fe	C	100	71	PL(A) = 1.42
71	12							12.05m: J, 30°, cu, cln 12.38m: J, 60°, pl, cln 12.40-12.42: Cs 20mm 12.55-12.72m: Jx2, 45°, pl, cln	C	100	99	PL(A) = 1.55 PL(A) = 1.81 PL(A) = 1.18
70	13							13.66m: J, 70-80°, pl				
69	14											PL(A) = 1.24
	14.3	Bore discontinued at 14.28m - limit of investigation										
68	15											
67	16											
66	17											
65	18											
64	19											
63												

RIG: Hanjin 8D drill rig **DRILLER:** Rockwell **LOGGED:** RB **CASING:** HQ to 8.8m

TYPE OF BORING: Diacore to 0.25m, Hand auger to 1.5m, SFA to 8.5m, rotary to 8.8m, NMLC coring to 14.3m

WATER OBSERVATIONS: No free groundwater observed whilst augering

REMARKS: Location coordinates are in MGA94 Zone 56.

SAMPLING & IN SITU TESTING LEGEND

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

Douglas Partners
Geotechnics / Environment / Groundwater

BOREHOLE LOG

CLIENT: Western Sydney University
PROJECT: Proposed Medical Research Centre
LOCATION: Therry Road, Campbelltown, NSW

SURFACE LEVEL: 83.0 mAHD
EASTING: 297387
NORTHING: 6227009
DIP/AZIMUTH: 90°/--

BORE No: 209
PROJECT No: 34275.31
DATE: 10/5/2021
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing: Type	Depth	Sample	Results & Comments	Water	Well Construction Details
83	0.23	CONCRETE: 230mm thick, 8mm reo at 100mm depth, up to 20mm aggregate							
	0.4	FILL/Sandy GRAVEL: fine to coarse grained, dark brown, igneous gravel, moist		E	0.3				
				A	0.4				
					0.5				
		FILL/Gravelly CLAY CI-CH: medium to high plasticity, brown and grey, siltstone gravel, trace sandstone gravel, w>PL, poorly compacted		A/E*	0.9				
82	1				1.0				1
				S			4,6,8 N = 14		
		- becoming w<PL below 1.0m			1.45				
81	2								2
					2.5				
				S			2,2,4 N = 6		
80	3				2.95				3
79	4				4.0				4
				S/E			4,3,4 N = 7		
					4.45				
78	5								5
	5.3	CLAY CI-CH: medium to high plasticity, brown mottled grey, trace ironstone gravel, w<PL, very stiff, residual			5.5			▼	
				S/E			4,7,11 N = 18	10-05-21	
77	6				5.95				6
	6.7	SILTSTONE: grey, very low to low strength, slightly weathered, Ashfield Shale							
76	7	7.0			7.0		25,-,- refusal bouncing		7
		Bore discontinued at 7.1m - limit of investigation		S	7.15				
75	8								8
74	9								9

RIG: Hanjin 8D drill rig **DRILLER:** Rockwell **LOGGED:** RB **CASING:** Uncased

TYPE OF BORING: Diacore to 0.23m, SFA to 7.0m

WATER OBSERVATIONS: Free groundwater observed whilst augering at 5.5m

REMARKS: Location coordinates are in MGA94 Zone 56. * Replicate sample BD2/100521 collected

SAMPLING & IN SITU TESTING LEGEND

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

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Geotechnics / Environment / Groundwater

Description and Classification Methods

The methods of description and classification of soils and rocks used in this report are generally based on Australian Standard AS1726:2017, Geotechnical Site Investigations. In general, the descriptions include strength or density, colour, structure, soil or rock type and inclusions.

Soil Types

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

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

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

Type	Particle size (mm)
Coarse gravel	19 - 63
Medium gravel	6.7 - 19
Fine gravel	2.36 – 6.7
Coarse sand	0.6 - 2.36
Medium sand	0.21 - 0.6
Fine sand	0.075 - 0.21

Definitions of grading terms used are:

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

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

In fine grained soils (>35% fines)

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

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

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

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

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

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

Soil Descriptions

Cohesive Soils

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

Description	Abbreviation	Undrained shear strength (kPa)
Very soft	VS	<12
Soft	S	12 - 25
Firm	F	25 - 50
Stiff	St	50 - 100
Very stiff	VSt	100 - 200
Hard	H	>200
Friable	Fr	-

Cohesionless Soils

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

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

Soil Origin

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

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

Moisture Condition – Coarse Grained Soils

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

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

Moisture Condition – Fine Grained Soils

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

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

Symbols & Abbreviations

Introduction

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

Drilling or Excavation Methods

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

Water

▷	Water seep
▽	Water level

Sampling and Testing

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

Description of Defects in Rock

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

Defect Type

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

Orientation

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

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

Coating or Infilling Term

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

Coating Descriptor

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

Shape

cu	curved
ir	irregular
pl	planar
st	stepped
un	undulating

Roughness

po	polished
ro	rough
sl	slickensided
sm	smooth
vr	very rough

Other

fg	fragmented
bnd	band
qtz	quartz

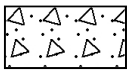
Symbols & Abbreviations

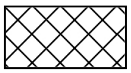
Graphic Symbols for Soil and Rock

General

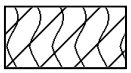

Asphalt

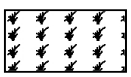

Road base

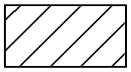

Concrete

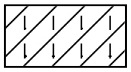

Filling

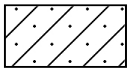
Soils


Topsoil

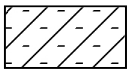

Peat

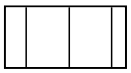

Clay

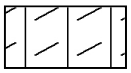

Silty clay

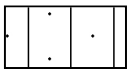

Sandy clay

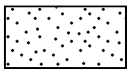

Gravelly clay

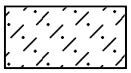

Shaly clay

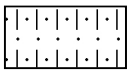

Silt


Clayey silt


Sandy silt

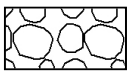

Sand

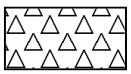

Clayey sand


Silty sand


Gravel

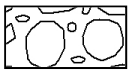

Sandy gravel


Cobbles, boulders

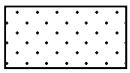

Talus

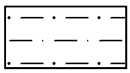
Sedimentary Rocks

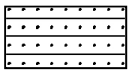

Boulder conglomerate

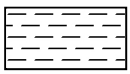

Conglomerate


Conglomeratic sandstone

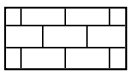

Sandstone


Siltstone

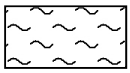

Laminite

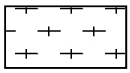

Mudstone, claystone, shale

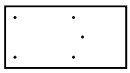

Coal


Limestone

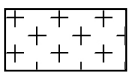
Metamorphic Rocks

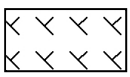

Slate, phyllite, schist

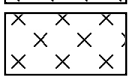

Gneiss

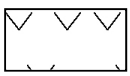

Quartzite

Igneous Rocks


Granite


Dolerite, basalt, andesite


Dacite, epidote


Tuff, breccia


Porphyry

Appendix H

Laboratory Analytical Reports

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CERTIFICATE OF ANALYSIS 268732

Client Details

Client	Douglas Partners Pty Ltd Smeaton Grange
Attention	Emily McGinty
Address	18 Waler Crescent, Smeaton Grange, NSW, 2567

Sample Details

Your Reference	**34275.27, Campbelltown Hospital**
Number of Samples	6 Soil
Date samples received	11/05/2021
Date completed instructions received	11/05/2021

Analysis Details

Please refer to the following pages for results, methodology summary and quality control data.

Samples were analysed as received from the client. Results relate specifically to the samples as received.

Results are reported on a dry weight basis for solids and on an as received basis for other matrices.

Please refer to the last page of this report for any comments relating to the results.

Report Details

Date results requested by	18/05/2021
Date of Issue	18/05/2021

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

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

Results Approved By
Diego Bigolin, Team Leader, Inorganics
Dragana Tomas, Senior Chemist
Loren Bardwell, Senior Chemist
Lucy Zhu, Asbestos Supervisor
Manju Dewendrage, Chemist
Steven Luong, Organics Supervisor

Authorised By

Nancy Zhang, Laboratory Manager

vTRH(C6-C10)/BTEXN in Soil						
Our Reference		268732-1	268732-2	268732-3	268732-4	268732-5
Your Reference	UNITS	201/1-1.45	203/0.5-0.95	205/0-0.1	207/1-1.45	208/2.5-2.95
Date Sampled		05/05/2021	05/05/2021	06/05/2021	06/05/2021	10/05/2021
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	-	12/05/2021	12/05/2021	12/05/2021	12/05/2021	12/05/2021
Date analysed	-	12/05/2021	12/05/2021	12/05/2021	12/05/2021	12/05/2021
TRH C_6 - C_9	mg/kg	<25	<25	<25	<25	<25
TRH C_6 - C_{10}	mg/kg	<25	<25	<25	<25	<25
vTPH C_6 - C_{10} less BTEX (F1)	mg/kg	<25	<25	<25	<25	<25
Benzene	mg/kg	<0.2	<0.2	<0.2	<0.2	<0.2
Toluene	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Ethylbenzene	mg/kg	<1	<1	<1	<1	<1
m+p-xylene	mg/kg	<2	<2	<2	<2	<2
o-Xylene	mg/kg	<1	<1	<1	<1	<1
naphthalene	mg/kg	<1	<1	<1	<1	<1
Total +ve Xylenes	mg/kg	<3	<3	<3	<3	<3
Surrogate aaa-Trifluorotoluene	%	107	106	105	100	111

vTRH(C6-C10)/BTEXN in Soil		
Our Reference		268732-6
Your Reference	UNITS	209/0.3-0.4
Date Sampled		11/05/2021
Type of sample		Soil
Date extracted	-	12/05/2021
Date analysed	-	12/05/2021
TRH C_6 - C_9	mg/kg	<25
TRH C_6 - C_{10}	mg/kg	<25
vTPH C_6 - C_{10} less BTEX (F1)	mg/kg	<25
Benzene	mg/kg	<0.2
Toluene	mg/kg	<0.5
Ethylbenzene	mg/kg	<1
m+p-xylene	mg/kg	<2
o-Xylene	mg/kg	<1
naphthalene	mg/kg	<1
Total +ve Xylenes	mg/kg	<3
Surrogate aaa-Trifluorotoluene	%	104

svTRH (C10-C40) in Soil						
Our Reference		268732-1	268732-2	268732-3	268732-4	268732-5
Your Reference	UNITS	201/1-1.45	203/0.5-0.95	205/0-0.1	207/1-1.45	208/2.5-2.95
Date Sampled		05/05/2021	05/05/2021	06/05/2021	06/05/2021	10/05/2021
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	-	12/05/2021	12/05/2021	12/05/2021	12/05/2021	12/05/2021
Date analysed	-	12/05/2021	12/05/2021	13/05/2021	13/05/2021	13/05/2021
TRH C_{10} - C_{14}	mg/kg	<50	<50	<50	<50	<50
TRH C_{15} - C_{28}	mg/kg	<100	<100	<100	<100	<100
TRH C_{29} - C_{36}	mg/kg	<100	<100	<100	<100	<100
TRH >C_{10} -C_{16}	mg/kg	<50	<50	<50	<50	<50
TRH >C_{10} - C_{16} less Naphthalene (F2)	mg/kg	<50	<50	<50	<50	<50
TRH >C_{16} -C_{34}	mg/kg	<100	<100	<100	<100	<100
TRH >C_{34} -C_{40}	mg/kg	<100	<100	<100	<100	<100
Total +ve TRH (>C10-C40)	mg/kg	<50	<50	<50	<50	<50
Surrogate o-Terphenyl	%	82	86	84	82	83

svTRH (C10-C40) in Soil		
Our Reference		268732-6
Your Reference	UNITS	209/0.3-0.4
Date Sampled		11/05/2021
Type of sample		Soil
Date extracted	-	12/05/2021
Date analysed	-	13/05/2021
TRH C_{10} - C_{14}	mg/kg	<50
TRH C_{15} - C_{28}	mg/kg	110
TRH C_{29} - C_{36}	mg/kg	230
TRH >C_{10} -C_{16}	mg/kg	<50
TRH >C_{10} - C_{16} less Naphthalene (F2)	mg/kg	<50
TRH >C_{16} -C_{34}	mg/kg	280
TRH >C_{34} -C_{40}	mg/kg	220
Total +ve TRH (>C10-C40)	mg/kg	490
Surrogate o-Terphenyl	%	83

PAHs in Soil						
Our Reference		268732-1	268732-2	268732-3	268732-4	268732-5
Your Reference	UNITS	201/1-1.45	203/0.5-0.95	205/0-0.1	207/1-1.45	208/2.5-2.95
Date Sampled		05/05/2021	05/05/2021	06/05/2021	06/05/2021	10/05/2021
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	-	12/05/2021	12/05/2021	12/05/2021	12/05/2021	12/05/2021
Date analysed	-	12/05/2021	12/05/2021	12/05/2021	12/05/2021	12/05/2021
Naphthalene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Acenaphthylene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Acenaphthene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Fluorene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Phenanthrene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Anthracene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Fluoranthene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Pyrene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Benzo(a)anthracene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Chrysene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Benzo(b,j+k)fluoranthene	mg/kg	<0.2	<0.2	<0.2	<0.2	<0.2
Benzo(a)pyrene	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.05
Indeno(1,2,3-c,d)pyrene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Dibenzo(a,h)anthracene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Benzo(g,h,i)perylene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Total +ve PAH's	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.05
Benzo(a)pyrene TEQ calc (zero)	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Benzo(a)pyrene TEQ calc(half)	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Benzo(a)pyrene TEQ calc(PQL)	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Surrogate p-Terphenyl-d14	%	109	111	112	115	113

PAHs in Soil		
Our Reference		268732-6
Your Reference	UNITS	209/0.3-0.4
Date Sampled		11/05/2021
Type of sample		Soil
Date extracted	-	12/05/2021
Date analysed	-	12/05/2021
Naphthalene	mg/kg	<0.1
Acenaphthylene	mg/kg	0.2
Acenaphthene	mg/kg	<0.1
Fluorene	mg/kg	<0.1
Phenanthrene	mg/kg	0.7
Anthracene	mg/kg	0.3
Fluoranthene	mg/kg	1.4
Pyrene	mg/kg	1.8
Benzo(a)anthracene	mg/kg	1.6
Chrysene	mg/kg	0.7
Benzo(b,j+k)fluoranthene	mg/kg	0.5
Benzo(a)pyrene	mg/kg	1.4
Indeno(1,2,3-c,d)pyrene	mg/kg	1.6
Dibenzo(a,h)anthracene	mg/kg	0.2
Benzo(g,h,i)perylene	mg/kg	1.3
Total +ve PAH's	mg/kg	12
Benzo(a)pyrene TEQ calc (zero)	mg/kg	2.1
Benzo(a)pyrene TEQ calc(half)	mg/kg	2.1
Benzo(a)pyrene TEQ calc(PQL)	mg/kg	2.1
Surrogate p-Terphenyl-d14	%	110

Organochlorine Pesticides in soil			
Our Reference		268732-3	268732-4
Your Reference	UNITS	205/0-0.1	207/1-1.45
Date Sampled		06/05/2021	06/05/2021
Type of sample		Soil	Soil
Date extracted	-	12/05/2021	12/05/2021
Date analysed	-	12/05/2021	12/05/2021
alpha-BHC	mg/kg	<0.1	<0.1
HCB	mg/kg	<0.1	<0.1
beta-BHC	mg/kg	<0.1	<0.1
gamma-BHC	mg/kg	<0.1	<0.1
Heptachlor	mg/kg	<0.1	<0.1
delta-BHC	mg/kg	<0.1	<0.1
Aldrin	mg/kg	<0.1	<0.1
Heptachlor Epoxide	mg/kg	<0.1	<0.1
gamma-Chlordane	mg/kg	<0.1	<0.1
alpha-chlordane	mg/kg	<0.1	<0.1
Endosulfan I	mg/kg	<0.1	<0.1
pp-DDE	mg/kg	<0.1	<0.1
Dieldrin	mg/kg	<0.1	<0.1
Endrin	mg/kg	<0.1	<0.1
Endosulfan II	mg/kg	<0.1	<0.1
pp-DDD	mg/kg	<0.1	<0.1
Endrin Aldehyde	mg/kg	<0.1	<0.1
pp-DDT	mg/kg	<0.1	<0.1
Endosulfan Sulphate	mg/kg	<0.1	<0.1
Methoxychlor	mg/kg	<0.1	<0.1
Total +ve DDT+DDD+DDE	mg/kg	<0.1	<0.1
Surrogate TCMX	%	86	87

Organophosphorus Pesticides in Soil			
Our Reference		268732-3	268732-4
Your Reference	UNITS	205/0-0.1	207/1-1.45
Date Sampled		06/05/2021	06/05/2021
Type of sample		Soil	Soil
Date extracted	-	12/05/2021	12/05/2021
Date analysed	-	12/05/2021	12/05/2021
Dichlorvos	mg/kg	<0.1	<0.1
Dimethoate	mg/kg	<0.1	<0.1
Diazinon	mg/kg	<0.1	<0.1
Chlorpyriphos-methyl	mg/kg	<0.1	<0.1
Ronnel	mg/kg	<0.1	<0.1
Fenitrothion	mg/kg	<0.1	<0.1
Malathion	mg/kg	<0.1	<0.1
Chlorpyriphos	mg/kg	<0.1	<0.1
Parathion	mg/kg	<0.1	<0.1
Bromophos-ethyl	mg/kg	<0.1	<0.1
Ethion	mg/kg	<0.1	<0.1
Azinphos-methyl (Guthion)	mg/kg	<0.1	<0.1
Surrogate TCMX	%	86	87

PCBs in Soil			
Our Reference		268732-3	268732-4
Your Reference	UNITS	205/0-0.1	207/1-1.45
Date Sampled		06/05/2021	06/05/2021
Type of sample		Soil	Soil
Date extracted	-	12/05/2021	12/05/2021
Date analysed	-	12/05/2021	12/05/2021
Aroclor 1016	mg/kg	<0.1	<0.1
Aroclor 1221	mg/kg	<0.1	<0.1
Aroclor 1232	mg/kg	<0.1	<0.1
Aroclor 1242	mg/kg	<0.1	<0.1
Aroclor 1248	mg/kg	<0.1	<0.1
Aroclor 1254	mg/kg	<0.1	<0.1
Aroclor 1260	mg/kg	<0.1	<0.1
Total +ve PCBs (1016-1260)	mg/kg	<0.1	<0.1
Surrogate TCMX	%	86	87

Acid Extractable metals in soil						
Our Reference		268732-1	268732-2	268732-3	268732-4	268732-5
Your Reference	UNITS	201/1-1.45	203/0.5-0.95	205/0-0.1	207/1-1.45	208/2.5-2.95
Date Sampled		05/05/2021	05/05/2021	06/05/2021	06/05/2021	10/05/2021
Type of sample		Soil	Soil	Soil	Soil	Soil
Date prepared	-	12/05/2021	12/05/2021	12/05/2021	12/05/2021	12/05/2021
Date analysed	-	12/05/2021	12/05/2021	12/05/2021	12/05/2021	12/05/2021
Arsenic	mg/kg	<4	<4	<4	4	<4
Cadmium	mg/kg	<0.4	<0.4	<0.4	<0.4	<0.4
Chromium	mg/kg	4	7	7	14	7
Copper	mg/kg	34	19	24	36	20
Lead	mg/kg	17	14	14	20	16
Mercury	mg/kg	<0.1	<0.1	0.1	<0.1	<0.1
Nickel	mg/kg	15	10	12	20	8
Zinc	mg/kg	59	39	44	86	32

Acid Extractable metals in soil		
Our Reference		268732-6
Your Reference	UNITS	209/0.3-0.4
Date Sampled		11/05/2021
Type of sample		Soil
Date prepared	-	12/05/2021
Date analysed	-	12/05/2021
Arsenic	mg/kg	<4
Cadmium	mg/kg	<0.4
Chromium	mg/kg	5
Copper	mg/kg	24
Lead	mg/kg	14
Mercury	mg/kg	<0.1
Nickel	mg/kg	4
Zinc	mg/kg	90

Misc Soil - Inorg					
Our Reference		268732-2	268732-3	268732-4	268732-5
Your Reference	UNITS	203/0.5-0.95	205/0-0.1	207/1-1.45	208/2.5-2.95
Date Sampled		05/05/2021	06/05/2021	06/05/2021	10/05/2021
Type of sample		Soil	Soil	Soil	Soil
Date prepared	-	12/05/2021	12/05/2021	12/05/2021	12/05/2021
Date analysed	-	12/05/2021	12/05/2021	12/05/2021	12/05/2021
Total Phenolics (as Phenol)	mg/kg	<5	<5	<5	<5

Moisture						
Our Reference		268732-1	268732-2	268732-3	268732-4	268732-5
Your Reference	UNITS	201/1-1.45	203/0.5-0.95	205/0-0.1	207/1-1.45	208/2.5-2.95
Date Sampled		05/05/2021	05/05/2021	06/05/2021	06/05/2021	10/05/2021
Type of sample		Soil	Soil	Soil	Soil	Soil
Date prepared	-	12/05/2021	12/05/2021	12/05/2021	12/05/2021	12/05/2021
Date analysed	-	13/05/2021	13/05/2021	13/05/2021	13/05/2021	13/05/2021
Moisture	%	9.0	13	17	15	12

Moisture		
Our Reference		268732-6
Your Reference	UNITS	209/0.3-0.4
Date Sampled		11/05/2021
Type of sample		Soil
Date prepared	-	12/05/2021
Date analysed	-	13/05/2021
Moisture	%	9.0

Asbestos ID - soils						
Our Reference		268732-1	268732-2	268732-3	268732-4	268732-5
Your Reference	UNITS	201/1-1.45	203/0.5-0.95	205/0-0.1	207/1-1.45	208/2.5-2.95
Date Sampled		05/05/2021	05/05/2021	06/05/2021	06/05/2021	10/05/2021
Type of sample		Soil	Soil	Soil	Soil	Soil
Date analysed	-	17/05/2021	17/05/2021	17/05/2021	17/05/2021	17/05/2021
Sample mass tested	g	Approx. 40g	Approx. 45g	Approx. 45g	Approx. 50g	Approx. 40g
Sample Description	-	Brown coarse-grained soil & rocks	Brown coarse-grained soil & rocks	Brown coarse-grained soil & rocks	Brown coarse-grained soil & rocks	Brown coarse-grained soil & rocks
Asbestos ID in soil	-	No asbestos detected at reporting limit of 0.1g/kg Organic fibres detected	No asbestos detected at reporting limit of 0.1g/kg Organic fibres detected	No asbestos detected at reporting limit of 0.1g/kg Organic fibres detected	No asbestos detected at reporting limit of 0.1g/kg Organic fibres detected	No asbestos detected at reporting limit of 0.1g/kg Organic fibres detected
Asbestos comments	-	NO	NO	NO	NO	NO
Trace Analysis	-	No asbestos detected	No asbestos detected	No asbestos detected	No asbestos detected	No asbestos detected

Asbestos ID - soils		
Our Reference		268732-6
Your Reference	UNITS	209/0.3-0.4
Date Sampled		11/05/2021
Type of sample		Soil
Date analysed	-	17/05/2021
Sample mass tested	g	Approx. 45g
Sample Description	-	Brown coarse-grained soil & rocks
Asbestos ID in soil	-	No asbestos detected at reporting limit of 0.1g/kg Organic fibres detected
Asbestos comments	-	NO
Trace Analysis	-	No asbestos detected

Method ID	Methodology Summary
ASB-001	Asbestos ID - Qualitative identification of asbestos in bulk samples using Polarised Light Microscopy and Dispersion Staining Techniques including Synthetic Mineral Fibre and Organic Fibre as per Australian Standard 4964-2004.
Inorg-008	Moisture content determined by heating at 105+/-5 °C for a minimum of 12 hours.
Inorg-031	Total Phenolics by segmented flow analyser (in line distillation with colourimetric finish). Solids are extracted in a caustic media prior to analysis.
Metals-020	Determination of various metals by ICP-AES.
Metals-021	Determination of Mercury by Cold Vapour AAS.
Org-020	Soil samples are extracted with Dichloromethane/Acetone and waters with Dichloromethane and analysed by GC-FID. F2 = (>C10-C16)-Naphthalene as per NEPM B1 Guideline on Investigation Levels for Soil and Groundwater (HSLs Tables 1A (3, 4)). Note Naphthalene is determined from the VOC analysis.
Org-020	Soil samples are extracted with Dichloromethane/Acetone and waters with Dichloromethane and analysed by GC-FID. F2 = (>C10-C16)-Naphthalene as per NEPM B1 Guideline on Investigation Levels for Soil and Groundwater (HSLs Tables 1A (3, 4)). Note Naphthalene is determined from the VOC analysis. Note, the Total +ve TRH PQL is reflective of the lowest individual PQL and is therefore "Total +ve TRH" is simply a sum of the positive individual TRH fractions (>C10-C40).
Org-021	Soil samples are extracted with dichloromethane/acetone and waters with dichloromethane and analysed by GC-ECD.
Org-021	Soil samples are extracted with dichloromethane/acetone and waters with dichloromethane and analysed by GC-ECD. Note, the Total +ve PCBs PQL is reflective of the lowest individual PQL and is therefore" Total +ve PCBs" is simply a sum of the positive individual PCBs.
Org-022	Determination of VOCs sampled onto coconut shell charcoal sorbent tubes, that can be desorbed using carbon disulphide, and analysed by GC-MS.
Org-022/025	Soil samples are extracted with Dichloromethane/Acetone and waters with Dichloromethane and analysed by GC-MS/GC-MSMS.
Org-022/025	Soil samples are extracted with dichloromethane/acetone and waters with dichloromethane and analysed by GC-MS/GC-MSMS. Note, the Total +ve reported DDD+DDE+DDT PQL is reflective of the lowest individual PQL and is therefore simply a sum of the positive individually report DDD+DDE+DDT.

Method ID	Methodology Summary
Org-022/025	Soil samples are extracted with Dichloromethane/Acetone and waters with Dichloromethane and analysed by GC-MS and/or GC-MS/MS. Benzo(a)pyrene TEQ as per NEPM B1 Guideline on Investigation Levels for Soil and Groundwater - 2013. For soil results:- 1. 'EQ PQL'values are assuming all contributing PAHs reported as <PQL are actually at the PQL. This is the most conservative approach and can give false positive TEQs given that PAHs that contribute to the TEQ calculation may not be present. 2. 'EQ zero'values are assuming all contributing PAHs reported as <PQL are zero. This is the least conservative approach and is more susceptible to false negative TEQs when PAHs that contribute to the TEQ calculation are present but below PQL. 3. 'EQ half PQL'values are assuming all contributing PAHs reported as <PQL are half the stipulated PQL. Hence a mid-point between the most and least conservative approaches above. Note, the Total +ve PAHs PQL is reflective of the lowest individual PQL and is therefore "Total +ve PAHs" is simply a sum of the positive individual PAHs.
Org-023	Soil samples are extracted with methanol and spiked into water prior to analysing by purge and trap GC-MS.
Org-023	Soil samples are extracted with methanol and spiked into water prior to analysing by purge and trap GC-MS. Water samples are analysed directly by purge and trap GC-MS. F1 = (C6-C10)-BTEX as per NEPM B1 Guideline on Investigation Levels for Soil and Groundwater.
Org-023	Soil samples are extracted with methanol and spiked into water prior to analysing by purge and trap GC-MS. Water samples are analysed directly by purge and trap GC-MS. F1 = (C6-C10)-BTEX as per NEPM B1 Guideline on Investigation Levels for Soil and Groundwater. Note, the Total +ve Xylene PQL is reflective of the lowest individual PQL and is therefore "Total +ve Xylenes" is simply a sum of the positive individual Xylenes.

QUALITY CONTROL: vTRH(C6-C10)/BTEXN in Soil						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-4	268732-4
Date extracted	-			12/05/2021	3	12/05/2021	12/05/2021		12/05/2021	12/05/2021
Date analysed	-			12/05/2021	3	12/05/2021	12/05/2021		12/05/2021	12/05/2021
TRH C_6 - C_9	mg/kg	25	Org-023	<25	3	<25	<25	0	114	116
TRH C_6 - C_{10}	mg/kg	25	Org-023	<25	3	<25	<25	0	114	116
Benzene	mg/kg	0.2	Org-023	<0.2	3	<0.2	<0.2	0	106	112
Toluene	mg/kg	0.5	Org-023	<0.5	3	<0.5	<0.5	0	118	120
Ethylbenzene	mg/kg	1	Org-023	<1	3	<1	<1	0	118	120
m+p-xylene	mg/kg	2	Org-023	<2	3	<2	<2	0	114	115
o-Xylene	mg/kg	1	Org-023	<1	3	<1	<1	0	115	116
naphthalene	mg/kg	1	Org-023	<1	3	<1	<1	0	[NT]	[NT]
Surrogate aaa-Trifluorotoluene	%		Org-023	115	3	105	105	0	93	109

QUALITY CONTROL: svTRH (C10-C40) in Soil						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-4	268732-4
Date extracted	-			12/05/2021	3	12/05/2021	12/05/2021		12/05/2021	12/05/2021
Date analysed	-			12/05/2021	3	13/05/2021	13/05/2021		12/05/2021	13/05/2021
TRH C_{10} - C_{14}	mg/kg	50	Org-020	<50	3	<50	<50	0	114	122
TRH C_{15} - C_{28}	mg/kg	100	Org-020	<100	3	<100	<100	0	77	84
TRH C_{29} - C_{36}	mg/kg	100	Org-020	<100	3	<100	<100	0	92	76
TRH >C_{10} -C_{16}	mg/kg	50	Org-020	<50	3	<50	<50	0	114	122
TRH >C_{16} -C_{34}	mg/kg	100	Org-020	<100	3	<100	<100	0	77	84
TRH >C_{34} -C_{40}	mg/kg	100	Org-020	<100	3	<100	<100	0	92	76
Surrogate o-Terphenyl	%		Org-020	83	3	84	86	2	117	82

QUALITY CONTROL: PAHs in Soil						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-4	268732-4
Date extracted	-			12/05/2021	3	12/05/2021	12/05/2021		12/05/2021	12/05/2021
Date analysed	-			12/05/2021	3	12/05/2021	12/05/2021		12/05/2021	12/05/2021
Naphthalene	mg/kg	0.1	Org-022/025	<0.1	3	<0.1	<0.1	0	88	86
Acenaphthylene	mg/kg	0.1	Org-022/025	<0.1	3	<0.1	<0.1	0	[NT]	[NT]
Acenaphthene	mg/kg	0.1	Org-022/025	<0.1	3	<0.1	<0.1	0	76	74
Fluorene	mg/kg	0.1	Org-022/025	<0.1	3	<0.1	<0.1	0	84	82
Phenanthrene	mg/kg	0.1	Org-022/025	<0.1	3	<0.1	<0.1	0	103	95
Anthracene	mg/kg	0.1	Org-022/025	<0.1	3	<0.1	<0.1	0	[NT]	[NT]
Fluoranthene	mg/kg	0.1	Org-022/025	<0.1	3	<0.1	<0.1	0	86	79
Pyrene	mg/kg	0.1	Org-022/025	<0.1	3	<0.1	<0.1	0	89	84
Benzo(a)anthracene	mg/kg	0.1	Org-022/025	<0.1	3	<0.1	<0.1	0	[NT]	[NT]
Chrysene	mg/kg	0.1	Org-022/025	<0.1	3	<0.1	<0.1	0	90	80
Benzo(b,j+k)fluoranthene	mg/kg	0.2	Org-022/025	<0.2	3	<0.2	<0.2	0	[NT]	[NT]
Benzo(a)pyrene	mg/kg	0.05	Org-022/025	<0.05	3	<0.05	<0.05	0	112	105
Indeno(1,2,3-c,d)pyrene	mg/kg	0.1	Org-022/025	<0.1	3	<0.1	<0.1	0	[NT]	[NT]
Dibenzo(a,h)anthracene	mg/kg	0.1	Org-022/025	<0.1	3	<0.1	<0.1	0	[NT]	[NT]
Benzo(g,h,i)perylene	mg/kg	0.1	Org-022/025	<0.1	3	<0.1	<0.1	0	[NT]	[NT]
Surrogate p-Terphenyl-d14	%		Org-022/025	116	3	112	111	1	105	107

QUALITY CONTROL: Organochlorine Pesticides in soil						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-4	268732-4
Date extracted	-			12/05/2021	3	12/05/2021	12/05/2021		12/05/2021	12/05/2021
Date analysed	-			12/05/2021	3	12/05/2021	12/05/2021		12/05/2021	12/05/2021
alpha-BHC	mg/kg	0.1	Org-022/025	<0.1	3	<0.1	<0.1	0	92	89
HCB	mg/kg	0.1	Org-022/025	<0.1	3	<0.1	<0.1	0	[NT]	[NT]
beta-BHC	mg/kg	0.1	Org-022/025	<0.1	3	<0.1	<0.1	0	85	85
gamma-BHC	mg/kg	0.1	Org-022/025	<0.1	3	<0.1	<0.1	0	[NT]	[NT]
Heptachlor	mg/kg	0.1	Org-022/025	<0.1	3	<0.1	<0.1	0	127	123
delta-BHC	mg/kg	0.1	Org-022/025	<0.1	3	<0.1	<0.1	0	[NT]	[NT]
Aldrin	mg/kg	0.1	Org-022/025	<0.1	3	<0.1	<0.1	0	105	97
Heptachlor Epoxide	mg/kg	0.1	Org-022/025	<0.1	3	<0.1	<0.1	0	103	97
gamma-Chlordane	mg/kg	0.1	Org-022/025	<0.1	3	<0.1	<0.1	0	[NT]	[NT]
alpha-chlordane	mg/kg	0.1	Org-022/025	<0.1	3	<0.1	<0.1	0	[NT]	[NT]
Endosulfan I	mg/kg	0.1	Org-022/025	<0.1	3	<0.1	<0.1	0	[NT]	[NT]
pp-DDE	mg/kg	0.1	Org-022/025	<0.1	3	<0.1	<0.1	0	97	96
Dieldrin	mg/kg	0.1	Org-022/025	<0.1	3	<0.1	<0.1	0	103	95
Endrin	mg/kg	0.1	Org-022/025	<0.1	3	<0.1	<0.1	0	125	120
Endosulfan II	mg/kg	0.1	Org-022/025	<0.1	3	<0.1	<0.1	0	[NT]	[NT]
pp-DDD	mg/kg	0.1	Org-022/025	<0.1	3	<0.1	<0.1	0	83	85
Endrin Aldehyde	mg/kg	0.1	Org-022/025	<0.1	3	<0.1	<0.1	0	[NT]	[NT]
pp-DDT	mg/kg	0.1	Org-022/025	<0.1	3	<0.1	<0.1	0	[NT]	[NT]
Endosulfan Sulphate	mg/kg	0.1	Org-022/025	<0.1	3	<0.1	<0.1	0	128	128
Methoxychlor	mg/kg	0.1	Org-022/025	<0.1	3	<0.1	<0.1	0	[NT]	[NT]
Surrogate TCMX	%		Org-022/025	95	3	86	87	1	88	85

QUALITY CONTROL: Organophosphorus Pesticides in Soil						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-4	268732-4
Date extracted	-			12/05/2021	3	12/05/2021	12/05/2021		12/05/2021	12/05/2021
Date analysed	-			12/05/2021	3	12/05/2021	12/05/2021		12/05/2021	12/05/2021
Dichlorvos	mg/kg	0.1	Org-022/025	<0.1	3	<0.1	<0.1	0	84	82
Dimethoate	mg/kg	0.1	Org-022/025	<0.1	3	<0.1	<0.1	0	[NT]	[NT]
Diazinon	mg/kg	0.1	Org-022/025	<0.1	3	<0.1	<0.1	0	[NT]	[NT]
Chlorpyriphos-methyl	mg/kg	0.1	Org-022/025	<0.1	3	<0.1	<0.1	0	[NT]	[NT]
Ronnel	mg/kg	0.1	Org-022/025	<0.1	3	<0.1	<0.1	0	89	91
Fenitrothion	mg/kg	0.1	Org-022/025	<0.1	3	<0.1	<0.1	0	91	89
Malathion	mg/kg	0.1	Org-022/025	<0.1	3	<0.1	<0.1	0	118	116
Chlorpyriphos	mg/kg	0.1	Org-022/025	<0.1	3	<0.1	<0.1	0	95	95
Parathion	mg/kg	0.1	Org-022/025	<0.1	3	<0.1	<0.1	0	98	108
Bromophos-ethyl	mg/kg	0.1	Org-022	<0.1	3	<0.1	<0.1	0	[NT]	[NT]
Ethion	mg/kg	0.1	Org-022/025	<0.1	3	<0.1	<0.1	0	109	113
Azinphos-methyl (Guthion)	mg/kg	0.1	Org-022/025	<0.1	3	<0.1	<0.1	0	[NT]	[NT]
Surrogate TCMX	%		Org-022/025	95	3	86	87	1	88	85

QUALITY CONTROL: PCBs in Soil						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-4	268732-4
Date extracted	-			12/05/2021	3	12/05/2021	12/05/2021		12/05/2021	12/05/2021
Date analysed	-			12/05/2021	3	12/05/2021	12/05/2021		12/05/2021	12/05/2021
Aroclor 1016	mg/kg	0.1	Org-021	<0.1	3	<0.1	<0.1	0	[NT]	[NT]
Aroclor 1221	mg/kg	0.1	Org-021	<0.1	3	<0.1	<0.1	0	[NT]	[NT]
Aroclor 1232	mg/kg	0.1	Org-021	<0.1	3	<0.1	<0.1	0	[NT]	[NT]
Aroclor 1242	mg/kg	0.1	Org-021	<0.1	3	<0.1	<0.1	0	[NT]	[NT]
Aroclor 1248	mg/kg	0.1	Org-021	<0.1	3	<0.1	<0.1	0	[NT]	[NT]
Aroclor 1254	mg/kg	0.1	Org-021	<0.1	3	<0.1	<0.1	0	100	100
Aroclor 1260	mg/kg	0.1	Org-021	<0.1	3	<0.1	<0.1	0	[NT]	[NT]
Surrogate TCMX	%		Org-021	95	3	86	87	1	88	85

QUALITY CONTROL: Acid Extractable metals in soil						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-4	268732-4
Date prepared	-			12/05/2021	3	12/05/2021	12/05/2021		12/05/2021	12/05/2021
Date analysed	-			12/05/2021	3	12/05/2021	12/05/2021		12/05/2021	12/05/2021
Arsenic	mg/kg	4	Metals-020	<4	3	<4	<4	0	90	76
Cadmium	mg/kg	0.4	Metals-020	<0.4	3	<0.4	<0.4	0	86	78
Chromium	mg/kg	1	Metals-020	<1	3	7	6	15	89	#
Copper	mg/kg	1	Metals-020	<1	3	24	22	9	87	90
Lead	mg/kg	1	Metals-020	<1	3	14	12	15	87	#
Mercury	mg/kg	0.1	Metals-021	<0.1	3	0.1	<0.1	0	91	109
Nickel	mg/kg	1	Metals-020	<1	3	12	11	9	86	#
Zinc	mg/kg	1	Metals-020	<1	3	44	39	12	95	#

QUALITY CONTROL: Misc Soil - Inorg					Duplicate				Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-4	268732-4
Date prepared	-			12/05/2021	[NT]	[NT]	[NT]	[NT]	12/05/2021	12/05/2021
Date analysed	-			12/05/2021	[NT]	[NT]	[NT]	[NT]	12/05/2021	12/05/2021
Total Phenolics (as Phenol)	mg/kg	5	Inorg-031	<5	[NT]	[NT]	[NT]	[NT]	100	100

Result Definitions

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

Quality Control Definitions

Blank	This is the component of the analytical signal which is not derived from the sample but from reagents, glassware etc, can be determined by processing solvents and reagents in exactly the same manner as for samples.
Duplicate	This is the complete duplicate analysis of a sample from the process batch. If possible, the sample selected should be one where the analyte concentration is easily measurable.
Matrix Spike	A portion of the sample is spiked with a known concentration of target analyte. The purpose of the matrix spike is to monitor the performance of the analytical method used and to determine whether matrix interferences exist.
LCS (Laboratory Control Sample)	This comprises either a standard reference material or a control matrix (such as a blank sand or water) fortified with analytes representative of the analyte class. It is simply a check sample.
Surrogate Spike	Surrogates are known additions to each sample, blank, matrix spike and LCS in a batch, of compounds which are similar to the analyte of interest, however are not expected to be found in real samples.

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

The recommended maximums for analytes in urine are taken from “2018 TLVs and BEIs”, as published by ACGIH (where available). Limit provided for Nickel is a precautionary guideline as per Position Paper prepared by AIOH Exposure Standards Committee, 2016.

Guideline limits for Rinse Water Quality reported as per analytical requirements and specifications of AS 4187, Amdt 2 2019, Table 7.2

Laboratory Acceptance Criteria

Duplicate sample and matrix spike recoveries may not be reported on smaller jobs, however, were analysed at a frequency to meet or exceed NEPM requirements. All samples are tested in batches of 20. The duplicate sample RPD and matrix spike recoveries for the batch were within the laboratory acceptance criteria.

Filters, swabs, wipes, tubes and badges will not have duplicate data as the whole sample is generally extracted during sample extraction.

Spikes for Physical and Aggregate Tests are not applicable.

For VOCs in water samples, three vials are required for duplicate or spike analysis.

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

Matrix Spikes, LCS and Surrogate recoveries: Generally 70-130% for inorganics/metals (not SPOCAS); 60-140% for organics/SPOCAS (+/-50% surrogates) and 10-140% for labile SVOCs (including labile surrogates), ultra trace organics and speciated phenols is acceptable.

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

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

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

Measurement Uncertainty estimates are available for most tests upon request.

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

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

Report Comments

8 metals in soil - # Percent recovery is not possible to report due to the inhomogeneous nature of the element/s in the sample/s. However an acceptable recovery was obtained for the LCS.

Asbestos: A portion of the supplied sample was sub-sampled for asbestos analysis according to Envirolab procedures.
We cannot guarantee that this sub-sample is indicative of the entire sample. Envirolab recommends supplying 40-50g of sample in its own container.
Note: Samples 268732-1 to 5 were sub-sampled from bags provided by the client.

Asbestos: A portion of the supplied sample was sub-sampled for asbestos analysis according to Envirolab procedures.
We cannot guarantee that this sub-sample is indicative of the entire sample. Envirolab recommends supplying 40-50g of sample in its own container.
Note: Sample 268732-6 was sub-sampled from a jar provided by the client.

Douglas Partners
Geotechnics | Environment | Groundwater

CHAIN OF CUSTODY

Project Name:	Campbelltown Hospital			**To:**	Envirolab Services
Project No:	34275.27	**Sampler:**	Emily Eden		12 Ashley Street, Chatswood NSW 2067
Project Mgr:	EMG	**Mob. Phone:**	0418651227	**Attn:**	Nancy Zhang
Email:	emily.mcginty@douglaspartners.com.au			**Phone:**	(02) 9910 6200 **Fax:** (02) 9910 6201
Date Required:	standard turnaround			**Email:**	nzhangs@envirolabservices.com.au

Sample ID	Lab ID	Date Sampled	Sample Type (S - soil, W - water)	Container Type (G - glass, P - plastic)	Analytes: Combo 3a	Combo 8a	Combo 4a							Notes/preservation
201 / 1 - 1.45		05/05/21	S	G / P	x									268732
203 / 0.5 - 0.95		05/05/21	S	G / P			x							
205 / 0 - 0.1		06/05/21	S	G / P		x								
207 / 1 - 1.45		06/05/21	S	G / P		x								17/5/21
208 / 2.5 - 2.95		10/05/21	S	G / P			x							
209 / 0.3 - 0.4		11/05/21	S	G	x									ice pack

Lab Report No:					
Send Results to:	Douglas Partners Pty Ltd	**Address** 18 Waler Crescent Smeaton Grange 2567		**Phone:** (02) 4647 0075	**Fax:** (02) 4646 1886
Relinquished by:	EMG		**Transported to laboratory by:**		
Signed:		**Date & Time:** 7/08/2018	**Received by:**		

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

SAMPLE RECEIPT ADVICE

Client Details

Client	Douglas Partners Pty Ltd Smeaton Grange
Attention	Emily McGinty

Sample Login Details

Your reference	34275.27, Campbelltown Hospital
Envirolab Reference	268732
Date Sample Received	11/05/2021
Date Instructions Received	11/05/2021
Date Results Expected to be Reported	18/05/2021

Sample Condition

Samples received in appropriate condition for analysis	Yes
No. of Samples Provided	6 Soil
Turnaround Time Requested	Standard
Temperature on Receipt (°C)	12
Cooling Method	Ice Pack
Sampling Date Provided	YES

Comments

Nil

Please direct any queries to:

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

Analysis Underway, details on the following page:

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

Sample ID	vTRH(C6-C10)/BTEXN in Soil	svTRH (C10-C40) in Soil	PAHs in Soil	Organochlorine Pesticides in soil	Organophosphorus Pesticides in Soil	PCBsin Soil	Acid Extractable metalsin soil	Misc Soil - Inorg	Asbestos ID - soils
201/1-1.45	✓	✓	✓				✓		✓
203/0.5-0.95	✓	✓	✓				✓	✓	✓
205/0-0.1	✓	✓	✓	✓	✓	✓	✓	✓	✓
207/1-1.45	✓	✓	✓	✓	✓	✓	✓	✓	✓
208/2.5-2.95	✓	✓	✓				✓	✓	✓
209/0.3-0.4	✓	✓	✓				✓		✓

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

Additional Info

Sample storage - Waters are routinely disposed of approximately 1 month and soils approximately 2 months from receipt.
Requests for longer term sample storage must be received in writing.
Please contact the laboratory immediately if observed settled sediment present in water samples is to be included in the extraction and/or analysis (exceptions include certain Physical Tests (pH/EC/BOD/COD/Apparent Colour etc.), Solids testing, Total Recoverable metals and PFAS analysis where solids are included by default.
TAT for Micro is dependent on incubation. This varies from 3 to 6 days.

Appendix I

QAQC

Appendix I
QAQC
Campbelltown Hospital, Campbelltown, NSW

I1.0 Field and Laboratory Data Quality Assurance and Quality Control

The field and laboratory data quality assurance and quality control (QA/QC) procedures and results are summarised in the following Table 1. Reference should be made to the field work methodology and the laboratory results / certificates of analysis for further details.

Table 1: Field and Laboratory Quality Control

Item	Evaluation / Acceptance Criteria	Compliance
Analytical laboratories used	NATA accreditation	C
Holding times	Various based on type of analysis	C
Inter-laboratory replicates	5% of primary samples; <30% RPD	NC
Trip Spikes	1 per sampling event; 60-140% recovery	NC
Trip Blanks	1 per sampling event; <PQL	NC
Rinsates	1 per sampling event; <PQL	NC
Laboratory / Reagent Blanks	1 per batch; <PQL	C
Matrix Spikes	1 per lab batch; 70-130% recovery (inorganics); 60-140% recovery (organics)	C
Surrogate Spikes	All organics analysis; 70-130% recovery (inorganics); 60-140% recovery (organics)	C
Control Samples	1 per lab batch; 70-130% recovery (inorganics); 60-140% recovery (organics)	C
Standard Operating Procedures (SOP)	Adopting SOP for all aspects of the sampling field work	C

Notes:
C = compliance; PC = partial compliance; NC = non-compliance

No field QA samples were collected and therefore no analysis was undertaken. As the soil analytical results were all below the adopted SAC, and exhibited fairly similar chemistries, the absence of this component of the QA assessment is not considered to significantly inhibit on the purpose of this investigation.

In regard to the laboratory RPD and acceptance limits, they were all within the acceptable range

In summary, the dataset is determined to be of sufficient quality to be considered acceptable for the assessment.

I2.0 Data Quality Indicators

The reliability of field procedures and analytical results was assessed against the following data quality indicators (DQIs) as outlined in NEPC *National Environment Protection (Assessment of Site Contamination) Measure 1999 (as amended 2013) [NEPM]* (NEPC, 2013):

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

Table 2: Data Quality Indicators

Data Quality Indicator	Method(s) of Achievement
Completeness	Systematic and selected target locations sampled.
	Preparation of borehole logs, sample location plan and chain of custody records.
	Laboratory sample receipt information received confirming receipt of samples intact and appropriateness of the chain of custody.
	Samples analysed for contaminants of potential concern (COPC) identified in the Conceptual Site Model (CSM).
	Completion of chain of custody (COC) documentation.
	NATA accredited laboratory results certificates provided by the laboratory.
	Satisfactory frequency and results for laboratory quality control (QC) samples as discussed in Section 1. The absence of field QC samples has been discussed in Section 1.
Comparability	Using appropriate techniques for sample recovery, storage and transportation, which were the same for the duration of the project.
	Experienced sampler(s) used.
	Use of NATA registered laboratories, with test methods the same or similar between laboratories.
	Satisfactory results for laboratory QC samples.

Data Quality Indicator	Method(s) of Achievement
Representativeness	Target media sampled.
	Sample numbers recovered and analysed are considered to be representative of the target media and complying with DQOs.
	Samples were extracted and analysed within holding times.
	Samples were analysed in accordance with the COC.
Precision	Field staff generally followed standard operating procedures.
	Satisfactory results for all laboratory QC samples.
Accuracy	Field staff generally followed standard operating procedures.
	Satisfactory results for all field and laboratory QC samples.

Based on the above, it is considered that the DQIs have been generally complied with.

I3.0 Conclusion

Based on the results of the field QA and field and laboratory QC, and evaluation against the DQIs it is concluded that the field and laboratory test data obtained are reliable and useable for this assessment.