Douglas PARTNERS

GROUNDED EXPERTISE

Remediation Action Plan

Proposed Mixed Use Development

79-81 Queens Road & 2-8 Spencer Street, Five Dock NSW

Prepared for DPG Project 37 Pty Ltd

Project 224583.03

19 February 2026

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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.

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FS604853

Douglas Partners acknowledges Australia's First Peoples as the Traditional Owners of the Land and Sea on which we operate. We pay our respects to Elders past and present and to all Aboriginal and Torres Strait Islander peoples across the many communities in which we live, visit and work. We recognise and respect their ongoing cultural and spiritual connection to Country.

Executive Summary

Douglas Partners Pty Ltd (Douglas) has prepared this remediation action plan (RAP) for a proposed mixed-use development at 79-81 Queens Road & 2-8 Spencer Street, Five Dock NSW. The proposed development involves the construction of multistorey mixed used commercial and residential development with up to four levels of basement parking.

The remediation objectives, devised in accordance with CRC (2019a), are to:

- Address potentially unacceptable risks from contamination perspective; and
- Render the site suitable, from a contamination perspective, for the proposed development.

A data gap investigation is recommended following demolition to better define the extent of remediation required and provide a final waste classification. This RAP presents the procedures and plans which provide the means by which site remediation can be achieved. The extent of remediation comprises:

- Validation of the following areas:
  - An inground sump pit near BH109 upon its removal; and
  - The footprints of the chemical stores and oil water separator (upon the removal of the concrete slab).
- Remediation Area 1: Asbestos contaminated soil at BH102, BH103 and BH104 and surrounding area; and
- Contingency Plan: It is considered that, based on the site history, that there is a moderate risk or unidentified UPSS. Therefore, a contingency plan is provided for the validation of UPSS finds.

It is considered that the site can be made suitable for the proposed mixed use residential and commercial land use development subject to implementation of this RAP.

On completion of remediation works, if residual contaminated soils are retained (outside of the proposed basement footprint) a long-term environmental management plan (EMP) may be required to be prepared in accordance with NSW EPA guidelines to outline management procedures for future works to maintain the integrity of the cap. The obligations within the EMP must be legally enforceable.

It should be noted that this RAP does not form a detailed specification for the proposed site remediation works, but rather represents a planning document which outlines the means by which site remediation can be achieved.

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Remediation Action Plan
Proposed Mixed Use Development
79-81 Queens Road & 2-8 Spencer Street, Five Dock NSW

1. Introduction

Douglas Partners Pty Ltd (Douglas) has prepared this remediation action plan (RAP) for a proposed mixed use development at 79-81 Queens Road & 2-8 Spencer Street, Five Dock NSW. The RAP was commissioned by Alexander Lekovski of DPG Project 37 Pty Ltd and was undertaken in accordance with Douglas' proposal 224583.02.P.003.Rev0 dated 16 May 2025.

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) [NEPM] (NEPC, 2013);
- NSW EPA *Guidelines for Consultants Reporting on Contaminated Land* (NSW EPA, 2020); and
- CRC CARE *Remediation Action Plan: Development - Guideline on Establishing Remediation Objectives* (CRC CARE, 2019a).

The remediation objectives, devised in accordance with CRC (2019a), are to:

- Address potentially unacceptable risks to relevant environmental values from contamination; and
- Render the site suitable, from a contamination perspective, for the proposed development.

It is understood that the report will be used to support a Stage Significant Development (SSD-78287462) Application. Specifically, this report has been prepared to response to the SEARs requirements issued below.

Table 1: Planning Secretary's Environmental Assessment Requirements

Secretary's Environmental Assessment Requirements	Response
In accordance with Chapter 4 of the State Environmental Planning Policy (Resilience and Hazards) 2021, assess and quantify any soil and groundwater contamination and demonstrate that the site is suitable (or will be suitable, after remediation) for the development. Supporting Documentation Required: • Preliminary Site Investigation Report	The Detailed Site Investigation report has been reported separately (reference: 224583.02. R.001.Rev2) and reviewed in Section6.3 of this report. This Remediation Action Plan report in its entirely. The need of Preliminary Long-term Environmental Management Plan is to be decided as discussed in Section 18 of this report.

Secretary's Environmental Assessment Requirements	Response
If required, provide: • Detailed Site Investigation • Remediation Action Plan • Preliminary Long-term Environmental Management Plan	

This RAP presents the procedures and plans which provide the means by which site remediation objectives can be achieved. The Remediation Contractor must base their detailed work methodologies around the requirements of this RAP.

It should be noted that this RAP does not form a detailed specification for the proposed site remediation works, but rather represents a planning document which outlines the means by which site remediation can be achieved.

The site layout is shown on Drawing 1, Appendix A. The proposed development involves the construction of multistorey mixed used commercial and residential development with up to five levels of basement parking.

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

2. Proposed development

It is understood that the proposed development comprises the following:

- Site preparation works, including demolition and excavation;
- Construction of 2 x shop top housing buildings, including a 5-storey building along Queens Road, and a 26-storey building along William Street, comprising a shared single storey non-residential podium, with 134 dwellings above;
- Construction of a shared basement carpark accessed from Spencer Street;
- Public domain and landscaping upgrades, including landscaped street setbacks to all boundaries, and the provision of part of a shared through site link connecting Queens Road to Spencer Street; and
- Associated infrastructure upgrades and diversions.

3. Scope of work

The scope of work to achieve the objective is as follows:

- Summarise the findings of previous investigations used to inform the status of contamination and contamination risk at the site;

- Present a conceptual site model (CSM) to list potential and likely contamination source, pathway and receptor linkages to address potentially unacceptable risks to human health and relevant environmental values from contamination;
- Define the anticipated extent of remediation;
- Assess potentially suitable remediation options to render the site suitable for its proposed use, and which will minimise potentially unacceptable risk to human health and/or the environment and which includes the consideration of the principles of ecologically sustainable development;
- Discuss options with the client to confirm the remediation approach to management and/or remediation to render the site suitable, from a contamination perspective, for the proposed development;
- Establish the remediation acceptance criteria (RAC) to be adopted for validation of remediation;
- Identify how successful implementation of the RAP will be demonstrated / validated;
- Outline waste classification, handling and tracking requirements;
- Outline environmental safeguards required to complete the remediation works;
- Include contingency plans and an unexpected finds protocol; and
- Identify the need for, and nature of, any long-term management and/or monitoring following the completion of management / remediation and, if required, provide an outline of an environmental management plan.

4. Site description

Site address	79-81 Queens Road Five Dock NSW; and 2-8 Spencer Street, Five Dock NSW.
Legal description	Lot 17, and Lot 20- 22 of Deposited Plan (DP) 1117; Lot 18 of DP 651570; and Lot 1 of DP 540151.
Area	3,200 m^2
Zoning	Majority of the site is mapped as MU1- Mixed use; and The eastern boundary of the site is mapped as RE1 - Public Recreation.
Local Council Area	City of Canada Bay Council
Current use	At the time of reporting the site was occupied by light industrial facilities including and second-hand car dealership, vehicle workshops (auto mechanic) and warehouses across most of the site, with on-grade pavements elsewhere.

Surrounding uses	North – Queens Road, followed by Five Dock Leisure Centre and Charles Heath Reserve East – William Street followed by industrial properties South – Spencer Street, followed by industrial properties including car mechanics West – Industrial properties including car mechanic and micro-brewery

The site boundary is shown on Figure 1.

Figure 1. Site boundary (red outline, refer to Drawing 1 for full legend)

5. Environmental setting

Regional topography	The regional topography falls generally to north towards Parramatta River which is located approximately 500 m north of the site. The site is located in the valley floor with the surrounding land rising to the east, south and west. Based on the supplied detailed survey plans prepared by C&A Surveyors NSW Pty Ltd (Ref: 30163-23 DET, Rev1, dated 24 August 2023), ground surface levels across the site range between RL 1.9 m Australian Height Datum (AHD) and RL 2.3 m AHD.

Soil landscape	Refer to Sydney 1:100 000 Soils Landscape Sheet indicates that majority of the site is underlain by disturbed terrain landscape which is typically extensively disturbed by human activity, including complete disturbance, removal or burial of soil. Fill type typically includes soil, rock, building and waste material. A small south portion of the site is underlain by the residual Blacktown soil landscape comprising gently undulating rises on Wianamatta Group Shales and Hawkesbury shale, local relief to 30 m, slops are usually < 5%. A corner of east potion of the site is underlain by erosional Gymea soil landscape comprising undulating to rolling rises and low hills on Hawkesbury Sandstone.
Geology	Reference to the Sydney 1:100 000 Series Seamless Geology Geological Sheet indicates that the site is underlain by Quaternary Anthropogenic deposits described as deposits varying from large man-made clasts (concrete blocks to building demolition rubble) to quarried natural boulders, with interstitial sand-sized to clay matrix, silty to peaty quartz sand, silt, and clay; overlying Ashfield Shale of the Wianamatta Group described as black to dark-grey shale and laminite. Quaternary deposits are mapped about 115 m to the north of the site and are associated with a buried channel connected to the connected to Kings Bay to the north. Large man-made clasts and quarried building rubble were not observed on the site during the geotechnical investigation.
Acid sulfate soils (ASS)	Douglas has previously undertaken an ASS assessment at the site and an acid sulfate soil management plan has been prepared for the project (refer to Section 6.4).
Surface water	Surface water is anticipated to drain to the local stormwater system and follow the general regional topography. An unnamed canal is present 90 m north of the site which drains towards Parramatta River. Surface water and stormwater likely discharge to this canal.
Groundwater	Groundwater is anticipated flow towards the north to the Parramatta River which is located about 500 m north of the site. Groundwater conditions, based on previous Douglas investigations, are discussed in Section 6.2.

6. Summary of previous investigations

6.1 Previous reports

The following previous reports are relevant to this RAP:

- *Report on Acid Sulfate Soil Assessment, Proposed Mixed Use Development, 79-81 Queens Road & 2-8 Spencer Street, Five Dock NSW*, prepared for DPG Project 37 Pty Ltd, Project 224583.01.R.002.Rev1 dated February 2026 (ASSA) (Douglas, 2026a);
- *Dewatering Management Plan, Proposed Mixed Use Development,79-81 Queens Rd & 2-8 Spencer St, Five Dock NSW*, prepared for DPG Project 37 Pty Ltd, Project 224583.01.R.003.Rev1 dated February 2026 (DMP) (Douglas, 2026b);
- *Report on Geotechnical Investigation, Proposed Mixed Use Development, 79-81 Queens Road & 2-8 Spencer Street, Five Dock NSW*, prepared for DPG Project 37 Pty Ltd, Project 224583.01.R.001.Rev2 dated February (Douglas, 2026c);

- *Report on Detailed Site (Contamination) Investigation, Proposed Mixed Use Development, 79-81 Queens Road & 2-8 Spencer Street, Five Dock NSW*, prepared for DPG Project 37 Pty Ltd, Project 224583.02.R.001.Rev2 dated February 2026 (Douglas, 2026d); and
- Acid Sulfate Soil Management Plan, Proposed Mixed Use Development, 79-81 Queens Road & 2-8 Spencer Street, Five Dock NSW, Prepared for DPG Project 37 Pty Ltd, Project 224583.03.R.001.Rev0 dated February 2026 (Douglas, 2026e).

6.2 **Douglas 2026c (Geotechnical)**

Douglas (2025a) was a geotechnical investigation that included the drilling of seven boreholes (BH101 – BH107). In addition, boreholes BH109 to BH111 were drilled for contamination investigation purposes to depths ranging from 1.5 to 3.0 m (refer to Section 6.3) were considered in understanding the sub-surface profile. Originally proposed BH108 was abandoned due to change in the proposed site boundary.

Previous investigations at the site have identified the following general sub-soil profile. The borehole logs are presented in Appendix D.

CONCRETE	-	Concrete slab at the start of BH101 and BH104 to BH112. The concrete was measured to be between 150 mm and 160 mm at all locations. Concrete was absent at locations BH102 and BH103.
	-	A recycled aggregate (crushed concrete and brick) was present on the surface in 79 Queen Street in the outdoor car storage area (at BH102 and BH103).
FILL	-	Typically, sandy clay with various proportions of gravel within the shallow depths of the boreholes, with variable thickness in a range of 0.6 m to 1.0 m.
ALLUVIAL SOIL	-	Comprising medium plasticity, soft, organic peaty clay varying in thickness between 0.2 m and 0.5 m, overlying fine to medium grained loose silty sand to depths ranging from 1.2 m to 2.2 m. The peaty clay was absent from boreholes BH105, BH109, BH110, and BH112.
RESIDUAL SOIL	-	Medium to high plasticity clay to depths ranging from 5.6 m to 7.1 m. The consistency of the soil was assessed to range from firm to hard but was typically stiff to very stiff.
SHALE and LAMINITE BEDROCK	-	Generally low to medium strength, moderately weathered to fresh, dark grey and grey shale and laminite (Mittagong Formation) encountered in boreholes BH105, BH106, and BH107 to depths between 7.4 m and 7.7 m. The Shale and laminite was absent with other boreholes.
SANDSTONE BEDROCK	-	Generally medium to high strength, slightly weathered to fresh, pale grey to grey, medium to coarse grained sandstone (Hawkesbury Sandstone) to the termination depth of boreholes. Low strength sandstone was

encountered within BH107 at a depth between 9.5 m and 11.5 m.

SILTSTONE BEDS - Siltstone interbeds within the sandstone bedrock in boreholes encountered at varying depths of between 11.1 m and 12.2 m with an average thickness of about 500 mm. The siltstone beds were generally medium to high strength.

Groundwater levels were gauged on 11 June 2024 (BH103, BH103s) and 7 June 2024 (BH105, BH107, BH107s) using an electronic oil / water interface meter prior to sampling. The measured water levels prior to sampling are shown in Table 2. It should be noted that groundwater levels are affected by climatic conditions and soil permeability and will therefore vary with time.

In addition to the groundwater levels measured in the monitoring wells groundwater seepage was observed in all boreholes (generally at the interface of fill and underlying clay soils between a depth of 0.6 to 1.3 m bgl during drilling.

Table 2: Summary of groundwater level measurements

Well ID	Location of monitoring well	Ground level * m (AHD)	SWL m (bgl)	SWL m (AHD)
BH103 Deep well in screened in rock	down-gradient	1.9	1.07	0.83
BH103s Shallow well screened in alluvial soils	down-gradient	1.9	1.1	0.8
BH105 Deep well in rock	up-gradient	2.0	10.16	-8.16
BH107 Deep well in rock	up-gradient	2.1	10.10	-8
BH107s Shallow well screened in fill	up-gradient	2.1	Dry	-

Notes:
*Surveyed by dGPS
AHD – Australian Height Datum
SWL – standing water level
bgl – below ground level
S – shallow groundwater wells screened in the alluvial soils. Other wells screened in rock

Based on the groundwater level measurements, groundwater is interpreted to be flowing to the north towards Parramatta River. This was expected given the topography and the location of the down-gradient discharge point (i.e. the Parramatta River).

6.3 Douglas 2026d (DSI)

Douglas has previously completed a detailed site investigation (DSI) at the site. The investigation included an assessment of site history, field testing including soil, groundwater and soil vapour testing and preparation of a report.

The following drawings from the DSI are included in Appendix A:

- Drawing 1: Site Location Plan;
- Drawing 2: Areas of Environmental Concern; and
- Drawing 3: Asbestos Detections and HIL Exceedances.

The previous soil, groundwater and soil vapour testing results are summarised in Appendix C in the following tables:

- Table C1: Results of Soil Testing.
- Table C2: Results of Groundwater Testing.
- Table C3: Results of Soil Vapour Testing.
- Table C4: Results of Preliminary Waste Classification Testing.
- Table C5: Results of Acid Sulfate Soil Testing.

6.3.1 Site history

The site history information suggests that the majority of the site was acquired by the current owner since 2011. The historical aerial photographs and historical ownership records suggest the western portion of the site has generally been used for commercial and industrial purpose since 1919 by various private owners until the present day. The records indicated that the eastern portion of the site has generally been used for commercial and industrial purpose since 1930 by various private owners until the present day, prior to which it was used for residential purposes.

6.3.2 Site observations

At the time of DSI the site was occupied by light industrial facilities, warehouses, and associated offices. The site was operated by the following businesses:

- 81 Queens Street – auto mechanic; and
- 2-8 Spencer Street and 79 Queens Street – second hand car dealership.

The following key site features pertinent to the DSI were recorded:

- Minor oil and chemical storage area was observed near where borehole BH104 was positioned (refer to Drawing 1, Appendix A for borehole locations). The ground surface of the storage area was observed to be concrete paved, and in fair condition;
- The eastern portion of the site was general used for car storage;
- The northwestern corner of the site (81 Queens Street) was mainly occupied by a mechanical bay, where oil and chemical storage were observed. The chemical and oil were either stored on shelves or in a bunded area, however, oil leaking / stains were observed outside of the bunded area. The mechanic bay area was concrete paved ground, and in fair condition;

- An above ground oil water separator was observed near where borehole BH110 was positioned;
- A possible pit or sump area was observed near where borehole BH109 was positioned; and
- The frontage of the site was generally used for car parking. The majority of this area was concrete paved with the exception of a small portion paved with recycled aggregate (where S1 and S3 were positioned).

The following potential areas of environmental concern (PAEC) were identified:

- Fill and demolition waste across the site.
- Current and former light industrial use across the site, including a car dealership and auto mechanic with the following activities:
  - Chemical stores of oils, grease and solvents;
  - The oil water separator;
  - The unknown sump or pit (potential hydraulic service or other underground tank); and
  - Potential for underground petroleum storage systems (UPSS) at the site. No UPSS was positively confirmed to be present, or to have previously been present at the site, however given the past and current use there was considered to be a potential for unknown UPSS.

6.3.3 **Results**

All analysed contaminant concentrations or arithmetic means and standard deviations were within the adopted site acceptance criteria (SAC) with the exception of the following:

- Asbestos detected in the samples tested for fibrous asbestos / asbestos fines (FA/AF) as follows:
  - Bonded chrysotile asbestos fragment detected in sample BH102/0.1-0.2;
  - Fibrous asbestos detected in sample BH103/0.5-0.6; and
  - Bonded and fibrous asbestos chrysotile in sample BH104/0.2-0.3 and BH104/0.5-0.6.

It is noted that one exceedance of the adopted human health-based criteria for lead and one exceedance of for benzo(a)pyrene (as indicated on Drawing 3) were recorded. Neither were considered to be significant based upon statistical analysis (including assessment of the 95% UCL), and as such are not considered to warrant remediation.

The DSI noted that further *in situ* or *ex situ* investigation including visual and analytical processes are required to confirm the preliminary waste classifications prior to offsite disposal. The DSI provided the following preliminary in situ waste classifications:

<u>Fill:</u>

- Fill soils in the vicinity of BH102, BH103, BH104 - Special Waste Asbestos - general solid waste (GSW) (non-putrescible);
- Remaining fill within the site – GSW (non-putrescible) subject to further assessment of asbestos finding no asbestos impact; and

- ASS: (refer to Section 6.4), which will require treatment, management and classification in accordance with the ASSMP. Treated ASS with no asbestos impacts is preliminarily classified as GSW (non-putrescible) - treated ASS.

Natural soils and bedrock:

- Based on the identification of ASS/PASS in natural soils across the site, alluvial soils cannot be classified as Virgin Excavated Natural Material (VENM). Further testing is required in accordance with the ASSMP to assess the extent of ASS and whether ASS extends into the residual soils. Treated ASS would (as a minimum) be classified as GSW (non-putrescible). Douglas note that it may be possible to obtain a specific resource and recovery exemption from the NSW EPA for beneficial reuse of treated ASS; and
- It is likely that bedrock underlying the natural soils across can be classified as VENM (subject to the results of further assessment).

The analytical results of groundwater suggest that groundwater beneath the site has not been significantly impacted by organic contaminants total recoverable hydrocarbons (TRH), polycyclic aromatic hydrocarbons (PAH), organochlorine pesticides (OCP), organophosphate pesticides (OPP), polychlorinated biphynels (PCB), phenol or volatile organic compounds (VOC). The results for all analysed samples were below the SAC, with the exception of:

- Copper at 4 µg/L in BH103, at 3 µg/L in its duplicate BD1/20240607, and at 2 µg/L in BH105 which exceeded the ANZG (2018) for the 95% level of protection (LOP) for slightly to moderately disturbed freshwater aquatic ecosystems (the freshwater guideline – 95% LOP FWG) of 1.4 µg/L;
- Zinc at 50 µg/L in BH103, at 44 µg/L in its duplicate BD1/20240607, at 58 µg/L in BH105, and at, 34 µg/L in BH107 which exceeded the 95% LOP FWG of 8 µg/L; and
- PFOS at 0.01 µg/L in BH103 which exceeded the HEPA (2020) 99% LOP FWG of 0.00023 µg/L (but was within the 95% LOP FWG). The concentration of PFOS recorded in the groundwater samples from BH105 and BH107 were below the practical quantification limit (PQL), however, the PQL was greater than the SAC.

Soil vapour results were within the adopted SAC.

It was recommended that further data gap assessment be undertaken post demolition to confirm the extent of asbestos and the waste classification of spoil to be disposed; and that a remediation action plan (RAP) be prepared.

6.4 Douglas 2026a (ASSA) and 2026e (ASSMP)

Douglas has previously completed a preliminary acid sulfate soil investigation at the site. Three samples were tested for SPOCAS and chromium reducible sulphur. The results are summarised below. The net acidity exceeded the action criterion in the three samples tested. Testing of soils confirmed the presence of ASS triggering the need for management, with the results of the previous ASS testing are summarised in Table C5, Appendix C.

An ASSMP has been prepared and describes the required management. This includes the requirement for a data gap assessment be undertaken to provide further vertical profiling of the PASS / ASS and to confirm the liming rates.

6.5 Douglas 2026b DMP

Douglas (2026b) comprises a dewatering management plan for the project, based on discharge of the extracted groundwater to the stormwater system. The DMP includes assessment requirements for potential contaminants prior to discharge.

The modelling reported in the DMP predict the groundwater drawdown to occur within the sandstone bedrock, with no significant off-site drawdown predicted in the upper alluvial soils.

7. Conceptual site model

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

The CSM below has been developed based on the results of the previous investigations. The sources (and associated contaminants of potential concern (CoPC)), pathway and receptor linkages are summarised in Table , Table and Table , below.

Table 3: Summary of potential sources

Potential sources and associated CoPC
On-site sources
Remediation Area 1: **S1:** Fill: asbestos contamination fill has been detected at BH102, BH103, BH104 and BH111 in the northern half of the site. The extent of asbestos impacted fill is unknown. **Entire Site: Potential sources of unidentified contamination** **S1:** Fill: Associated with levelling, demolition of former buildings on the site CoPC include metals, PFAS, TRH, BTEX, PAH, PCB, OCP, OPP, phenols and asbestos **S2:** Current and historical on-site (commercial and industrial) activities including mechanical workshop associated with car servicing and carpark area. Chemical stores, an oil water separator and an unknown possible sump / or pit has been identified. Based on the former and current mechanical workshop and car dealership it is considered that there is a risk of unidentified UPSS CoPC include metals, TRH, BTEX, PAH, PFAS and VOC such as solvents **S3:** Former buildings CoPC include asbestos, synthetic mineral fibres (SMF), lead (in paint) and PCB

Metals (arsenic, cadmium, chromium, copper, lead, nickel, mercury and zinc
PFAS – per and polyfluoroalkyl substances
TRH – total recoverable hydrocarbons
BTEX – benzene, toluene, ethylbenzene and xylenes
PAH – polycyclic aromatic hydrocarbons
PCB – polychlorinated biphenyls
OCP – organochlorine pesticides
OPP – organophosphate pesticides

The following potential human and environmental receptors, along with relevant potential pathways, have been identified and summarised in Table 4.

Table 4: Summary of potential receptors and pathways

Potential human receptors
HR1: Construction and maintenance workers **HR2:** End users [commercial / residential mixed use] **HR3:** Adjacent site users [industrial land use]
Potential environmental receptors
ER1: Surface water [drainage canal and Parramatta River] **ER2:** Groundwater
Potential pathways to human receptors
HP1: Ingestion and dermal contact **HP2:** Inhalation of dust and/or vapours
Potential pathways to environmental receptors
EP1: Surface water run-off **EP2:** Leaching of contaminants and vertical migration into groundwater **EP3:** Lateral migration of groundwater providing base flow to water bodies **EP4**: Discharge of extracted groundwater during dewatering to the stormwater system **EP5:** Inhalation, ingestion and absorption

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 S4) and receptors are provided in the following Table 5.

Table 5: Summary of potentially complete exposure pathways

Source and CoPC	Exposure pathway	Receptor	Proposed Management Strategy
Remediation Area 1			
Fill: Asbestos impacted fill	**HP2:** Inhalation of dust and/or vapours	**HR1:** Construction and maintenance workers **HR2:** End users **HR3:** Adjacent site users	Data gap assessment (detailed asbestos) assessment to assess extent of asbestos. Testing to focus on the areas where asbestos has not been detected. Remediation to comprise, excavation, off-site disposal and validation of asbestos impacted fill. Contingency to cap and contain asbestos contaminated fill outside the proposed basement footprint

Source and CoPC	Exposure pathway	Receptor	Proposed Management Strategy
			and at practical limit of excavation (if asbestos present).
Entire site (potential for unidentified contamination)			
S1: Fill: metals, PFAS, TRH, BTEX, PAH, PCB, OCP, phenols and asbestos **S2:** On-site activities: metals, TRH, BTEX, PAH, PFAS and VOC such as solvents Note 1 – refer below table **S4**: Surrounding industrial land use: metals, TRH, BTEX, PAH, PCB, OCP, phenols, PFAS and VOC as solvents	**HP1:** Ingestion and dermal contact **HP2:** Inhalation of dust and/or vapours	**HR1:** Construction and maintenance workers **HR2:** End users [commercial / residential mixed use]	Inspection of ground surface following removal of site infrastructure for sign of contamination concern. Data gap assessment (e.g. in conjunction with above asbestos assessment) in areas previously inaccessible to assess potential for additional contamination in previous inaccessible areas and to provide waste classification. Validation of removal of potential contaminants associated identified sources following their removal, including: • Oil / water separator • The sump / pit chemical stores • Chemical stores Contingency plan for unexpected contamination / contamination sources, including potential UPSS. Management of extracted water and site water in accordance with the DMP, ASSMP and this RAP. Further groundwater monitoring is recommended to inform treatment requirements.
	HP2: Inhalation of dust and/or vapours	**HR3:** Adjacent site users [industrial land use]	
	EP1: Surface water run-off **EP3:** Lateral migration of groundwater providing base flow to water bodies **EP4**: Discharge of extracted groundwater during dewatering to the stormwater system	**ER1:** Surface water [drainage canal and Paramatta River]	
	EP2: Leaching of contaminants and vertical migration into groundwater	**ER2:** Groundwater	
S3: Former buildings: asbestos, SMF, lead (in paint) and PCB	**HP1:** Ingestion and dermal contact	**HR1:** Construction and maintenance workers **HR1:** End users [commercial / residential mixed use]	Conduct appropriate hazardous materials (asbestos) clearance following completion of removal of hazardous building materials and demolition.
	HP2: Inhalation of dust and/or vapours	**HR3:** Adjacent site users [industrial land use]	

Note 1: Chemical stores, an oil water separator and an unknown possible sump / or pit has been identified. Based on the former and current mechanical workshop and car dealership it is considered that there is a risk of unidentified underground petroleum storage systems (UPSS).

8. Remediation extent

The extent of remediation comprises:

- Remediation Area 1: Asbestos contaminated soil. Extent to be confirmed based on DGA (refer to Section 10.1), with previous investigation identifying asbestos at BH102, BH103 and BH104.
- Validation of the following areas:
  - The in ground sump pit near BH109; and
  - The footprints of the chemical stores and oil water separator.
- Contingency Plan: Based on the site history it is considered that there is a moderate risk or unidentified contamination finds, potentially including a UPSS. Therefore, a contingency plan is provided, including requirements for the validation of UPSS finds.

The actual extent (the final remediation extent) will be established at the completion of the excavation of the area during remediation. Drawing 4, Appendix A provides the provisional minimum extent, including:

- The approximate extent of previously identified asbestos contaminated fill (based on an interpretation of the available borehole and sampling data); and
- The location of the pit / sump, oil water separator and chemical stores.

9. Remediation options assessment

The objective of the remediation options assessment and evaluation is to establish a preferred remediation strategy. The process involves canvassing various remediation options which may be viable and then ranking each option based on a number of evaluation criteria. The remediation options assessment was undertaken with reference to CRC CARE *Remediation Action Plan: Development - Guideline on Performing Remediation Options Assessment* (CRC CARE, 2019b).

The remediation options assessment is included in Appendix E.

10. Preferred remediation strategy

10.1 Data Gap Assessment (DGA)

Asbestos has been detected in three boreholes during the DSI. The DSI comprised testing from boreholes, which are inefficient at detecting asbestos and do not include testing of bulk samples for asbestos as recommended in WA DoH (2021). A data gap assessment (DGA) is therefore required to assess the expected extent of asbestos in fill above the SAC.

For detailed asbestos assessment, where asbestos has been identified, NSW EPA (2022) recommends consideration of the sampling regimes in WA DoH (2021). In that regard it is recommended that detailed asbestos assessment be undertaken at double the sampling frequency in NSW EPA (2022) in areas outside of the known asbestos contamination (BH102, BH103 and BH104) post demolition. Based on an estimate of the portion of the site where

asbestos has not been positively confirmed (approximately 0.25 ha) testing from 16 test pits is recommended.

To confirm and finalise an *in situ* waste classification it is recommended that additional chemical testing on the fill be conducted utilising the proposed DGA test locations.

The DGA is to be conducted by a suitably qualified environmental consultant post demolition.

The minimum scope of work for the DGA is to comprise:

- Excavation of a minimum of 16 test pits at the approximate locations indicated on Drawing 4, Appendix A. Test pits are to be excavated to a depth of 3 m. This may need to be conducted following demolition when better access is available across the site.
- For each test pit, log the soils encountered, and collect soil samples from surface and then at 0.5 m intervals, at signs of contamination, changes in strata at the top of natural and at test pit completion. Sample of are to include:
  - For asbestos assessment: a 500 ml AFFA and 10 L sample (all fill samples);
  - For contaminant assessment: 250 mL jars (all samples with signs of chemical contamination concern and selected other samples); and
  - Additional testing for acid sulfate soil assessment as per Douglas (2025c). The additional acid sulfate soil investigation must also better define the boundary between alluvial and residual soils.
- On-site screening of the 10 L sieve sample for potential asbestos containing material (ACM).
- Analysis of samples:
  - Asbestos (FA/AF) (all fill samples);
  - TRH, BTEX, PAH and metals (nominally 12 primary samples, pending field observations);
  - Leachability testing as required to inform waste classification; and
  - Quality control samples.
- Preparation of a report(s) which includes the results of the following:
  - Results of additional soil and testing and general site condition;
  - Preliminary *in situ* waste classification;
  - Advice on requirements for any addenda or amendment to this RAP; and
  - If capping of asbestos contaminated soils is adopted as the remediation strategy the updated RAP / Addendum to the RAP must include a plan showing the proposed location/s of capping and provide cross-sections of the capping layer / capped material.

10.2 **Rationale**

The rationale for the selection of the preferred remediation strategy is outlined in Appendix E. The preferred option was selected in consultation with the client and was based on both technical considerations (as discussed herein), and other project specific considerations (such as program, cost, and consideration of ongoing liability implications). The preferred remediation strategy is for:

- Remediation Area 1: Cap and contain for the asbestos impacted fill.
- Additional Validation Requirements:
  - Validation of the sump / pit, and footprint of the chemical stores and oil water separator following removal of infrastructure.
- Potential for unidentified contamination / contamination sources (e.g. UPSS): implementation of contingency plan.

10.3 **Sequence of remediation**

The general sequence of remediation shall be determined by the Remediation Contractor with the aim of minimising the potential for cross contamination of 'clean' areas / soils with contaminated soils. This should include avoiding, wherever possible transporting or placing contaminated soil over 'clean' areas, separating stockpiles of different origin / contamination profile and validating the complete removal of any contaminated material placed / potentially impacting 'clean' areas.

All works in asbestos contaminated fill must be conducted in accordance with the requirements for asbestos removal works in the Work Health and Safety (WHS) Act and issued by SafeWork NSW.

The general sequence of remediation should consider the following recommended sequence:

- Task 1: Surface validation following the removal of the oil water separator and chemical stores (and concrete slab from these areas).
- Task 2: Validation following the decommissioning and removal of the unknown sump / pit.
- Task 3: Remediation of asbestos contaminated fill:
  - Task 3A: Excavation and off-site disposal of asbestos contaminated fill within the footprint of the proposed basement:
    - Waste classification of unsuitable / surplus fill.
    - Disposal of unsuitable / surplus fill.
    - Validation of remediation excavation.
  - Task 3B: Capping of Asbestos beyond the basement footprint (if residual asbestos contaminated fill present):
    - Placement of marker layer.
    - Identification / importation of suitable fill for use as the capping layer (refer to Section 14).
    - Construction of the capping layer.

- Task 4: Contingency for additional contamination / contamination source finds (including a UPSS) (if encountered).

Roles and responsibilities are outlined in the site management plan (Appendix H).

10.4 Validation of the chemical stores / oil water separator

Following the removal by the Remediation Contractor of the concrete slab at the locations of the chemical stores and oil water separator the following process shall be adopted:

- The surface shall be inspected by the environmental consultant:
  - If no signs of chemical contamination are identified:
    - Surface samples shall be collected by the environmental consultant at the surface at the locations indicated on Drawing 4, Appendix A and analysed at a NATA accredited laboratory for the following analytical scope; metals TRH, PAH, BTEX, and VOC.
  - If signs of contamination are observed (and/or confirmed by sampling and analysis as appropriate):
    - Remedial excavations shall be recommended by the Environmental Consultant;
    - Remedial excavations shall be conducted by the Remediation Contractor to achieve the recommendations of the Environmental Consultant;
    - The Environmental Consultant will collect validation samples as per the requirements of Section 12. The validation samples will be analysed at a NATA accredited laboratory for the following analytical scope; metals TRH, PAH, BTEX, and VOC. Additional analysis may be required as advised by the environmental consultant based on site observations; and
    - Validation sample result shall be compared to the SAC in Appendix F (and/or the waste classification thresholds relevant to the surrounding materials if the surrounding soil is to be excavated and disposed of off-site). The excavation and validation process will continue as above until the Environmental Consultant confirms that the areas have been appropriately remediated.

10.5 Validation of the pit / sump

The following general process is to be undertaken for the validation of the sump / pit:

- The pit will be exposed by the Remediation Contractor and examined for potential leaks and general condition. The Environmental Consultant should inspect the pit prior to removal;
- Excavation and stockpiling of impacted materials (based on field observations) by the Remediation Contractor for assessment by the Environmental Consultant. Materials which meet the criteria adopted for site re-use suitability (i.e. site assessment criteria – SAC) can be retained on-site;
- Collection by the Environmental Consultant of validation samples from the pit at a minimum rate of one location per side wall or one sample per soil type and at the depth of observed groundwater, whichever is the greater and at least one sample in the excavation base. Note that the actual number of samples may vary depending on the size of the pit and the degree of contamination, the soil profile encountered and the presence of groundwater;

- The validation samples will be analysed at a NATA accredited laboratory for the following analytical scope; metals TRH, PAH, BTEX, and VOC. Additional analysis may be required as advised by the environmental consultant based on the contents of the tank (if identified) or other site observations; and
- Validation sample result shall be compared by the Environmental Consultant to the SAC in Appendix F (and/or the waste classification thresholds relevant to the surrounding materials if the surrounding soil is to be excavated and disposed of off-site). The excavation and validation process will continue as above until the Environmental Consultant confirms that the excavation has been appropriately remediated.

10.6 Remediation Area 1: Asbestos Contaminated Fill

10.6.1 Task 3A: Off-site disposal and validation

The proposed remediation sequence to be adopted for asbestos contaminated fill within the basement footprint will comprise:

- Excavation by the Remediation Contractor of the asbestos impacted fill identified in the DGA.
- Off-site disposal of the fill by the Remediation Contractor in accordance with the formal waste classification. Where a suitable in situ waste classification allowing direct disposal does not apply:
  - Excavated soils shall be placed into a stockpile for waste classification in accordance with the requirements of Section 13. The excavated soil is to be managed in accordance with the site management plan (Appendix H); and
  - If soils are stored or placed on bare ground validation samples shall be collected from the stockpile footprints per the requirements of Section 12.
- Collection of validation samples by the Environmental Consultant from the remedial excavation at the rates specified in Section 12.
- Assessment of validation samples for asbestos as follows:
  - On-site screening of 10 L sieve samples for potential ACM (all fill samples); and
  - Analysis by a NATA accredited laboratory for FA/AF in 500 ml samples (all fill and natural soil samples).
- If asbestos is recorded beyond the extent of impact identified by the DGA, based on the validation results or other observations / results, repeat the excavation and validation process above until all identified asbestos impacted soils are removed from the excavation area, or the limit of excavation is reached (whichever is encountered first).

10.6.2 Task 3B: Cap and contain

This task comprises in-situ capping of asbestos contaminated soils outside the basement footprint / extent of excavation (if present).

The capping layer is to comprise:

- 'Soft capping' areas: A geofabric marker layer overlain by 500 mm of 'clean' fill (meeting the requirements of Section 14) or (development) site won material that meets the site acceptance criteria (SAC) which has been approved for use by the Environmental Consultant; or
- Pavement areas: A geofabric marker layer overlain by a pavement (bitumen or concrete).

The geofabric marker layer must (per the requirements of (WA DoH, 2021) be:

- Water permeable;
- High visibility;
- Rot-proof and chemically inert;
- High tensile strength;
- Coverage of the contaminated area and at least 0.5 m beyond boundary if practical; and
- Parallel sheets and adjoining sheets to be fixed together or overlap by at least 20 cm.

Further information on capping requirements, including for the marker layer are provided in Section 11.1.

The capping is to be conducted in accordance with the following general procedure:

- Construction by the Remediation Contractor of the capping layer. The construction is to follow the following process, each subject to a hold point:
  - Hold Point No.1: Completion of Pre-Capping Earthworks:
    - Completion by the Remediation Contractor of the earthworks required to form the pre-capping site levels;
    - Removal by the Remediation Contractor of any oversized or sharp objects which could puncture the geofabric layer; and
    - Inspection by the Environmental Consultant of the exposed ground surface. The Environmental Consultant is to take a photographic record of the inspection.
  - Hold Point No. 2: Installation of Geofabric marker layer:
    - Following the installation of the geofabric marker layer the Environmental Consultant must complete a site inspection to confirm the installation of the geo-fabric has been completed;
    - Inspection by the Environmental Consultant of the exposed geofabric marker layer. The Environmental Consultant is to take a photographic record of the inspection; and
    - Surveying by the Site Surveyor of the extent and level of the marker layer (which to the extent practical should be 0.5 m beyond the capping area.
  - Hold Point No 3: Capping materials:
    - Provision by the Remediation Contractor to the Environmental Consultant documentation on the soil / rock / landscaping (including proposed base course) materials proposed to be used to form the capping layer;

  - Assessment by the Environmental Consultant of the documentation, and advise on the suitability (or otherwise) of the materials, and any additional assessment requirements to allow final approval for the use of the material;
  - Importation by the Remediation Contractor of Capping Soils (where applicable);
  - On-site inspection of the stockpiled capping soils (or other materials) by the Environmental Consultant and collection and analysis of check samples in accordance with Section 14; and
  - Provision of advice by the by the Environmental Consultant to the Remediation Contractor on the suitability (or otherwise) of the materials, and any additional assessment requirements to allow final approval for the use of the material.
- Construction by the Remediation Contractor of the capping using the materials approved by the Environmental Consultant and pavements (as applicable). The capping layer is to be constructed in accordance with engineering requirements to provide a long term, stable layer.

- Following the completion of the pavement capping layer:
  - Surveying by the Site Surveyor of the extent and level of the capping layer, in accordance with Section 10.6. Preparation by the Site Surveyor of survey drawings clearly showing the extent and levels of the marker layer, capping layer, and an overlay of the pre- and post-capping surveys to show the thickness of the layer.
  - Inspection by the Environmental Consultant to confirm that the capping layer has been constructed. The Environmental Consultant is to take a photographic record of the inspection.
  - Review by the Environmental Consultant of the survey drawings.
- Rectification by the Remediation Contractor of any significant non-compliances identified by the Environmental Consultant.

The principal contractor will be responsible for undertaking the following:

- Complete surveys and survey drawings as required above. At a minimum one survey point is recommended per 50 m^2 accurate to +/- 0.05 m;
- Provide the Environmental Consultant with any records / reports related to soil (VENM / ENM / topsoil) materials proposed to be imported to the development site to form part of the capping layer. No materials should be imported until the Environmental Consultant has granted approval;
- Provide the Environmental Consultant with material data sheets for the geofabric marker layer, provide the roll numbers of the geo-fabric used and provide the manufacturers quality assurance certificate for the geo-fabric;
- Provide the Environmental Consultant with transport and tipping dockets for all waste disposed of off-site. This is to include record of tracking of asbestos waste in accordance with the NSW EPA Integrated Waste Tracking System (IWTS); and
- Keep and provide the Environmental Consultant with site tracking records for all imported soil / rock / landscaping materials entering the site and waste leaving the site.

10.7 Potential UPSS and other additional contamination finds

A contingency plan provided in Appendix I for UPSS or other potential contamination is found.

11. Assessment criteria

11.1 Remediation acceptance criteria

The overarching remediation acceptance criterion (RAC) to be adopted for the project is for 'no unacceptable risks posed by the relevant media (i.e. soils, groundwater or soil vapour) to human health or the environment'.

The remediation works are to be validated as meeting the RAC by the Environmental Consultant by means of visual inspection, field screening, recovery and analysis of samples and review of any available plans as set out in this report.

In the absence of derivation of Tier 2 site specific target levels (SSTL), the (RAC) for contaminants in soil are the same as the Tier 1 site assessment criteria (SAC) adopted for Douglas (2025b), protective of human health. The following table 6 provides a summary of the RAC.

Table 6: Remediation acceptance criteria

Item	Remediation acceptance criteria
Remediation Area 1 Asbestos Contaminated Soils	
Task 1: Excavation and Off-Site Disposal	Samples from the base and sides of the excavation must have a concentration of ACM below 0.05% w/w and a FA/AF below 0.001% w/w and no visible asbestos in soils at the surface (0.2 m from the surface).
Task 2: Cap and Contain (outside basement)	The cap must meet the nominated design thickness of 0.5 m (within the nominated tolerance) over the brightly coloured (orange) geotextile marker layer pre the requirements of Section 10.6.2; or The cap must meet the nominated design of a permanent durable pavement (concrete / asphalt) of a minimum thickness of 0.1 m over a brightly coloured (orange) geotextile marker layer.
Other	
Sump of Pit near BH109 **Potential UPSS**	Validation samples must be within the SAC specified in Appendix F.
Surface validation testing below chemical stores and oil water separator	Validation samples must be within the SAC specified in Appendix F.

11.2 Site assessment criteria

Additional area(s) of contamination encountered beyond those outlined in Section 8, during the course of the remediation and site redevelopment will be subject to the contingency plan or unexpected find protocol (Appendix I) and assessed using the SAC in Appendix F. The SAC are the same as the Tier 1 SAC adopted for Douglas (2025b). This is on the provision that other considerations such as risks to groundwater are also taken into account. The broader list of contaminants and their SAC are included in Appendix F.

The SAC should also be used as part of the assessment framework for imported soils (i.e. contaminant concentrations in imported soils must comply with the SAC).

The adopted investigation and screening levels comprise levels for a generic residential with minimal access to soil land use scenario. As noted in Appendix F, further consideration of the applicable land use category can be undertaken upon completion of the final design (commercial land use criteria may be applicable to parts or all of the site). The derivation of the SAC is included in Appendix F and the adopted SAC are listed in the summary analytical results tables in Appendix C.

The SAC are not RAC, and an exceedance of the SAC does not automatically trigger the need for remediation. Exceedances of the SAC will trigger the need for further assessment of risk by the Environmental Consultant to determine the need for remediation in accordance with NEPC (2013) and Appendix H.

12. Validation plan

12.1 Data quality objectives

The data quality objectives (DQO) for the validation plan are included in Appendix G.

12.2 Validation assessment requirements

The following site validation work will be required:

- Field assessment by the Environmental Consultant comprising:
  - Visual inspection, including taking photographs for record purposes;
  - Collecting validation samples from excavations resulting from the removal of contaminated soils, including contaminated soil stockpile footprints (if relevant); and
  - Collecting validation / characterisation samples for materials to be re-used on-site.
- If asbestos (or other contaminants) are capped on-site outside the proposed basement footprint:
  - Surveying by the Surveyor comprising:
    - Survey of the extent and level at the top of the contaminated fill;
    - Survey of the extent and levels of the top of the marker layer; and
    - Survey of the extent and levels of the top of the capping layer.

- Laboratory analysis of validation samples at a NATA accredited laboratory for:
  - The CoPC relevant to the remediation area; and
  - Quality control (QC) samples in accordance with Section 15.
- Comparison by the Environmental Consultant of the laboratory results with the SAC and/or RAC as appropriate (refer to Section 11); and
- Preparation by the Environmental Consultant of a validation report detailing the methods and results of the remediation works and validation assessment.

12.3 **Visual inspections**

All areas to be assessed and validated will first be subject to a visual inspection by the Environmental Consultant. Any areas of fill / ACM / staining (as appropriate for the remediation) must be removed prior to validation sampling.

12.4 **Validation sampling**

The sampling frequency will depend on the volume or area to be assessed and the previous results. The following approximate sampling frequencies will be adopted but may be modified by the Environmental Consultant to take into account previous results, where applicable, and findings from the visual inspections.

Small to medium excavations / areas (base <500 m^2):

- Base of excavation: one sample per 25 m^2 or part thereof, with a minimum of three samples where the base of the excavation is fill rather than natural soils; and
- Sides of excavation: one sample per 10 m length or part thereof with a minimum of one sample per wall. Additional samples will be collected at depths of concern where there is more than one depth of concern, with a minimum of one sample per 1.5 m depth in fill.

Large excavations / areas (base ≥500 m^2):

- Base of excavation: sampling on a grid at a density in accordance with Table 2 in NSW EPA (2022) or a minimum of 10 samples. In sub-areas with any specific signs of concern, a higher sampling density may be required; and
- Sides of excavation: one sample per 20 m length or part thereof with a minimum of one sample per wall. Additional samples will be collected at depths of concern where there is more than one depth of concern, with a minimum of one sample per 1.5 m depth in fill.

Where contaminated soils are stored or treated on bare soils, the footprint of the stockpile will require validation following removal of the contaminated soils.

Validation samples will be analysed by a NATA accredited laboratory for the relevant CoPC relevant to the remediation area.

Validation sample test results will be compared to the RAC, as per the DQO (Appendix G). Where the RAC are considered to have not been met, further remediation and validation will be required as advised by the Environmental Consultant. This process will continue until all results are below the RAC.

In the event that contamination extends beyond site boundaries or in areas that cannot be practically chased out (e.g. under remaining service lines), validation samples will be taken at the limit of excavation. Notwithstanding that there may be residual contamination present.

Advice may need to be obtained from a qualified geotechnical or structural engineer regarding excavation and/or structure stability if excavations approach site boundaries and/or existing infrastructure.

13. Waste disposal

Disposal of waste must be to an appropriately licensed waste facility, as per *Protection of the Environment Operations Act 1997* NSW (POEO Act) and the *Protection of the Environment (Waste) Regulation 2014* NSW.

Any waste disposed off-site must be initially classified by the Environmental Consultant in accordance with:

- NSW EPA *Waste Classification Guidelines, Part 1: Classifying Waste* (NSW EPA, 2014a);
- NSW EPA *Waste Classification Guidelines, Part 2: Immobilisation of Waste* (NSW EPA, 2014b);
- NSW EPA *Waste Classification Guidelines, Part 4: Acid Sulfate Soils* (NSW EPA, 2014c); and
- NSW EPA *Addendum to the Waste Classification Guidelines (2014) - Part 1: Classifying Waste* (NSW EPA, 2016) [addendum for per- and poly-fluoroalkyl substances (PFAS)].

Samples will be collected from stockpiles / *in situ* fill at various depths to characterise the full depth of the material. The frequency is to be determined by the Environmental Consultant based on the risk of contamination and heterogeneity of the material.

For stockpiles comprising similar materials and a:

- Volume up to 200 m^3: a recommended minimum frequency of one sample per 25 m^3, with a minimum of three per stockpile (NSW EPA, 2022); or
- Volume greater than 200 m^3: a recommended minimum frequency of one sample per 25 m^3, with a minimum of 12 samples OR a minimum of 10 samples and calculation of the 95% upper confidence limit of the arithmetic mean for all applicable analytes (NSW EPA, 2022). Note that this does not apply to stockpiles impacted, or potentially impacted, by asbestos. For stockpiles greater than 200 m^3 which are impacted, or potentially impacted, by asbestos the Environmental Consultant shall provide guidance in accordance with NSW EPA (2022).

It may be possible to classify excavated soil / fill for reuse on another site under a relevant NSW EPA resource recovery order (RRO) so that it can be used on other sites under the requirements of the corresponding NSW EPA resource recovery exemption (RRE). For this option, the frequency of sampling should be in accordance with the relevant RRO and the contaminants to be analysed will be determined by the Environmental Consultant. The Environmental Consultant will provide a report confirming the suitability of the spoil for reuse under a RRO, or otherwise. Note: material containing asbestos cannot be supplied under an RRO.

All waste must be tracked by the Remediation Contractor from 'cradle to grave'. Copies of all consignment notes / disposal dockets (or similar) and environment protection licences for receipt and disposal of the materials must be maintained by the Remediation Contractor as part of the site log and must be provided to the Environmental Consultant for inclusion in the validation report.

Based on the presence of ASS at the site Douglas recommends that a specific resource recovery exemption application be made to the NSW EPA to allow for potential beneficial reuse of treated ASS off-site.

14. Imported material

Any soil, aggregate etc imported for the remediation works must have contaminant concentrations that meet the relevant criteria outlined in Section 11. Imported materials will only be accepted for use at the site if:

- It can legally be accepted onto the site (e.g. classified as virgin excavated natural material (VENM), accompanied by a report / certificate prepared by a qualified environmental consultant);
- Visual inspection of the imported soil confirms that the soil has no signs of concern and is consistent with those described in the supporting classification documentation;
- It has no aesthetic issues of concern, and
- The materials are validated (by inspection / sampling) by the Environmental Consultant as being suitable for use at the site.

The classification report / certificate for all material proposed for import must be reviewed and approved in writing by the Environmental Consultant prior to import. Materials to be imported may also need to meet other requirements which are to be assessed by others (e.g. geotechnical or landscaping requirements).

If permitted by the development consent and approved by the site owner, Remediation Contractor and Environmental Consultant material classified under a NSW EPA RRO may also be accepted, provided the material can be used on site in accordance with the corresponding RRE. This could include excavated natural material (ENM), classified under NSW EPA *Resource Recovery Order under Part 9, Clause 93 of the Protection of the Environment Operations (Waste) Regulation 2014, The excavated natural material order 2014* (NSW EPA, 2014d).

The need for check-sampling of VENM and/or RRO material is to be determined by the Environmental Consultant depending on the source of the material, adequacy of the supporting documentation provided and inspection(s) of material. Quarried material / VENM may need little or no check sampling.

Any recycled materials proposed for importation must be sampled at a frequency of one sample per 25 m^3, with a minimum of three samples per load. The recycled material will not be permitted to be used on site until the results of the inspection and laboratory analysis have been approved in writing by the Environmental Consultant.

15. Quality assurance and quality control

Field quality assurance and quality control (QA/QC) testing will include the following:

- 5% sample inter-laboratory analysis, analysed for the same suite as primary sample;
- 5% sample intra-laboratory analysis, analysed for the same suite as primary sample;
- Rinsate samples (where re-useable sampling equipment is used), analysed for the suite of analytes analysed by the majority of the primary samples; and
- Trip spike and trip blank samples (analysed for BTEX) (approximately one per batch of samples where volatile contaminants are primary CoPC).

The laboratory will undertake analysis in accordance with its NATA accreditation, including in-house QA/QC procedures.

The QC analytical results will be assessed using the following criteria:

- Sampling location rationale met the sampling objective;
- Standard operating procedures (SOP) are followed;
- Appropriate QA/QC samples are collected / prepared and analysed;
- Samples are stored under secure, temperature-controlled conditions;
- Chain of custody documentation is employed for the handling, transport and delivery of samples to the selected laboratory;
- Conformance with specified holding times;
- Accuracy of spiked samples within the laboratory's acceptable range (typically 70-130% for inorganic contaminants and greater for some organic contaminants);
- Field and laboratory duplicate, and replicate samples will have a precision average of +/- 30% relative percentage difference (RPD); and
- Rinsate samples will show that the sampling equipment (if used) is free of introduced contaminants, i.e. the analytes show that the rinsate sample is within the normal range for deionised water.

16. Management and responsibilities

16.1 Site management plan

A general site management plan for the construction phase of site remediation is included in Appendix H. The management plan includes soil, noise, dust, work health safety (WHS), remediation schedule, hours of operation and incident response. The Remediation Contractor is to implement the requirements of the general site management plan for the duration of remediation works by incorporating the plan into their over-arching construction environmental management plan (CEMP).

16.2 Site responsibilities

The site management plan (Appendix H) provides a summary of the general program management and associated responsibilities. Contact details for key utilities are also included in the event of needing to respond to any incidents.

16.3 Contingency plan and unexpected finds protocol

Plans for contingency situations (e.g. encountering additional asbestos in fill), along with an unexpected finds protocol for dealing with unexpected finds during remediation work / earthworks, are included in Appendix I.

17. Validation reporting

17.1 Documentation

The following documents will need to be collated and reviewed by the Environmental Consultant as part of the validation assessment (including those items that are prepared by the Environmental Consultant):

- Any licences and approvals required for the remediation works (Remediation Contractor);
- Waste classification report(s) (Environmental Consultant);
- Transportation Record: comprising a record of all truckloads of soil (including aggregate) entering the site, including truck identification (e.g. registration number), date, time, source site, load characteristics (e.g. type of material, i.e. quarried aggregate, etc.), approximate volume, use (e.g. general site raising, service trenches, etc.) (Remediation Contractor);
- Disposal dockets: for any soil disposed off-site including transportation records, spoil source, spoil disposal location, receipt provided by the receiving waste facility / site (Remediation Contractor). Note: A record of the building materials disposed off-site is also to be kept and provided to the Principal, on request;
- Imported materials records: records for any soil imported onto the site, including source site, classification reports, inspection records of soil upon receipt at site and transportation records (Remediation Contractor);
- Records relating to any unexpected finds and contingency plans implemented (Remediation Contractor);
- Laboratory certificates and chain-of-custody documentation;
- Inspections records from the Environmental Consultant;
- Photographic records by all contractors and consultants of the works undertaken within their purview of responsibilities (Remediation Contractor);
- If capping adopted, surveys pre- and post-installation of geotextile marker layer and clean fill cap (Remediation Contractor;
- Airborne asbestos monitoring records (Remediation Contractor); and
- Interim / final visual and sampling clearances for any asbestos related works (Remediation Contractor).

17.2 **Reporting**

A validation assessment report will be prepared by the Environmental Consultant in accordance with NSW EPA (2020).

The validation report shall describe the remediation approach adopted, methodology, results and conclusion of the assessment and make a statement regarding the suitability of the site for the proposed mixed use residential and commercial land use).

18. **Conclusions**

It is considered that the site can be made suitable for the proposed mixed use residential and commercial land use development subject to implementation of this RAP.

On completion of remediation works, if residual contaminated soils are retained (outside of the proposed basement footprint) a long-term environmental management plan (EMP) may be required that is prepared in accordance with NSW EPA guidelines to outline management procedures for future works to maintain the integrity of the cap. The obligations within the EMP must be legally enforceable.

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WA DoH. (2021). *Guidelines for the Assessment, Remediation and Management of Asbestos-Contaminated Sites in Western Australia*. WA Department of Health.

20. Limitations

Douglas Partners Pty Ltd (Douglas) has prepared this report (or services) for this project at 79-81 Queens Road & 2-8 Spencer Street, Five Dock NSW in line with Douglas' proposal dated 16 May 2025 and acceptance received from Alexander Lekovski of DPG Project 37 Pty Ltd dated 28 May 2025. The work was carried out under Douglas' Engagement Terms. This report is provided for the exclusive use of DPG Project 37 Pty Ltd 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 Douglas, does so entirely at its own risk and without recourse to Douglas for any loss or damage. In preparing this report Douglas has necessarily relied upon information provided by the client and/or their agents.

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

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

The assessment of atypical safety hazards arising from this advice is restricted to the environmental components set out in this report and based on known project conditions and stated design advice and assumptions. While some recommendations for safe controls may be provided, detailed 'safety in design' assessment is outside the current scope of this report and requires additional project data and assessment.

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. Douglas 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 Douglas. This is because this report has been written as advice and opinion rather than instructions for construction.

Asbestos has detected by laboratory analysis in three borehole locations in fill materials. Building demolition materials such as brick and concrete observed in other locations which can be considered as indicative of the possible presence of hazardous building materials (HBM), including asbestos.

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

Appendix A

Drawings

About this Report

REV	DESCRIPTION/COMMENT	DATE	DRAWN BY
0	INITIAL ISSUE	18.06.2025	CL

SCALE: 0 5 10 15 20 m
1:400 @ A3

Douglas PARTNERS
OFFICE: SYDNEY
96-98 Hermitage Rd, West Ryde NSW 2114
(02)9809 0666

CLIENT:
Proposed Mixed Use Development

NOTE:
1: Basemap from Metromap (Dated 25.03.2024)

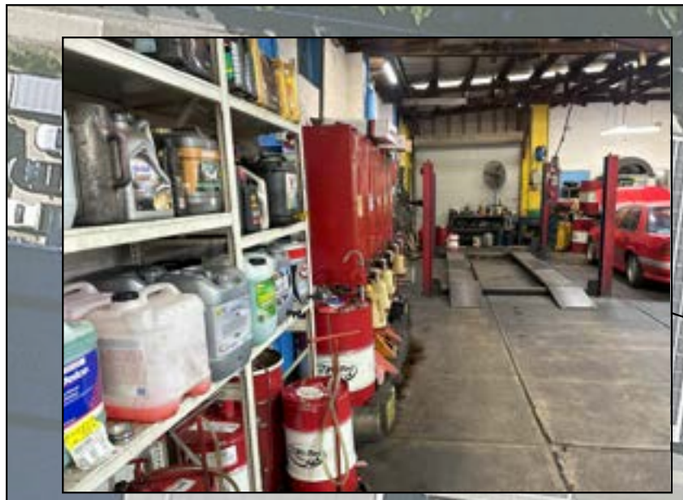
COORDINATE REFERENCE SYSTEM: GDA2020 / MGA zone 56

PROJECT NAME:
DPG Project 37 Pty Ltd

PROJECT ADRESS:
79-81 Queens Road & 2-8 Spencer Street, Five Dock

DRAWING TITLE:
TEST LOCATION PLAN

PROJECT NO: **224583.02**
DRAWING NO: **1**
REVISION: **0**



QUEENS ROAD

WILLIAM STREET

SPENCER STREET

BH103
BH101
BH111
BH112
S3
SVP112
Chemical Store 1
Chemical Store 2
BH102
BH104
S1
BH107
BH109
SVP106
BH106
BH105
SVP110
BH110

LEGEND

- Site Boundary
- Geotechnical Borehole - Rock Cored
- Geotechnical Borehole - Rock Cored with Monitoring Well
- Geotechnical Borehole - Hand Auger
- Environmental Borehole - Drill
- Environmental Borehole - Hand Auger
- Soil Vapour Pin Location
- Surface samples
- Dealership Office
- Car Dealership
- Chemical and Oil Store
- Auto Mechanic
- Possible Sump, Pit or Tank
- Oil Water Separator

REV	DESCRIPTION/COMMENT	DATE	DRAWN BY
0	INITIAL ISSUE	18.06.2025	CL

SCALE: 0 5 10 15 20 m
1:400 @ A3

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CLIENT:
Proposed Mixed Use Development

NOTE:
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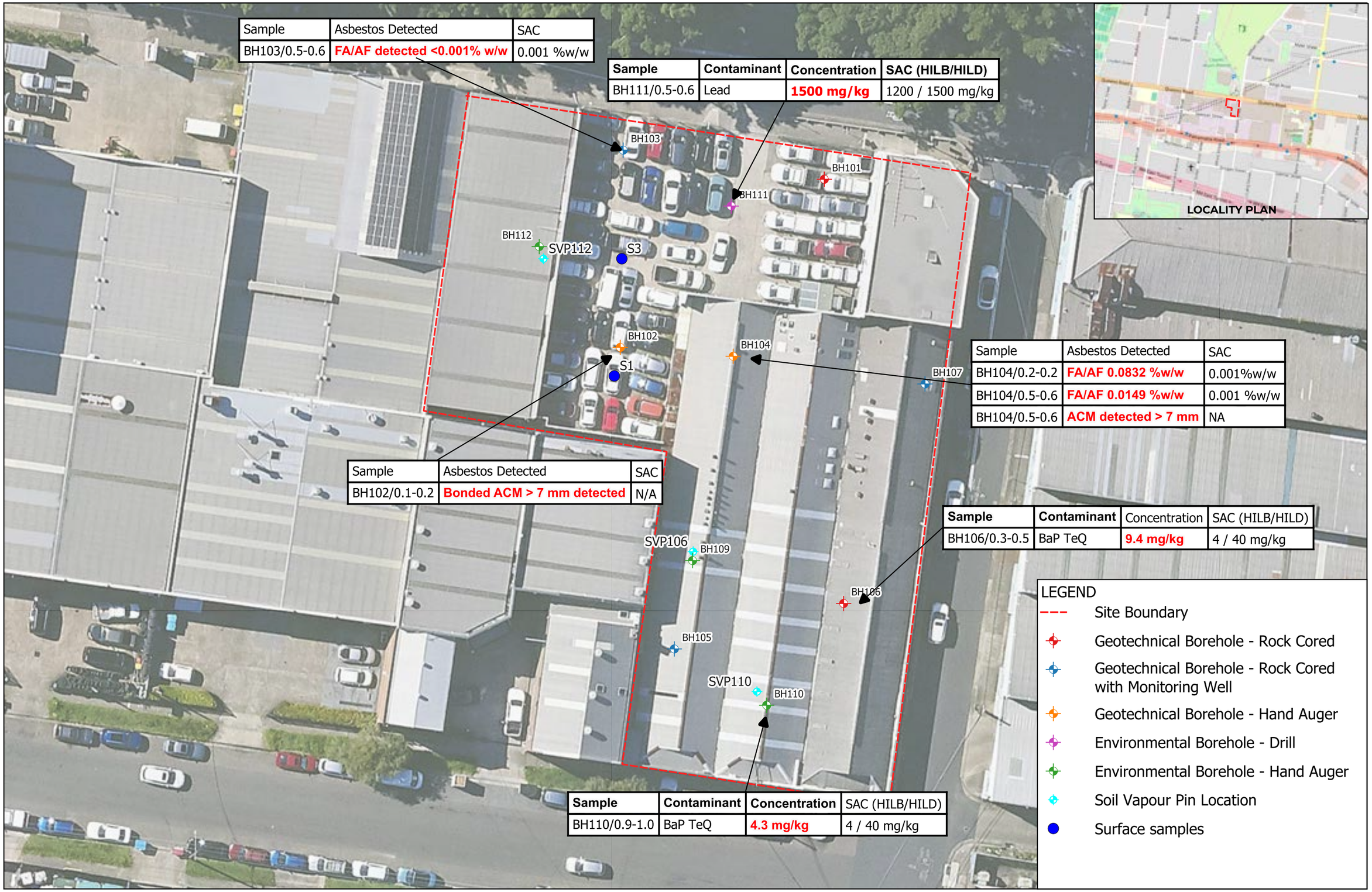
COORDINATE REFERENCE SYSTEM: GDA2020 / MGA zone 56

PROJECT NAME:
DPG Project 37 Pty Ltd

PROJECT ADRESS:
79-81 Queens Road & 2-8 Spencer Street, Five Dock

DRAWING TITLE:
Areas of Environmental Concern

PROJECT NO: **224583.03**
DRAWING NO: **2**
REVISION: **0**



Sample	Asbestos Detected	SAC
BH103/0.5-0.6	FA/AF detected <0.001% w/w	0.001 %w/w

Sample	Contaminant	Concentration	SAC (HILB/HILD)
BH111/0.5-0.6	Lead	1500 mg/kg	1200 / 1500 mg/kg

Sample	Asbestos Detected	SAC
BH104/0.2-0.2	FA/AF 0.0832 %w/w	0.001%w/w
BH104/0.5-0.6	FA/AF 0.0149 %w/w	0.001 %w/w
BH104/0.5-0.6	ACM detected > 7 mm	NA

Sample	Asbestos Detected	SAC
BH102/0.1-0.2	Bonded ACM > 7 mm detected	N/A

Sample	Contaminant	Concentration	SAC (HILB/HILD)
BH106/0.3-0.5	BaP TeQ	9.4 mg/kg	4 / 40 mg/kg

Sample	Contaminant	Concentration	SAC (HILB/HILD)
BH110/0.9-1.0	BaP TeQ	4.3 mg/kg	4 / 40 mg/kg

LEGEND

- Site Boundary
- Geotechnical Borehole - Rock Cored
- Geotechnical Borehole - Rock Cored with Monitoring Well
- Geotechnical Borehole - Hand Auger
- Environmental Borehole - Drill
- Environmental Borehole - Hand Auger
- Soil Vapour Pin Location
- Surface samples

REV	DESCRIPTION/COMMENT	DATE	DRAWN BY
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CLIENT: **Proposed Mixed Use Development**

NOTE:
1: Basemap from Metromap (Dated 25.03.2024)

COORDINATE REFERENCE SYSTEM: GDA2020 / MGA zone 56

PROJECT NAME: **DPG Project 37 Pty Ltd**

PROJECT ADRESS: **79-81 Queens Road & 2-8 Spencer Street, Five Dock**

DRAWING TITLE: **Asbestos Detections and HIL Exceedances**

PROJECT NO: **224583.03**

DRAWING NO: **3**

REVISION: **0**

LEGEND

- Site Boundary
- Geotechnical Borehole - Rock Cored
- Geotechnical Borehole - Rock Cored with Monitoring Well
- Geotechnical Borehole - Hand Auger
- Environmental Borehole - Drill
- Environmental Borehole - Hand Auger
- Soil Vapour Pin Location
- Surface samples
- Chemical and Oil Store
- Area of Asbestos Previous Detection
- Possible Sump, Pit or Tank
- Oil Water Separator
- Proposed Chemical Store / Oil Water Separator Validation Sample
- Proposed Post Demolition Test Pits

REV	DESCRIPTION/COMMENT	DATE	DRAWN BY
0	INITIAL ISSUE	18.06.2025	CL

SCALE: 0 5 10 15 20 m — 1:400 @ A3

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CLIENT:
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NOTE:
1: Basemap from Metromap (Dated 25.03.2024)

COORDINATE REFERENCE SYSTEM: GDA2020 / MGA zone 56

PROJECT NAME:
DPG Project 37 Pty Ltd

PROJECT ADRESS:
79-81 Queens Road & 2-8 Spencer Street, Five Dock

DRAWING TITLE:
Proposed Data Gap and Surface Validation Sample Locations

PROJECT NO: **224583.03**

DRAWING NO: **4**

REVISION: **0**

About this Report

November 2023

Introduction

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

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

Copyright

Borehole and Test Pit Logs

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

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

Groundwater

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

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

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

Reports

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

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

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

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

continued next page

About this Report

Site Anomalies

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

Information for Contractual Purposes

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

Site Inspection

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

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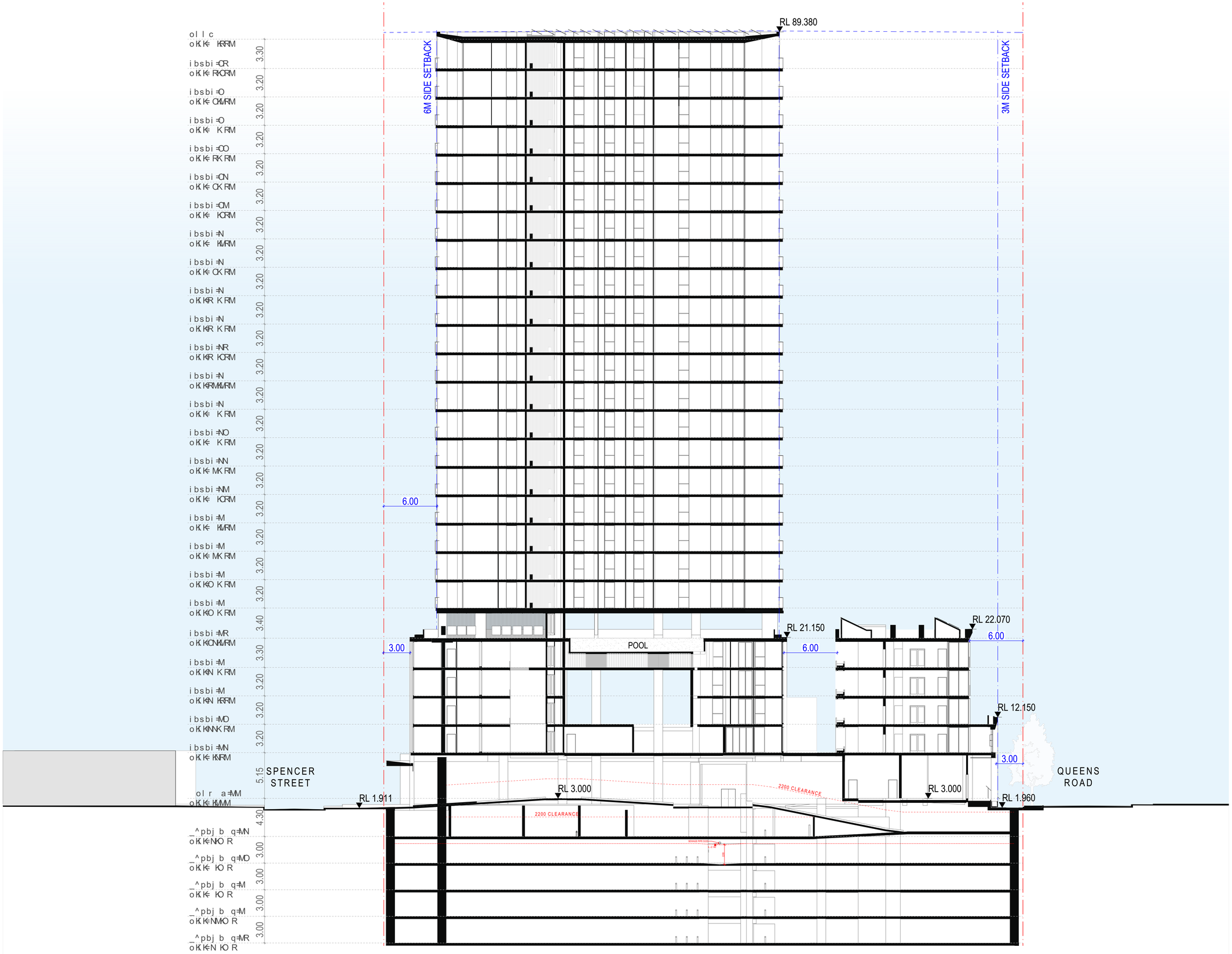
Appendix B

Section and Basement Drawings



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E	4/02/2026	FOR INFORMATION	LS	JW
F	5/02/2026	FOR INFORMATION	LS	JW
G	10/02/2026	FOR INFORMATION	LS	JW

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LAND AND FORM
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PROJECT TITLE
DPG 37
79-81 QUEENS ROAD & 2-8 SPENCER STREET
FIVE DOCK

CLIENT
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APPROVED	CHECKED	DRAWN
JW	JW	LS

DRAWING TITLE
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PROJECT NUMBER
20830

STAGE
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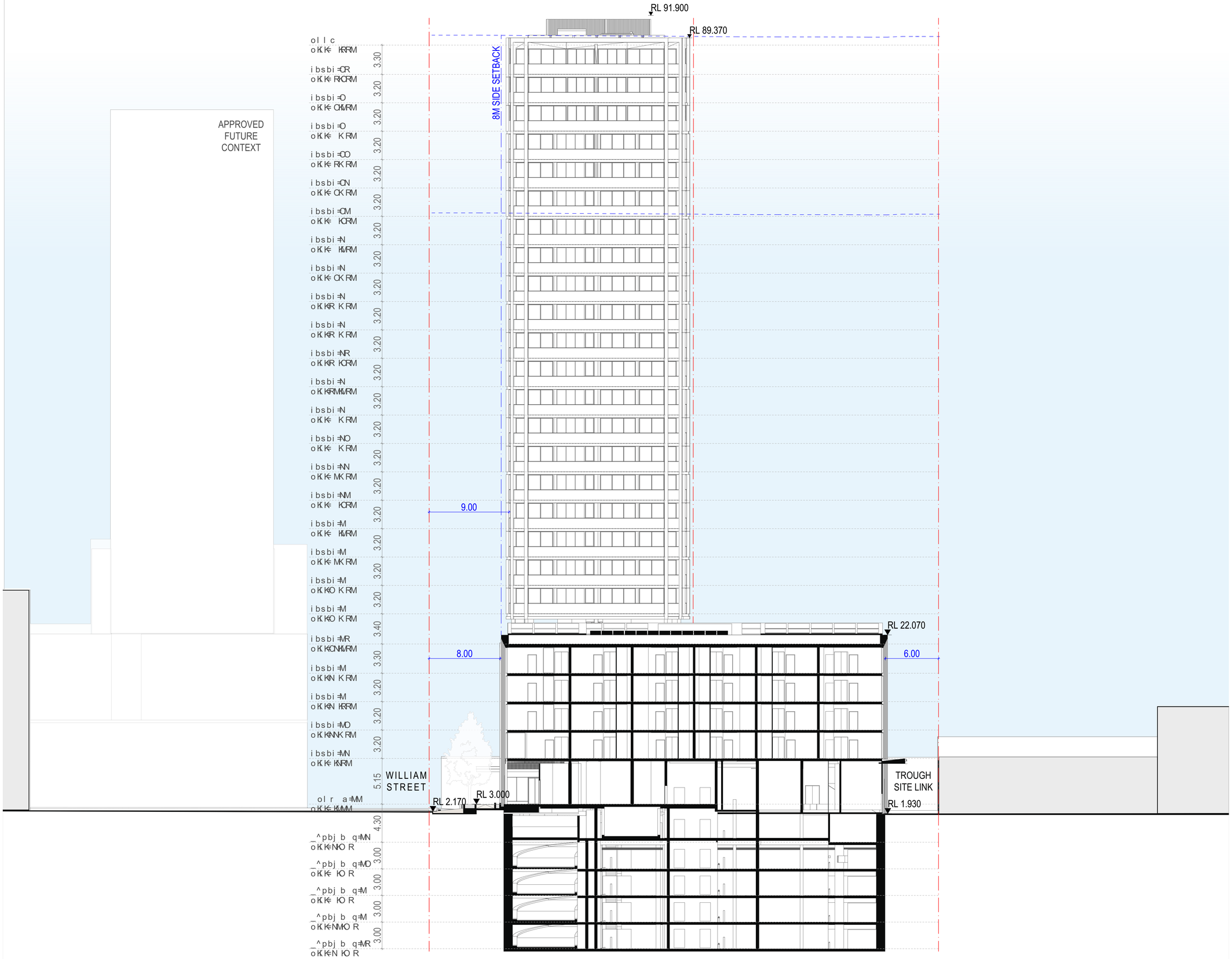
REVISION



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JW	JW	LS

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NORTH POINT

PROJECT NUMBER
20830

STAGE
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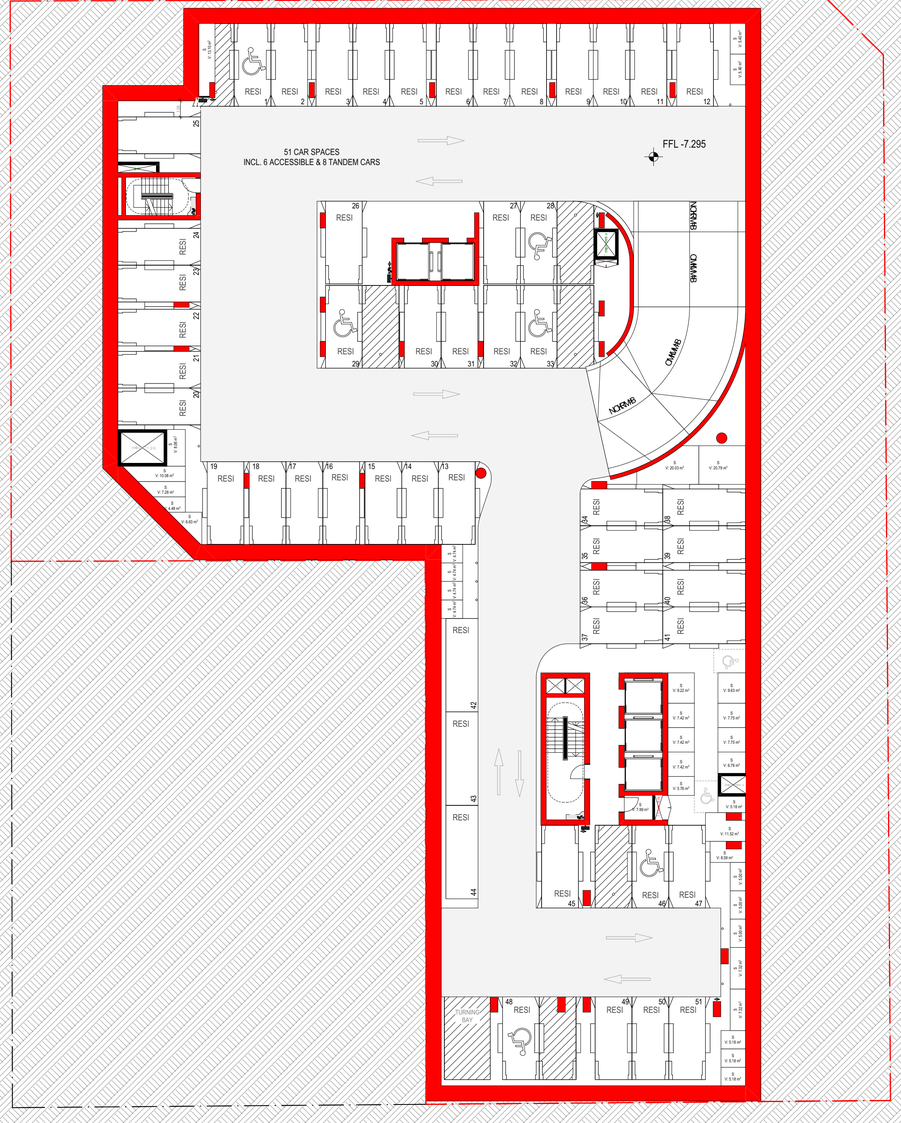
REVISION



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DRAWING TITLE

BASEMENT 5-3

SCALE

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PROJECT NUMBER

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STAGE

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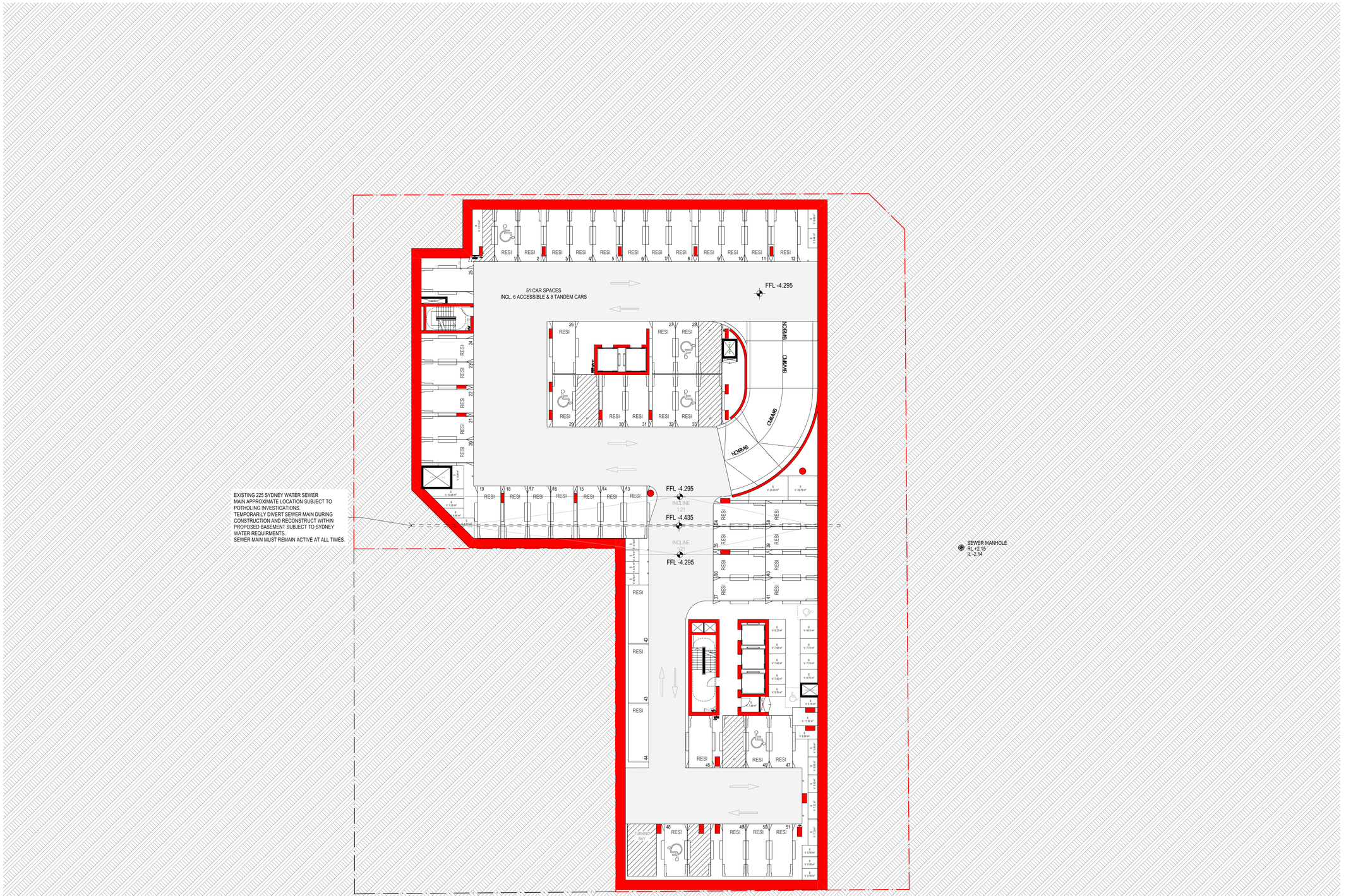

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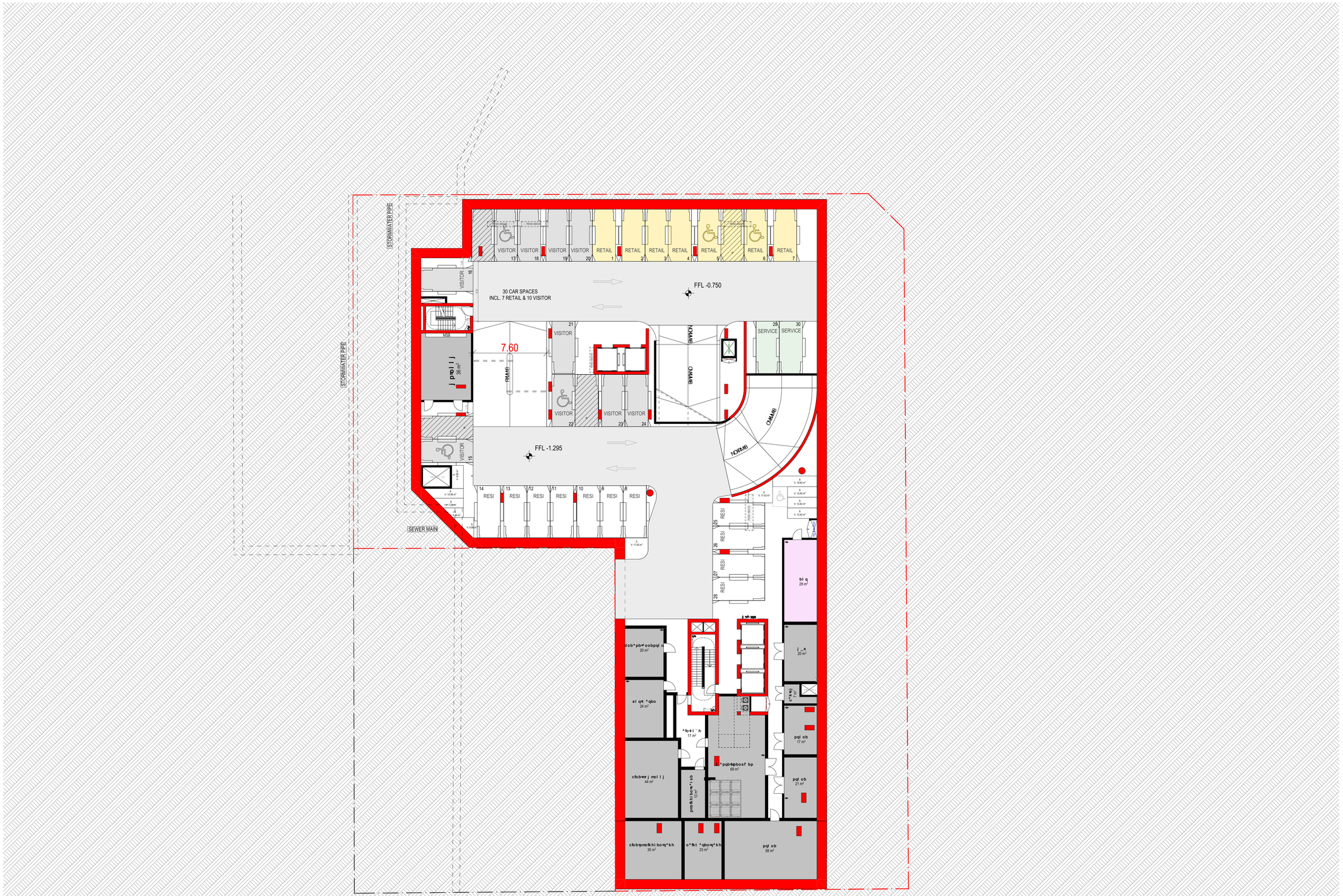

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DRAWING TITLE
BASEMENT 1

SCALE
1:200 @ A1 Size

NORTH POINT

PROJECT NUMBER
20830

STAGE
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DRAWING NUMBER
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REVISION

Appendix C

Tabulated Summary Results from Previous Report

Douglas PARTNERS

Table C1: Results of Soil Testing

				Priority metals								Priority PAH				Priority TRH					
				Total Arsenic	Cadmium	Total Chromium	Copper	Lead	Mercury (inorganic)	Nickel	Zinc	Naphthalene [b]	Benzo(a)pyrene (B(a)P)	Benzo(a)pyrene TEQ (B(a)P TEQ)	Total PAH	TRH C6 - C10	TRH >C10-C16	F1 ((C6-C10)-BTEX)	F2 (>C10-C16 less Naphthalene)	F3 (>C16-C34)	F4 (>C34-C40)
			PQL	4	0.4	1	1	1	0.1	1	1	1	0.05	0.5	0.05	25	50	25	50	100	100
Sample ID	Soil Matrix	Depth	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
HIL B / HSL D				**500**	**150**	**500**	**30,000**	**1,200**	**120**	**1,200**	**60,000**	**5**		**4**	**400**	**-**	**-**	**50**	**280**	**-**	**-**
EIL / ESL B				**100**		**410**	**240**	**1,100**		**300**	**900**	**170**	**0.7**			**-**	**120**	**180**	**-**	**1300**	**5600**
HILB for PFAS																**-**	**-**	**-**	**-**	**-**	**-**
EGV for PFAS																**-**	**-**	**-**	**-**	**-**	**-**
Management Limits (ML A, B, C)																800	1,000	-	-	3,500	10,000
HSL Direct Contact (DC HSL-B)												2,200				-	-	5,600	4,200	5,800	8,100
HSL Direct Contact Intrusive Maintenance Worker (DC - HSL IMW)												29,000				-	-	82,000	62,000	85,000	120,000
BH101	Fill	0.5 - 0.6 m	01/05/24	**7**	<0.4	**15**	**20**	**43**	<0.1	**5**	**53**	<1	**0.54**	**0.7**	**3.1**	<25	<50	<25	<50	<100	<100
BH101	Natural	0.9 - 1 m	01/05/24	**12**	<0.4	**8**	**2**	**7**	<0.1	**1**	**5**	<1	<0.05	<0.5	<0.05	<25	<50	<25	<50	<100	<100
BH102	Fill	0.1 - 0.2 m	29/04/24	**8**	<0.4	**13**	**8**	**19**	<0.1	**4**	**32**	<1	**0.08**	<0.5	**0.3**	<25	<50	<25	<50	<100	<100
BH102 - [TRIPLICATE]	Fill	0.1 - 0.2 m	29/04/24	**5**	<0.4	**23**	**33**	**57**	<0.1	**14**	**210**	-	-	-	-	-	-	-	-	-	-
BH102	Natural	1.5 - 1.6 m	29/04/24	**10**	<0.4	**17**	**14**	**70**	<0.1	**11**	**28**	<1	**0.4**	**0.5**	**4.3**	<25	<50	<25	<50	**120**	<100
BH103	Fill	0.5 - 0.6 m	29/04/24	**8**	<0.4	**38**	**20**	**110**	<0.1	**28**	**110**	<1	**1.2**	**1.7**	**11**	<25	<50	<25	<50	**160**	**120**
BH103	Natural	3 - 3.1 m	29/04/24	<4	<0.4	**15**	**3**	**24**	<0.1	**4**	**3**	<1	<0.05	<0.5	<0.05	<25	<50	<25	<50	<100	<100
BH104	Fill	0.2 - 0.3 m	13/05/24	**8**	<0.4	**14**	**35**	**160**	**0.2**	**11**	**130**	<0.1	**0.84**	**1.2**	**7**	<25	<50	<25	<50	**100**	<100
BH104 - [TRIPLICATE]	Fill	0.2 - 0.3 m	13/05/24	**6**	<0.4	**12**	**39**	**250**	<0.1	**18**	**74**	-	-	-	-	-	-	-	-	-	-
BH104	Fill	0.5 - 0.6 m	13/05/24	**15**	<0.4	**15**	**31**	**120**	<0.1	**10**	**75**	<0.1	**1.1**	**1.9**	**15**	<25	<50	<25	<50	**120**	<100
BH105	Fill	0.5 - 0.6 m	14/05/24	**7**	<0.4	**21**	**21**	**56**	**0.2**	**13**	**53**	<0.1	**0.93**	**1.4**	**11**	<25	<50	<25	<50	<100	<100
BH105	Fill	0.9 - 1 m	14/05/24	**7**	<0.4	**8**	<1	**6**	<0.1	**1**	**2**	<0.1	<0.05	<0.5	<0.05	<25	<50	<25	<50	<100	<100
BD1/20240514	Fill	0.9 - 1 m	14/05/24	**31**	<1	**18**	<5	**12**	<0.1	**4**	**6**	<0.5	<0.5	<0.5	<0.5	-	-	-	-	-	-
BH105	Natural	4.4 - 4.5 m	14/05/24	<4	<0.4	**5**	**5**	**8**	<0.1	**1**	**11**	<0.1	<0.05	<0.5	<0.05	<25	<50	<25	<50	<100	<100
BH106	Fill	0.3 - 0.5 m	21/05/24	**8**	<0.4	**11**	**72**	**110**	<0.1	**11**	**61**	<1	**5.9**	**9.4**	**81**	<25	<50	<25	<50	**260**	**100**
BH106 - [TRIPLICATE]	Fill	0.3 - 0.5 m	21/05/24	**9**	<0.4	**13**	**26**	**33**	<0.1	**6**	**54**	-	-	-	-	-	-	-	-	-	-
BH106	Natural	0.9 - 1 m	21/05/24	**10**	<0.4	**16**	**34**	**50**	<0.1	**8**	**78**	<1	**2.1**	**3**	**20**	<25	<50	<25	<50	<100	<100
BH107	Fill	0.5 - 0.6 m	23/05/24	**13**	<0.4	**13**	**69**	**300**	<0.1	**5**	**55**	<1	**2.1**	**3.2**	**23**	<25	<50	<25	<50	<100	<100
BH107	Natural	0.9 - 1 m	23/05/24	**10**	<0.4	**3**	**11**	**13**	<0.1	**6**	**16**	<1	**1.4**	**2**	**22**	<25	<50	<25	<50	<100	<100
BH109	Fill	0.1 - 0.2 m	24/04/24	<4	<0.4	**10**	**61**	**76**	**1.1**	**13**	**58**	<1	<0.05	<0.5	<0.05	<25	<50	<25	<50	<100	<100
BD1/240424	Fill	0.1 - 0.2 m	24/04/24	<4	<0.4	**9**	**30**	**50**	**0.7**	**10**	**53**	<1	**0.05**	<0.5	**0.05**	<25	-	<25	-	-	-
BH109	Fill	1 - 1.1 m	24/04/24	**13**	<0.4	**30**	**16**	**49**	<0.1	**8**	**33**	<1	**2.6**	**3.5**	**28**	<25	<50	<25	<50	<100	<100
BH110	Fill	0.4 - 0.5 m	24/04/24	**9**	**0.5**	**18**	**21**	**46**	**0.1**	**7**	**260**	<1	**0.3**	<0.5	**3.2**	<25	<50	<25	<50	<100	<100
BH110	Fill	0.9 - 1 m	24/04/24	**9**	**0.4**	**19**	**63**	**100**	**0.1**	**9**	**490**	<1	**3.1**	**4.3**	**39**	<25	<50	<25	<50	**140**	<100

Table C1: Results of Soil Testing

				Priority metals								Priority PAH				Priority TRH					
				Total Arsenic	Cadmium	Total Chromium	Copper	Lead	Mercury (inorganic)	Nickel	Zinc	Naphthalene [b]	Benzo(a)pyrene (B(a)P)	Benzo(a)pyrene TEQ (B(a)P TEQ)	Total PAH	TRH C6 - C10	TRH >C10-C16	F1 ((C6-C10)-BTEX)	F2 (>C10-C16 less Naphthalene)	F3 (>C16-C34)	F4 (>C34-C40)
			PQL	4	0.4	1	1	1	0.1	1	1	1	0.05	0.5	0.05	25	50	25	50	100	100
Sample ID	Soil Matrix	Depth	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
BH111	Fill	0.5 - 0.6 m	29/04/24	**11**	<0.4	**13**	**35**	**1,500**	**0.4**	**14**	**120**	<1	**0.8**	**1.1**	**8.1**	<25	<50	<25	<50	<100	<100
BH111 - [TRIPLICATE]	Fill	0.5 - 0.6 m	29/04/24	**8**	<0.4	**13**	**34**	**1000**	**0.2**	**10**	**110**	-	-	-	-	-	-	-	-	-	-
BH111	Natural	1.5 - 1.6 m	29/04/24	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH112	Fill	0.2 - 0.3 m	24/04/24	**10**	<0.4	**19**	**100**	**610**	<0.1	**18**	**410**	<1	**1.9**	**2.6**	**14**	<25	<50	<25	<50	<100	<100
BH112	Fill	1 - 1.1 m	24/04/24	**9**	<0.4	**20**	**18**	**53**	<0.1	**8**	**71**	<1	**0.82**	**1**	**7**	<25	<50	<25	<50	<100	<100
S1	Fill	0 - 0.05 m	24/04/24	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
S3	Fill	0 - 0.05 m	24/04/24	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

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 **Red** = EGV-indirect exceedance HSL 0-<1 Exceedance

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

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

Notes:

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

b Naphthalene reported as highest detection from the BTEXN or PAH suite, or if both results <PQL as lowest PQL

c EIL criteria applies to DDT only

Site Assessment Criteria (SAC):

SAC based on generic land use thresholds for Residential B with minimal opportunities for soil access

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

HIL	HIL-B (NEPC, 2013 or HEPA, 2020 (PFAS only))	EGV	EGV, all land uses, direct exposure (HEPA, 2020)
HSL (vapour intrusion)	HSL-A/B (NEPC, 2013)	ESL	Urban Residential and Public Open Space (NEPC, 2013)
DC	Direct contact HSL B Residential (High density) (CRC CARE, 2011)	ML	Residential, Parkland and Public Open Space (NEPC, 2013)
		EGV-Indir	EGV, all land uses, Indirect exposure (HEPA, 2020)

Table C1: Results of Soil Testing

				BTEX				Priority phenols	Priority OCP									Priority OPP	PCB
				Benzene	Toluene	Ethylbenzene	Total Xylenes	Total Phenolics	DDT+DDE+DDDc	Aldrin + Dieldrin	Total Chlordane	Total Endosulfan	Endrin	Heptachlor	Hexachlorobenzene	Methoxychlor	Mirex	Chlorpyriphos	Total PCB
			PQL	0.2	0.5	1	1	5	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Sample ID	Soil Matrix	Depth	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
Site Assessment Criteria																			
HIL B / HSL D				**0.7**	**480**	**NL**	**110**	**130**	**600**	**10**	**90**	**400**	**20**	**10**	**15**	**500**	**20**	**340**	**1**
EIL / ESL B				**65**	**105**	**125**	**45**	**-**	**180**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
HILB for PFAS				**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
EGV for PFAS				**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
Management Limits (ML A, B, C)				-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
HSL Direct Contact (DC HSL-B)				**140**	**21,000**	**5,900**	**17,000**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
HSL Direct Contact Intrusive Maintenance Worker (DC - HSL IMW)				**1,100**	**120,000**	**85,000**	**130,000**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
Results																			
BH101	Fill	0.5 - 0.6 m	01/05/24	<0.2	<0.5	<1	<1	<5	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
BH101	Natural	0.9 - 1 m	01/05/24	<0.2	<0.5	<1	<1	-	-	-	-	-	-	-	-	-	-	-	-
BH102	Fill	0.1 - 0.2 m	29/04/24	<0.2	<0.5	<1	<1	<5	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
BH102 - [TRIPLICATE]	Fill	0.1 - 0.2 m	29/04/24	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH102	Natural	1.5 - 1.6 m	29/04/24	<0.2	<0.5	<1	<1	-	-	-	-	-	-	-	-	-	-	-	-
BH103	Fill	0.5 - 0.6 m	29/04/24	<0.2	<0.5	<1	<1	<5	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
BH103	Natural	3 - 3.1 m	29/04/24	<0.2	<0.5	<1	<1	-	-	-	-	-	-	-	-	-	-	-	-
BH104	Fill	0.2 - 0.3 m	13/05/24	<0.2	<0.5	<1	<1	<5	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
BH104 - [TRIPLICATE]	Fill	0.2 - 0.3 m	13/05/24	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH104	Fill	0.5 - 0.6 m	13/05/24	<0.2	<0.5	<1	<1	-	-	-	-	-	-	-	-	-	-	-	-
BH105	Fill	0.5 - 0.6 m	14/05/24	<0.2	<0.5	<1	<1	<5	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
BH105	Fill	0.9 - 1 m	14/05/24	<0.2	<0.5	<1	<1	-	-	-	-	-	-	-	-	-	-	-	-
BD1/20240514	Fill	0.9 - 1 m	14/05/24	<0.2	<0.5	<0.5	<0.5	-	-	-	-	-	-	-	-	-	-	-	-
BH105	Natural	4.4 - 4.5 m	14/05/24	<0.2	<0.5	<1	<1	-	-	-	-	-	-	-	-	-	-	-	-
BH106	Fill	0.3 - 0.5 m	21/05/24	<0.2	<0.5	<1	<1	<5	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
BH106 - [TRIPLICATE]	Fill	0.3 - 0.5 m	21/05/24	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH106	Natural	0.9 - 1 m	21/05/24	<0.2	<0.5	<1	<1	-	-	-	-	-	-	-	-	-	-	-	-
BH107	Fill	0.5 - 0.6 m	23/05/24	<0.2	<0.5	<1	<1	<5	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
BH107	Natural	0.9 - 1 m	23/05/24	<0.2	<0.5	<1	<1	-	-	-	-	-	-	-	-	-	-	-	-
BH109	Fill	0.1 - 0.2 m	24/04/24	<0.2	<0.5	<1	<1	<5	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
BD1/240424	Fill	0.1 - 0.2 m	24/04/24	<0.2	<0.5	<1	<1	-	-	-	-	-	-	-	-	-	-	-	-
BH109	Fill	1 - 1.1 m	24/04/24	<0.2	<0.5	<1	<1	-	-	-	-	-	-	-	-	-	-	-	-
BH110	Fill	0.4 - 0.5 m	24/04/24	<0.2	<0.5	<1	<1	<5	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
BH110	Fill	0.9 - 1 m	24/04/24	<0.2	<0.5	<1	<1	-	-	-	-	-	-	-	-	-	-	-	-

Table C1: Results of Soil Testing

				BTEX				Priority phenols	Priority OCP									Priority OPP	PCB
				Benzene	Toluene	Ethylbenzene	Total Xylenes	Total Phenolics	DDT+DDE+DDDc	Aldrin + Dieldrin	Total Chlordane	Total Endosulfan	Endrin	Heptachlor	Hexachlorobenzene	Methoxychlor	Mirex	Chlorpyriphos	Total PCB
			PQL	0.2	0.5	1	1	5	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Sample ID	Soil Matrix	Depth	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
BH111	Fill	0.5 - 0.6 m	29/04/24	<0.2	<0.5	<1	<1	<5	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
BH111 - [TRIPLICATE]	Fill	0.5 - 0.6 m	29/04/24	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH111	Natural	1.5 - 1.6 m	29/04/24	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH112	Fill	0.2 - 0.3 m	24/04/24	<0.2	<0.5	<1	<1	<5	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
BH112	Fill	1 - 1.1 m	24/04/24	<0.2	<0.5	<1	<1	-	-	-	-	-	-	-	-	-	-	-	-
S1	Fill	0 - 0.05 m	24/04/24	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
S3	Fill	0 - 0.05 m	24/04/24	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

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 **Red** = EGV-indirect exceedance HSL 0-<1 Exceedance

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

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

Notes:

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

b Naphthalene reported as highest detection from the BTEXN or PAH suite, or if both results <PQL as lowest PQL

c EIL criteria applies to DDT only

Site Assessment Criteria (SAC):

SAC based on generic land use thresholds for Residential B with minimal opportunities for soil access

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

HIL	HIL-B (NEPC, 2013 or HEPA, 2020 (PFAS only))	EGV	EGV, all land uses, direct exposure (HEPA, 2020)
HSL (vapour intrusion)	HSL-A/B (NEPC, 2013)	ESL	Urban Residential and Public Open Space (NEPC, 2013)
DC	Direct contact HSL B Residential (High density) (CRC CARE, 2011)	ML	Residential, Parkland and Public Open Space (NEPC, 2013)
		EGV-Indir	EGV, all land uses, Indirect exposure (HEPA, 2020)

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Table C1: Results of Soil Testing

				PFAS							Asbestos ID-soils		Asbestos ID - soils NEPM							
				Total Positive PFAS	PFOA	PFOS + PFHxS	PFOS	PFHxS	6:2 FTS	8:2 FTS	Asbestos ID in soil >0.1g/kg	Trace Analysis (AS)	Asbestos ID in soil >0.1g/kg	Asbestos ID in soil <0.1g/kg	Trace Analysis (NEPC)	ACM >7mm Estimation	ACM >7mm Estimation	FA and AF Estimation	FA and AF Estimation	Total Asbestos#1
			PQL	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002							0.01		0.001	0.1
Sample ID	Soil Matrix	Depth	Sample Date	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	-	-	-	-	-	g	%(w/w)	g	%(w/w)	g/kg
HIL B / HSL D				-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	**0.001**	-
EIL / ESL B				-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
HILB for PFAS				-	**20**	**2**	-	-	-	-	-	-	-	-	-	-	-	-	-	-
EGV for PFAS				-	**10 / 0.003**	-	**1 / 0.003**	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Management Limits (ML A, B, C)				-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
HSL Direct Contact (DC HSL-B)				-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
HSL Direct Contact Intrusive Maintenance Worker (DC - HSL IMW)				-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH101	Fill	0.5 - 0.6 m	01/05/24	-	-	-	-	-	-	-	-	-	NAD	NAD	NAD	-	-	-	<0.001	<0.1
BH101	Natural	0.9 - 1 m	01/05/24	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH102	Fill	0.1 - 0.2 m	29/04/24	-	-	-	-	-	-	-	-	-	NAD	**Chrysotile Detected**	NAD	**0.0138**	-	-	<0.001	<0.1
BH102 - [TRIPLICATE]	Fill	0.1 - 0.2 m	29/04/24	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH102	Natural	1.5 - 1.6 m	29/04/24	-	-	-	-	-	-	-	NAD	NAD	-	-	-	-	-	-	-	-
BH103	Fill	0.5 - 0.6 m	29/04/24	**0.0031**	**0.0005**	**0.0025**	**0.0024**	**0.0002**	<0.0001	<0.0002	-	-	NAD	**Chrysotile Detected**	NAD	-	-	**0.0007**	<0.001	<0.1
BH103	Natural	3 - 3.1 m	29/04/24	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH104	Fill	0.2 - 0.3 m	13/05/24	-	-	-	-	-	-	-	-	-	**Chrysotile Detected**	NAD	NAD	**2.5793**	**0.4817**	**0.4455**	**0.0832**	**5.6485**
BH104 - [TRIPLICATE]	Fill	0.2 - 0.3 m	13/05/24	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH104	Fill	0.5 - 0.6 m	13/05/24	-	-	-	-	-	-	-	-	-	**Chrysotile Detected**	NAD	NAD	**0.0395**	<0.01	**0.0918**	**0.0149**	**0.2129**
BH105	Fill	0.5 - 0.6 m	14/05/24	-	-	-	-	-	-	-	-	-	NAD	NAD	NAD	-	<0.01	-	<0.001	<0.1
BH105	Fill	0.9 - 1 m	14/05/24	-	-	-	-	-	-	-	-	-	NAD	NAD	NAD	-	<0.01	-	<0.001	<0.1
BD1/20240514	Fill	0.9 - 1 m	14/05/24	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH105	Natural	4.4 - 4.5 m	14/05/24	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH106	Fill	0.3 - 0.5 m	21/05/24	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0002	-	-	NAD	NAD	NAD	-	-	-	<0.001	<0.1
BH106 - [TRIPLICATE]	Fill	0.3 - 0.5 m	21/05/24	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH106	Natural	0.9 - 1 m	21/05/24	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH107	Fill	0.5 - 0.6 m	23/05/24	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0002	-	-	NAD	NAD	NAD	-	-	-	<0.001	<0.1
BH107	Natural	0.9 - 1 m	23/05/24	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH109	Fill	0.1 - 0.2 m	24/04/24	-	-	-	-	-	-	-	-	-	NAD	NAD	NAD	-	-	-	<0.001	<0.1
BD1/240424	Fill	0.1 - 0.2 m	24/04/24	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH109	Fill	1 - 1.1 m	24/04/24	-	-	-	-	-	-	-	NAD	NAD	-	-	-	-	-	-	-	-
BH110	Fill	0.4 - 0.5 m	24/04/24	-	-	-	-	-	-	-	-	-	NAD	NAD	NAD	-	-	-	<0.001	<0.1
BH110	Fill	0.9 - 1 m	24/04/24	-	-	-	-	-	-	-	NAD	NAD	-	-	-	-	-	-	-	-

Table C1: Results of Soil Testing

				PFAS							Asbestos ID-soils		Asbestos ID - soils NEPM							
				Total Positive PFAS	PFOA	PFOS + PFHxS	PFOS	PFHxS	6:2 FTS	8:2 FTS	Asbestos ID in soil >0.1g/kg	Trace Analysis (AS)	Asbestos ID in soil >0.1g/kg	Asbestos ID in soil <0.1g/kg	Trace Analysis (NEPC)	ACM >7mm Estimation	ACM >7mm Estimation	FA and AF Estimation	FA and AF Estimation	Total Asbestos#1
			PQL	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002							0.01		0.001	0.1
Sample ID	Soil Matrix	Depth	Sample Date	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	-	-	-	-	-	g	%(w/w)	g	%(w/w)	g/kg
BH111	Fill	0.5 - 0.6 m	29/04/24	-	-	-	-	-	-	-	-	-	NAD	NAD	NAD	-	-	-	<0.001	<0.1
BH111 - [TRIPLICATE]	Fill	0.5 - 0.6 m	29/04/24	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH111	Natural	1.5 - 1.6 m	29/04/24	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0002	-	-	-	-	-	-	-	-	-	-
BH112	Fill	0.2 - 0.3 m	24/04/24	**0.0012**	**0.0003**	**0.0009**	**0.0007**	**0.0002**	<0.0001	<0.0002	-	-	NAD	NAD	NAD	-	-	-	<0.001	<0.1
BH112	Fill	1 - 1.1 m	24/04/24	-	-	-	-	-	-	-	NAD	NAD	-	-	-	-	-	-	-	-
S1	Fill	0 - 0.05 m	24/04/24	-	-	-	-	-	-	-	-	-	NAD	NAD	NAD	-	-	-	<0.001	<0.1
S3	Fill	0 - 0.05 m	24/04/24	-	-	-	-	-	-	-	-	-	NAD	NAD	NAD	-	-	-	<0.001	<0.1

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 **Red** = EGV-indirect exceedance HSL 0-<1 Exceedance

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

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

Notes:

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

b Naphthalene reported as highest detection from the BTEXN or PAH suite, or if both results <PQL as lowest PQL

c EIL criteria applies to DDT only

Site Assessment Criteria (SAC):

SAC based on generic land use thresholds for Residential B with minimal opportunities for soil access

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

HIL	HIL-B (NEPC, 2013 or HEPA, 2020 (PFAS only))	EGV	EGV, all land uses, direct exposure (HEPA, 2020)
HSL (vapour intrusion)	HSL-A/B (NEPC, 2013)	ESL	Urban Residential and Public Open Space (NEPC, 2013)
DC	Direct contact HSL B Residential (High density) (CRC CARE, 2011)	ML	Residential, Parkland and Public Open Space (NEPC, 2013)
		EGV-Indir	EGV, all land uses, Indirect exposure (HEPA, 2020)

Table C2: Results of Groundwater Testing

		Metals - Dissolved								TRH				BTEX						PAH														
		Total Arsenic	Cadmium	Total Chromium	Copper	Lead	Mercury (inorganic)	Nickel	Zinc	F1 ((C6-C10) BTEX)	F2 (>C10-C16 less Naphthalene)	F3 (>C16-C34)	F4 (>C34-C40)	Benzene	Toluene	Ethylbenzene	o-Xylene	m+p-Xylene	Total Xylenes	Acenaphthene	Acenaphthylene	Anthracene	Benzo(a)anthracene	Naphthalene	Benzo(a)pyrene (BaP)	Benzo(b+j)fluoranthene	Benzo(g,h,i)perylene	Chrysene	Dibenz(a,h)anthracene	Fluoranthene	Fluorene	Indeno(1,2,3-cd)pyrene	Phenanthrene	Pyrene	Sum of detected PAH
	PQL	1	0.1	1	1	1	0.05	1	1	10	50	100	100	1	1	1	1	2	1	0.1	0.1	0.1	0.1	1	0.1	0.2	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
ANZG (2018) 95% LOP Fresh		13	0.2	1	1.4	3.4	**0.06**	11	8					950	180	80	350	75				**0.01**		16	**0.1**					**1**			**0.6**		
HEPA (2020) 99% LOP Fresh																																			
NEPC (2013) HSL 2-4m										NL	NL			30000	NL	NL			NL					NL										
Sample ID	Sample Date	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
BH103	07/06/24	<1	<0.1	<1	**4**	<1	<0.05	**4**	**50**	<10	<50	<100	<100	<1	<1	<1	<1	<2	<1	<0.1	<0.1	<0.1	<0.1	<1	<0.1	<0.2	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
BD1/20240607	07/06/24	<1	<0.1	<1	**3**	<1	<0.05	**4**	**44**	<10	<50	<100	<100	<1	<1	<1	<1	<2	<1	<0.1	<0.1	<0.1	<0.1	<1	<0.1	<0.2	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
BH105	07/06/24	**1**	<0.1	<1	**2**	**1**	<0.05	**2**	**58**	<10	<50	**110**	<100	<1	<1	<1	<1	<2	<1	<0.1	<0.1	<0.1	<0.1	<1	<0.1	<0.2	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
BH107	07/06/24	**1**	<0.1	<1	<1	<1	<0.05	**10**	**34**	<10	**130**	<100	<100	<1	<1	<1	<1	<2	<1	<0.1	<0.1	<0.1	<0.1	<1	<0.1	<0.2	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1

Notes:

- No criterion / not defined / not tested / not applicable
* QA/QC replicate of sample listed directly below the primary sample
NL Not limiting
PQL Practical quantitation limit
Shaded cell is exceedance of guideline value
Where one or more guideline value is exceeded, the cell is shaded to the colour of the highest guideline value exceeded
NEPC (2013) National Environment Protection (Assessment of Site Contamination) Measure 1999 (as amended 2013), health screening level Clay 2-4m
ANZG (2018) Australian and New Zealand Guidelines for Fresh and Marine Water Quality, 95% level of protection of species for Fresh aquatic ecosystems [NB: 99% level of protection adopted for bioaccumulative chemicals]
HEPA (2018) PFAS National Environmental Management Plan, Version 2 99% level of protection for Fresh water aquatic ecosystems
NHMRC (2018) Australian Drinking Water Guidelines 6 2011, drinking water aesthetic-based criteria
ANZG (2018) Australian and New Zealand Guidelines for Fresh and Marine Water Quality, orange text is 'unknown' level of protection
Underlining of ANZG (2018) criteria indicates a criteria with an 'unknown' level of protection.
ANZG (2018) DGV adopted for most conservative species of following analytes: DGV for xylene (m) adopted for xylene (m+p); DGV for CrVI adopted for total chromium; DGV for AsV adopted for total arsenic
ANZG (2018) DGV adopted for aluminium in freshwater is for receiving waters with pH >6.5. For receiving waters with pH <6.5 suitability of the more conservative, low reliability DGV of unknown LOP should be considered
ANZG (2018) Ammonia DGV is pH and temperature dependant. DGV for a pH of 8 provided in table.

Table C2: Results of Groundwater Testing

		OCP																						OPP										
		DDE	DDT	DDD	Aldrin	Dieldrin	Aldrin + Dieldrin (calculated)	alpha-chlordane	gamma-Chlordane	Endosulfan I	Endosulfan II	Endosulfan Sulphate	Endrin	Endrin Aldehyde	Heptachlor	Heptachlor Epoxide	Hexachlorobenzene	Methoxychlor	Mirex	alpha-BHC	beta-BHC	delta-BHC	Lindane	Sum of detected OCP	Azinphos methyl (Guthion)	Bromophos-ethyl	Chlorpyriphos	Chlorpyriphos-methyl	Diazinon	Dichlorvos	Dimethoate	Ethion	Ronnel (fenchlorphos)	Fenitrothion	Fenthion
	PQL	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
ANZG (2018) 95% LOP Fresh			**0.006**		**0.001**	**0.01**							**0.01**		**0.01**		0.1	**0.005**	**0.04**				0.2		0.02		**0.00004**		0.01		0.15			0.2	
HEPA (2020) 99% LOP Fresh																																		
NEPC (2013) HSL 2-4m																																		
Sample ID	Sample Date	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
BH103	07/06/24	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
BD1/20240607	07/06/24	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH105	07/06/24	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
BH107	07/06/24	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2

Notes:

-	No criterion / not defined / not tested / not applicable
*	QA/QC replicate of sample listed directly below the primary sample
NL	Not limiting
PQL	Practical quantitation limit
	Shaded cell is exceedance of guideline value
	Where one or more guideline value is exceeded, the cell is shaded to the colour of the highest guideline value exceeded
	NEPC (2013) National Environment Protection (Assessment of Site Contamination) Measure 1999 (as amended 2013), health screening level Clay 2-4m
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	ANZG (2018) DGV adopted for most conservative species of following analytes: DGV for xylene (m) adopted for xylene (m+p); DGV for CrVI adopted for total chromium; DGV for AsV adopted for total arsenic
	ANZG (2018) DGV adopted for aluminium in freshwater is for receiving waters with pH >6.5. For receiving waters with pH <6.5 suitability of the more conservative, low reliability DGV of unknown LOP should be considered
	ANZG (2018) Ammonia DGV is pH and temperature dependant. DGV for a pH of 8 provided in table.

Table C2: Results of Groundwater Testing

								PCB																																	
		Malathion	Parathion	Parathion-methyl	Methidathion	Fenamiphos	Sum of detected OPP	Arochlor 1016	Arochlor 1221	Arochlor 1232	Arochlor 1242	Arochlor 1248	Arochlor 1254	Arocolor 1260	Sum of detected PCB	1,1,1,2-tetrachloroethane	1,1,1-trichloroethane	1,1,2,2-tetrachloroethane	tetrachloroethene	1,1,2-trichloroethane	1,1,2-trichloroethylene	1,1-dichloroethane	1,1-Dichloroethene	1,1-dichloropropene	1,2,3-trichlorobenzene	1,2,3-trichloropropane	1,2,4-trichlorobenzene	1,2,4-trimethyl benzene	1,2-dibromo-3-chloropropane	1,2-dichlorobenzene	1,2-dichloroethane	1,2-dichloropropane	1,3,5-trimethyl benzene	1,3-dichlorobenzene	1,3-dichloropropane	1,4-dichlorobenzene
	PQL	0.2	0.2	0.2	0.2	0.2	0.2	2	2	2	2	2	2	2	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
ANZG (2018) 95% LOP Fresh		0.05	0.004								**0.3**		**0.01**				270	400	70	6,500	330			700		**3**		**85**			160	1,900	900		260	1,100	60
HEPA (2020) 99% LOP Fresh																																								
NEPC (2013) HSL 2-4m																																								
Sample ID	Sample Date	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
BH103	07/06/24	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<2	<2	<2	<2	<2	<2	<2	<2	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
BD1/20240607	07/06/24	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH105	07/06/24	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<2	<2	<2	<2	<2	<2	<2	<2	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
BH107	07/06/24	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<2	<2	<2	<2	<2	<2	<2	<2	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1

Notes:

-	No criterion / not defined / not tested / not applicable
*	QA/QC replicate of sample listed directly below the primary sample
NL	Not limiting
PQL	Practical quantitation limit
	Shaded cell is exceedance of guideline value
	Where one or more guideline value is exceeded, the cell is shaded to the colour of the highest guideline value exceeded
	NEPC (2013) National Environment Protection (Assessment of Site Contamination) Measure 1999 (as amended 2013), health screening level Clay 2-4m
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	ANZG (2018) DGV adopted for aluminium in freshwater is for receiving waters with pH >6.5. For receiving waters with pH <6.5 suitability of the more conservative, low reliability DGV of unknown LOP should be considered
	ANZG (2018) Ammonia DGV is pH and temperature dependant. DGV for a pH of 8 provided in table.

Table C2: Results of Groundwater Testing

		VOC (excluding BTEX)																																
		2,2-dichloropropane	2-chlorotoluene	4-chlorotoluene	4-isopropyl toluene	Bromobenzene	Bromochloromethane	Bromodichloroethane	Bromoform	carbon tetrachloride	Chloroethane	Vinyl Chloride	Chloroform	Chloromethane	cis-1,2-dichloroethene	cis-1,3-dichloropropene	Isopropylbenzene (cumene)	Cyclohexane	dibromochloromethane	Dibromomethane	Dichlorodifluoromethane	1,2-dibromoethane	hexachlorobutadiene	Bromomethane	Monochlorobenzene	n-butyl benzene	n-propyl benzene	sec-butyl benzene	Styrene (vinylbenzene)	Tert-butyl benzene	trans-1,2-dichloroethene	trans-1,3-dichloropropene	Trichlorofluoromethane	Sum of detected VOC
	PQL	1	1	1	1	1	1	1	1	1	10	10	1	10	1	1	1	1	1	1	10	1	1	10	1	1	1	1	1	1	1	1	10	1
ANZG (2018) 95% LOP Fresh										240		100	770				30								55									
HEPA (2020) 99% LOP Fresh																																		
NEPC (2013) HSL 2-4m																																		
Sample ID	Sample Date	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
BH103	07/06/24	<1	<1	<1	<1	<1	<1	<1	<1	<1	<10	<10	<1	<10	<1	<1	<1	<1	<1	<1	<10	<1	<1	<10	<1	<1	<1	<1	<1	<1	<1	<1	<10	<1
BD1/20240607	07/06/24	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH105	07/06/24	<1	<1	<1	<1	<1	<1	<1	<1	<1	<10	<10	**5**	<10	<1	<1	<1	<1	<1	<1	<10	<1	<1	<10	<1	<1	<1	<1	<1	<1	<1	<1	<10	**5**
BH107	07/06/24	<1	<1	<1	<1	<1	<1	<1	<1	<1	<10	<10	**2**	<10	<1	<1	<1	<1	<1	<1	<10	<1	<1	<10	<1	<1	<1	<1	<1	<1	<1	<1	<10	**2**

Notes:

-	No criterion / not defined / not tested / not applicable
*	QA/QC replicate of sample listed directly below the primary sample
NL	Not limiting
PQL	Practical quantitation limit
	Shaded cell is exceedance of guideline value
	Where one or more guideline value is exceeded, the cell is shaded to the colour of the highest guideline value exceeded
	NEPC (2013) National Environment Protection (Assessment of Site Contamination) Measure 1999 (as amended 2013), health screening level Clay 2-4m
	ANZG (2018) Australian and New Zealand Guidelines for Fresh and Marine Water Quality, 95% level of protection of species for Fresh aquatic ecosystems [NB: 99% level of protection adopted for bioaccumulative chemicals]
	HEPA (2018) PFAS National Environmental Management Plan, Version 2 99% level of protection for Fresh water aquatic ecosystems
	NHMRC (2018) Australian Drinking Water Guidelines 6 2011, drinking water aesthetic-based criteria
	ANZG (2018) Australian and New Zealand Guidelines for Fresh and Marine Water Quality, orange text is 'unknown' level of protection
	Underlining of ANZG (2018) criteria indicates a criteria with an 'unknown' level of protection.
	ANZG (2018) DGV adopted for most conservative species of following analytes: DGV for xylene (m) adopted for xylene (m+p); DGV for CrVI adopted for total chromium; DGV for AsV adopted for total arsenic
	ANZG (2018) DGV adopted for aluminium in freshwater is for receiving waters with pH >6.5. For receiving waters with pH <6.5 suitability of the more conservative, low reliability DGV of unknown LOP should be considered
	ANZG (2018) Ammonia DGV is pH and temperature dependant. DGV for a pH of 8 provided in table.

Table C2: Results of Groundwater Testing

		PFAS					
		PFOS	PFOA	PFHxS	6:2 FTS	8:2 FTS	Sum of detected PFAS
	PQL	0.01	0.01	0.01	0.01	0.02	0.01
ANZG (2018) 95% LOP Fresh							
HEPA (2020) 99% LOP Fresh		**0.00023**	**19**				
NEPC (2013) HSL 2-4m							
Sample ID	Sample Date	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
BH103	07/06/24	**0.01**	<0.01	<0.01	<0.01	<0.02	**0.01**
BD1/20240607	07/06/24	-	-	-	-	-	-
BH105	07/06/24	<0.01	<0.01	<0.01	**0.01**	<0.02	**0.01**
BH107	07/06/24	<0.01	<0.01	<0.01	<0.01	<0.02	<0.01

Notes:

-	No criterion / not defined / not tested / not applicable
*	QA/QC replicate of sample listed directly below the primary sample
NL	Not limiting
PQL	Practical quantitation limit
	Shaded cell is exceedance of guideline value
	Where one or more guideline value is exceeded, the cell is shaded to the colour of the highest guideline value exceeded
	NEPC (2013) National Environment Protection (Assessment of Site Contamination) Measure 1999 (as amended 2013), health screening level Clay 2-4m
	ANZG (2018) Australian and New Zealand Guidelines for Fresh and Marine Water Quality, 95% level of protection of species for Fresh aquatic ecosystems [NB: 99% level of protection adopted for bioaccumulative chemicals]
	HEPA (2018) PFAS National Environmental Management Plan, Version 2 99% level of protection for Fresh water aquatic ecosystems
	NHMRC (2018) Australian Drinking Water Guidelines 6 2011, drinking water aesthetic-based criteria
	ANZG (2018) Australian and New Zealand Guidelines for Fresh and Marine Water Quality, orange text is 'unknown' level of protection
	Underlining of ANZG (2018) criteria indicates a criteria with an 'unknown' level of protection.
	ANZG (2018) DGV adopted for most conservative species of following analytes: DGV for xylene (m) adopted for xylene (m+p); DGV for CrVI adopted for total chromium; DGV for AsV adopted for total arsenic
	ANZG (2018) DGV adopted for aluminium in freshwater is for receiving waters with pH >6.5. For receiving waters with pH <6.5 suitability of the more conservative, low reliability DGV of unknown LOP should be considered
	ANZG (2018) Ammonia DGV is pH and temperature dependant. DGV for a pH of 8 provided in table.

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Table C3: Results of Soil Vapour Testing

			IPA	TPH Air / Air Phase Hydrocarbon					TO15 Chlorinated VOCs														
			Isopropyl Alcohol	TPH C5-C8 Aliphatic	TPH C9-C12 Aliphatic	TPH C9-C10 Aromatic	TPH C6-C10-BTEX (FI)	TPH >C10-C12 - Naphthalene (F2)	1,1,1-trichloroethane	1,1,2-trichloroethane	1,1-dichloroethene	1,1-Dichloroethene	cis-1,2-dichloroethene	tetrachloroethene	trans-1,2-dichloroethene	trichloroethylene	Vinyl Chloride	Naphthalene	o-Xylene	m-&p-Xylene	Ethylbenzene	Toluene	Benzene
PQL				200	50	100	200	40	2.7	2.7	2	2	2	3.4	2	1.6	0.8	2.6	2.2	4.3	2.2	1.9	1.6
Site Assessment Criteria																							
IHIL-A&B									60000				80	2000		20	30						
HSL D, Clay, 0-<1m (soil vapour)							1,000,000	800,000										4,000	1,200,000*	1,200,000*	1,800,000	6,500,000	5,000
WHO Tolerable Concentration (ambient air)												200											
Modified WHO Tolerable Concentration (soil vapour)												2000											
USEPA-Sub-slab Residential Air THQ=1, TR=10-6, Slab Attenuation Factor 0.1				417																10.4			
Sample ID	Depth	Sample Date	µg/m3	µg/m3	µg/m3	µg/m3	µg/m3	µg/m3	µg/m3	µg/m3	µg/m3	µg/m3	µg/m3	µg/m3	µg/m3	µg/m3	µg/m3	µg/m3	µg/m3	µg/m3	µg/m3	µg/m3	µg/m3
SVP106	0 m	07/06/24	**190**	**300**	<50	<100	<200	<40	<2.7	<2.7	<2	<2	<2	**5**	<2	<1.6	<0.8	<2.6	**2**	**7**	**2**	**29**	**3**
BD1/20240607	0 m	07/06/24	**100**	<200	<50	<100	<200	<40	<2.7	<2.7	<2	<2	<2	**4**	<2	<1.6	<0.8	<2.6	<2.2	**6**	<2.2	**24**	<1.6
SVP110	0 m	07/06/24	**90**	<200	<50	<100	<200	<40	<2.7	<2.7	<2	<2	<2	**4**	<2	<1.6	<0.8	<2.6	**2**	<4.3	<2.2	**10**	<1.6
SVP112	0 m	11/06/24	**20**	<200	<50	<100	<200	<40	<2.7	<2.7	<2	<2	<2	**52**	<2	<1.6	<0.8	<2.6	<2.2	**6**	<2.2	**10**	<1.6

Note

* The soil vapour health screening levels for Xylene Total is adopted as an initial screening level

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Table C4: Summary of Waste Classification Results

					Metals							TRH		BTEX				PAH		
					Total Arsenic	Cadmium	Total Chromium	Lead	TCLP Lead	Mercury (inorganic)	Nickel	TRH C6 - C9	TRH C10-C36	Benzene	Toluene	Ethylbenzene	Total Xylenes	Benzo(a)pyrene (B(a)P)	TCLP Benzo(a)pyrene (B(a)P)	Total PAH
				PQL	4	0.4	1	1	0.03	0.1	1	25	50	0.2	0.5	1	1	0.05	0.0001	0.05
Sample ID	Soil Matrix	Depth	Lab Report	Sample Date	mg/kg	mg/kg	mg/kg	mg/kg	mg/L	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/L	mg/kg
BH101	Fill	0.5 - 0.6 m	350716	01/05/24	**7**	<0.4	**15**	**43**	-	<0.1	**5**	<25	<50	<0.2	<0.5	<1	<1	**0.54**	-	**3.1**
BH101	Natural	0.9 - 1 m	350716	01/05/24	**12**	<0.4	**8**	**7**	-	<0.1	**1**	<25	<50	<0.2	<0.5	<1	<1	<0.05	-	<0.05
BH102	Fill	0.1 - 0.2 m	350284	29/04/24	**8**	<0.4	**13**	**19**	-	<0.1	**4**	<25	<50	<0.2	<0.5	<1	<1	**0.08**	-	**0.3**
BH102 - [TRIPLICATE]	Fill	0.1 - 0.2 m	350284	29/04/24	**5**	<0.4	**23**	**57**	-	<0.1	**14**	-	-	-	-	-	-	-	-	-
BH102	Natural	1.5 - 1.6 m	350284	29/04/24	**10**	<0.4	**17**	**70**	-	<0.1	**11**	<25	**240**	<0.2	<0.5	<1	<1	**0.4**	-	**4.3**
BH103	Fill	0.5 - 0.6 m	350284	29/04/24	**8**	<0.4	**38**	**110**	**0.44**	<0.1	**28**	<25	**240**	<0.2	<0.5	<1	<1	**1.2**	<0.0001	**11**
BH103	Natural	3 - 3.1 m	350284	29/04/24	<4	<0.4	**15**	**24**	-	<0.1	**4**	<25	<50	<0.2	<0.5	<1	<1	<0.05	-	<0.05
BH104	Fill	0.2 - 0.3 m	351686	13/05/24	**8**	<0.4	**14**	**160**	-	**0.2**	**11**	<25	<50	<0.2	<0.5	<1	<1	**0.84**	-	**7**
BH104 - [TRIPLICATE]	Fill	0.2 - 0.3 m	351686	13/05/24	**6**	<0.4	**12**	**250**	-	<0.1	**18**	-	-	-	-	-	-	-	-	-
BH104	Fill	0.5 - 0.6 m	351686	13/05/24	**15**	<0.4	**15**	**120**	**0.06**	<0.1	**10**	<25	<50	<0.2	<0.5	<1	<1	**1.1**	<0.0001	**15**
BH105	Fill	0.5 - 0.6 m	351686	14/05/24	**7**	<0.4	**21**	**56**	-	**0.2**	**13**	<25	<50	<0.2	<0.5	<1	<1	**0.93**	-	**11**
BH105	Fill	0.9 - 1 m	351686	14/05/24	**7**	<0.4	**8**	**6**	-	<0.1	**1**	<25	<50	<0.2	<0.5	<1	<1	<0.05	-	<0.05
BD01/20240514	Fill	0.9 - 1 m	ES2416510	14/05/24	**31**	<1	**18**	**12**	-	<0.1	**4**			<0.2	<0.5	<0.5	<0.5	<0.5	-	<0.5
BH105	Natural	4.4 - 4.5 m	351686	14/05/24	<4	<0.4	**5**	**8**	-	<0.1	**1**	<25	<50	<0.2	<0.5	<1	<1	<0.05	-	<0.05
BH106	Fill	0.3 - 0.5 m	352326	21/05/24	**8**	<0.4	**11**	**110**	-	<0.1	**11**	<25	**620**	<0.2	<0.5	<1	<1	**5.9**	<0.0001	**81**
BH106 - [TRIPLICATE]	Fill	0.3 - 0.5 m	352326	21/05/24	**9**	<0.4	**13**	**33**	-	<0.1	**6**	-	-	-	-	-	-	-	-	-
BH106	Natural	0.9 - 1 m	352326	21/05/24	**10**	<0.4	**16**	**50**	-	<0.1	**8**	<25	<50	<0.2	<0.5	<1	<1	**2.1**	-	**20**
BH107	Fill	0.5 - 0.6 m	352326	23/05/24	**13**	<0.4	**13**	**300**	**0.05**	<0.1	**5**	<25	<50	<0.2	<0.5	<1	<1	**2.1**	<0.0001	**23**
BH107	Natural	0.9 - 1 m	352326	23/05/24	**10**	<0.4	**3**	**13**	-	<0.1	**6**	<25	<50	<0.2	<0.5	<1	<1	**1.4**	-	**22**
BH109	Fill	0.1 - 0.2 m	349900	24/04/24	<4	<0.4	**10**	**76**	-	**1.1**	**13**	<25	<50	<0.2	<0.5	<1	<1	<0.05	-	<0.05
BD1/240424	Fill	0.1 - 0.2 m	349900	24/04/24	<4	<0.4	**9**	**50**	-	**0.7**	**10**	<25	-	<0.2	<0.5	<1	<1	**0.05**	-	**0.05**
BH109	Fill	1 - 1.1 m	349900	24/04/24	**13**	<0.4	**30**	**49**	-	<0.1	**8**	<25	<50	<0.2	<0.5	<1	<1	**2.6**	<0.0001	**28**
BH110	Fill	0.4 - 0.5 m	349900	24/04/24	**9**	**0.5**	**18**	**46**	-	**0.1**	**7**	<25	<50	<0.2	<0.5	<1	<1	**0.3**	-	**3.2**
BH110	Fill	0.9 - 1 m	349900	24/04/24	**9**	**0.4**	**19**	**100**	<0.03	**0.1**	**9**	<25	<50	<0.2	<0.5	<1	<1	**3.1**	<0.0001	**39**
BH111	Fill	0.5 - 0.6 m	350284	29/04/24	**11**	<0.4	**13**	**1,500**	<0.03	**0.4**	**14**	<25	<50	<0.2	<0.5	<1	<1	**0.8**	-	**8.1**
BH111 - [TRIPLICATE]	Fill	0.5 - 0.6 m	350284	29/04/24	**8**	<0.4	**13**	**1000**	-	**0.2**	**10**	-	-	-	-	-	-	-	-	-
BH111	Natural	1.5 - 1.6 m	350284	29/04/24	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH112	Fill	0.2 - 0.3 m	349900	24/04/24	**10**	<0.4	**19**	**610**	**0.2**	<0.1	**18**	<25	<50	<0.2	<0.5	<1	<1	**1.9**	<0.0001	**14**
BH112	Fill	1 - 1.1 m	349900	24/04/24	**9**	<0.4	**20**	**53**	-	<0.1	**8**	<25	<50	<0.2	<0.5	<1	<1	**0.82**	-	**7**
S1	Fill	0 - 0.05 m	349900	24/04/24	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
S3	Fill	0 - 0.05 m	349900	24/04/24	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Table C4: Summary of Waste Classification Results

					Metals							TRH		BTEX				PAH		
					Total Arsenic	Cadmium	Total Chromium	Lead	TCLP Lead	Mercury (inorganic)	Nickel	TRH C6 - C9	TRH C10-C36	Benzene	Toluene	Ethylbenzene	Total Xylenes	Benzo(a)pyrene (B(a)P)	TCLP Benzo(a)pyrene (B(a)P)	Total PAH
				PQL	4	0.4	1	1	0.03	0.1	1	25	50	0.2	0.5	1	1	0.05	0.0001	0.05
Sample ID	Soil Matrix	Depth	Lab Report	Sample Date	mg/kg	mg/kg	mg/kg	mg/kg	mg/L	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/L	mg/kg
Waste Classification Criteria [f]																				
CT1					100	20	100	100	-	4	40	650	10,000	10	288	600	1000	0.8	-	200
SCC1					500	100	1,900	1,500	-	50	1,050	650	10,000	18	518	1,080	1,800	10	-	200
TCLP1					-	-	-	-	5	-	-	-	-	-	-	-	-	-	0.04	-
CT2					400	80	400	400	-	16	160	2,600	40,000	40	1,152	2,400	4,000	3.2	-	800
SCC2					2,000	400	7,600	6,000	-	200	4,200	2,600	40,000	72	2,073	4,320	7,200	23	-	800
TCLP2					-	-	-	-	20	-	-	-	-	-	-	-	-	-	0.16	-
VENM Classification Criteria																				
NEPC (1999)					1-50	1	5-1000	2-200	-	0.03	5-500	-	-	-	-	-	-	-	-	-
ANZECC (1992)					0.2-30	0.04-2	0.5-110	<2-200	-	0.001-0.1	2-400	-	-	0.05 - 1	0.1 - 1	-	-	-	-	0.95-5
ANZECC (2000)					1-53	0.016-0.78	2.5-673	2-81	-	-	1-517	-	-	-	-	-	-	-	-	-

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

- = Not tested, no criteria or not applicable NAD = no asbestos detected

Notes:

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

b Total chromium used as initial screen for chromium(VI).

c Total recoverable hydrocarbons (TRH) used as an initial screen for total petroleum hydrocarbons (TPH)

d Criteria for scheduled chemicals used as an initial screen

e Criteria for Chlorpyrifos used as initial screen

f NSW EPA, 2014, Waste Classification Guidelines Part 1; Classifying Waste

PQL Practical quantitation limit

CT1 Maximum values of specific contaminant concentration (SCC) for classification without TCLP: General solid waste

SCC1 Maximum values for leachable concentration (TCLP) and specific contaminant concentration (SCC) when used together: General solid waste

TCLP1 Maximum values for leachable concentration (TCLP) and specific contaminant concentration (SCC) when used together: General solid waste

CT2 Maximum values of specific contaminant concentration (SCC) for classification without TCLP: Restricted solid waste

SCC2 Maximum values for leachable concentration (TCLP) and specific contaminant concentration (SCC) when used together: Restricted solid waste

TCLP2 Maximum values for leachable concentration (TCLP) and specific contaminant concentration (SCC) when used together: Restricted solid waste

Table C4: Summary of Waste Classification Results

					Phenols	OCP				OPP	PCB	VOC													
					Total Phenolics	Scheduled Chemical Waste (standard)	Total Endosulfan	Total Analysed OCP	Mirex	Total Analysed OPP	Total PCB	carbon tetrachloride	Monochlorobenzene	Chloroform	1,2-dichlorobenzene	1,4-dichlorobenzene	1,2-dichloroethane	1,1-Dichloroethene	Styrene (vinylbenzene)	1,1,1,2-tetrachloroethane	1,1,2,2-tetrachloroethane	tetrachloroethene	1,1,1-trichloroethane	1,1,2-trichloroethane	1,1,2-trichloroethylene	Vinyl Chloride
				PQL	5	0.1	0.1	0.1	0.1	0.1	0.1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Sample ID	Soil Matrix	Depth	Lab Report	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
BH101	Fill	0.5 - 0.6 m	350716	01/05/24	<5	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH101	Natural	0.9 - 1 m	350716	01/05/24	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH102	Fill	0.1 - 0.2 m	350284	29/04/24	<5	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH102 - [TRIPLICATE]	Fill	0.1 - 0.2 m	350284	29/04/24	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH102	Natural	1.5 - 1.6 m	350284	29/04/24	-	-	-	-	-	-	-	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
BH103	Fill	0.5 - 0.6 m	350284	29/04/24	<5	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH103	Natural	3 - 3.1 m	350284	29/04/24	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH104	Fill	0.2 - 0.3 m	351686	13/05/24	<5	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH104 - [TRIPLICATE]	Fill	0.2 - 0.3 m	351686	13/05/24	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH104	Fill	0.5 - 0.6 m	351686	13/05/24	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH105	Fill	0.5 - 0.6 m	351686	14/05/24	<5	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH105	Fill	0.9 - 1 m	351686	14/05/24	-	-	-	-	-	-	-	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
BD01/20240514	Fill	0.9 - 1 m	ES2416510	14/05/24																					
BH105	Natural	4.4 - 4.5 m	351686	14/05/24	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH106	Fill	0.3 - 0.5 m	352326	21/05/24	<5	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH106 - [TRIPLICATE]	Fill	0.3 - 0.5 m	352326	21/05/24	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH106	Natural	0.9 - 1 m	352326	21/05/24	-	-	-	-	-	-	-	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
BH107	Fill	0.5 - 0.6 m	352326	23/05/24	<5	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH107	Natural	0.9 - 1 m	352326	23/05/24	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH109	Fill	0.1 - 0.2 m	349900	24/04/24	<5	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BD1/240424	Fill	0.1 - 0.2 m	349900	24/04/24	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH109	Fill	1 - 1.1 m	349900	24/04/24	-	-	-	-	-	-	-	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
BH110	Fill	0.4 - 0.5 m	349900	24/04/24	<5	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH110	Fill	0.9 - 1 m	349900	24/04/24	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH111	Fill	0.5 - 0.6 m	350284	29/04/24	<5	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH111 - [TRIPLICATE]	Fill	0.5 - 0.6 m	350284	29/04/24	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH111	Natural	1.5 - 1.6 m	350284	29/04/24	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH112	Fill	0.2 - 0.3 m	349900	24/04/24	<5	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
BH112	Fill	1 - 1.1 m	349900	24/04/24	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
S1	Fill	0 - 0.05 m	349900	24/04/24	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
S3	Fill	0 - 0.05 m	349900	24/04/24	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Table C4: Summary of Waste Classification Results

					Phenols	OCP				OPP	PCB	VOC													
					Total Phenolics	Scheduled Chemical Waste (standard)	Total Endosulfan	Total Analysed OCP	Mirex	Total Analysed OPP	Total PCB	carbon tetrachloride	Monochlorobenzene	Chloroform	1,2-dichlorobenzene	1,4-dichlorobenzene	1,2-dichloroethane	1,1-Dichloroethene	Styrene (vinylbenzene)	1,1,1,2-tetrachloroethane	1,1,2,2-tetrachloroethane	tetrachloroethene	1,1,1-trichloroethane	1,1,2-trichloroethane	1,1,2-trichloroethylene	Vinyl Chloride
				PQL	5	0.1	0.1	0.1	0.1	0.1	0.1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Sample ID	Soil Matrix	Depth	Lab Report	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
Waste Classification Criteria [f]																									
CT1					288	<50	60	-	-	4	<50	10	2,000	120	86	150	10	14	60	200	26	14	600	24	10	4
SCC1					518	<50	108	-	-	7.5	<50	18	3,600	126	155	270	18	25	108	360	46.8	25.2	1,080	43.2	18	7.2
TCLP1					-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CT2					1,152	<50	240	-	-	16	<50	40	8,000	480	344	600	40	56	240	800	104	56	2,400	96	40	16
SCC2					2,073	<50	432	-	-	30	<50	72	14,400	864	620	1,080	72	100	432	1,440	187.2	100.8	4,320	172.8	72	28.8
TCLP2					-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
VENM Classification Criteria																									
NEPC (1999)					-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
ANZECC (1992)					0.03 – 0.5	-	<0.001 - <0.97	-	-	-	0.02 – 0.1	-	-	-	-	-	-	-	-	-	-	-	-	-	-
ANZECC (2000)					-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

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

- = Not tested, no criteria or not applicable NAD = no asbestos detected

Notes:

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

Table C4: Summary of Waste Classification Results

					PFAS				Asbestos ID-soils		Asbestos ID - soils NEPM							
					PFOA	TCLP PFOA	PFOS + PFHxS	TCLP PFOS + PFHxS	Asbestos ID in soil >0.1g/kg	Trace Analysis (AS)	Asbestos ID in soil >0.1g/kg	Asbestos ID in soil <0.1g/kg	Trace Analysis (NEPC)	ACM >7mm Estimation	ACM >7mm Estimation	FA and AF Estimation	FA and AF Estimation	Total Asbestos#1
				PQL	0.0001	0.00001	0.0001	0.00001							0.01		0.001	0.1
Sample ID	Soil Matrix	Depth	Lab Report	Sample Date	mg/kg	mg/L	mg/kg	mg/L	-	-	-	-	-	g	%(w/w)	g	%(w/w)	g/kg
BH101	Fill	0.5 - 0.6 m	350716	01/05/24	-	-	-	-	-	-	NAD	NAD	NAD	–		–	<0.001	<0.1
BH101	Natural	0.9 - 1 m	350716	01/05/24	-	-	-	-	-	-	-	-	-	-		-	-	-
BH102	Fill	0.1 - 0.2 m	350284	29/04/24	-	-	-	-	-	-	NAD	**Chrysotile Detected**	NAD	**0.0138**		–	<0.001	<0.1
BH102 - [TRIPLICATE]	Fill	0.1 - 0.2 m	350284	29/04/24	-	-	-	-	-	-	-	-	-	-		-	-	-
BH102	Natural	1.5 - 1.6 m	350284	29/04/24	-	-	-	-	NAD	NAD	-	-	-	-		-	-	-
BH103	Fill	0.5 - 0.6 m	350284	29/04/24	**0.0005**	**0.00002**	**0.0025**	**0.00012**	-	-	NAD	**Chrysotile Detected**	NAD	–		**0.0007**	<0.001	<0.1
BH103	Natural	3 - 3.1 m	350284	29/04/24	-	-	-	-	-	-	-	-	-	-		-	-	-
BH104	Fill	0.2 - 0.3 m	351686	13/05/24	-	-	-	-	-	-	**Chrysotile Detected**	NAD	NAD	**2.5793**	**0.4817**	**0.4455**	**0.0832**	**5.6485**
BH104 - [TRIPLICATE]	Fill	0.2 - 0.3 m	351686	13/05/24	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH104	Fill	0.5 - 0.6 m	351686	13/05/24	-	-	-	-	-	-	**Chrysotile Detected**	NAD	NAD	**0.0395**	<0.01	**0.0918**	**0.0149**	**0.2129**
BH105	Fill	0.5 - 0.6 m	351686	14/05/24	-	-	-	-	-	-	NAD	NAD	NAD	–	<0.01	–	<0.001	<0.1
BH105	Fill	0.9 - 1 m	351686	14/05/24	-	-	-	-	-	-	NAD	NAD	NAD	–	<0.01	–	<0.001	<0.1
BD01/20240514	Fill	0.9 - 1 m	ES2416510	14/05/24														
BH105	Natural	4.4 - 4.5 m	351686	14/05/24	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH106	Fill	0.3 - 0.5 m	352326	21/05/24	<0.0001	<0.00001	<0.0001	<0.00001	-	-	NAD	NAD	NAD	–		–	<0.001	<0.1
BH106 - [TRIPLICATE]	Fill	0.3 - 0.5 m	352326	21/05/24	-	-	-	-	-	-	-	-	-	-		-	-	-
BH106	Natural	0.9 - 1 m	352326	21/05/24	-	-	-	-	-	-	-	-	-	-		-	-	-
BH107	Fill	0.5 - 0.6 m	352326	23/05/24	<0.0001	<0.00001	<0.0001	<0.00001	-	-	NAD	NAD	NAD	–		–	<0.001	<0.1
BH107	Natural	0.9 - 1 m	352326	23/05/24	-	-	-	-	-	-	-	-	-	-		-	-	-
BH109	Fill	0.1 - 0.2 m	349900	24/04/24	-	-	-	-	-	-	NAD	NAD	NAD	–		–	<0.001	<0.1
BD1/240424	Fill	0.1 - 0.2 m	349900	24/04/24	-	-	-	-	-	-	-	-	-	-		-	-	-
BH109	Fill	1 - 1.1 m	349900	24/04/24	-	-	-	-	NAD	NAD	-	-	-	-		-	-	-
BH110	Fill	0.4 - 0.5 m	349900	24/04/24	-	-	-	-	-	-	NAD	NAD	NAD	–		–	<0.001	<0.1
BH110	Fill	0.9 - 1 m	349900	24/04/24	-	-	-	-	NAD	NAD	-	-	-	-		-	-	-
BH111	Fill	0.5 - 0.6 m	350284	29/04/24	-	-	-	-	-	-	NAD	NAD	NAD	–		–	<0.001	<0.1
BH111 - [TRIPLICATE]	Fill	0.5 - 0.6 m	350284	29/04/24	-	-	-	-	-	-	-	-	-	-		-	-	-
BH111	Natural	1.5 - 1.6 m	350284	29/04/24	<0.0001	<0.00001	<0.0001	<0.00001	-	-	-	-	-	-		-	-	-
BH112	Fill	0.2 - 0.3 m	349900	24/04/24	**0.0003**	<0.00001	**0.0009**	<0.00001	-	-	NAD	NAD	NAD	–		–	<0.001	<0.1
BH112	Fill	1 - 1.1 m	349900	24/04/24	-	-	-	-	NAD	NAD	-	-	-	-		-	-	-
S1	Fill	0 - 0.05 m	349900	24/04/24	-	-	-	-	-	-	NAD	NAD	NAD	–		–	<0.001	<0.1
S3	Fill	0 - 0.05 m	349900	24/04/24	-	-	-	-	-	-	NAD	NAD	NAD	–		–	<0.001	<0.1

Douglas PARTNERS

Table C4: Summary of Waste Classification Results

					PFAS				Asbestos ID-soils		Asbestos ID - soils NEPM							
					PFOA	TCLP PFOA	PFOS + PFHxS	TCLP PFOS + PFHxS	Asbestos ID in soil >0.1g/kg	Trace Analysis (AS)	Asbestos ID in soil >0.1g/kg	Asbestos ID in soil <0.1g/kg	Trace Analysis (NEPC)	ACM >7mm Estimation	ACM >7mm Estimation	FA and AF Estimation	FA and AF Estimation	Total Asbestos#1
				PQL	0.0001	0.00001	0.0001	0.00001							0.01		0.001	0.1
Sample ID	Soil Matrix	Depth	Lab Report	Sample Date	mg/kg	mg/L	mg/kg	mg/L	-	-	-	-	-	g	%(w/w)	g	%(w/w)	g/kg
Waste Classification Criteria [f]																		
CT1					-	-	-	-	-	-	-	-	-	-		-	-	-
SCC1					18	-	1.8	-	-	-	-	-	-	-		-	-	-
TCLP1					-	0.5	-	0.05	-	-	-	-	-	-		-	-	-
CT2					-	-	-	-	-	-	-	-	-	-		-	-	-
SCC2					72	-	7.2	-	-	-	-	-	-	-		-	-	-
TCLP2					-	2	-	0.2	-	-	-	-	-	-		-	-	-
VENM Classification Criteria																		
NEPC (1999)					-	-	-	-	-	-	-	-	-	-	-	-	-	-
ANZECC (1992)					-	-	-	-	-	-	-	-	-	-	-	-	-	-
ANZECC (2000)					-	-	-	-	-	-	-	-	-	-	-	-	-	-

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

- = Not tested, no criteria or not applicable NAD = no asbestos detected

Notes:

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

Table C5: Summary of results - acid sulfate soils

Project No: 224583.03

Project Name: Proposed Mixed Use Development

Location: 79-85 Queens Road and 2-8 Spencer Street, Fivedock

Sample Information						Screening Test Results				Laboratory Analysis Results (Acid Base Accounting)									
Location ID	Depth from (m)	Depth to (m)	Reduced level (AHD)	Sample Description	Adopted Texture	pH_F (pH units)	pH_{FOX} (pH units)	Reaction Strength	pH change (pH units)	pH_{KCl} (pH units)	S_{KCl} (%S)	S_{HCl} (%S)	SPOS (%S)	Scr (%S)	TAA (%S)	S_{NAS} (%S)	ANC_{BT} (%S)	ANC Corroborated (Y/N)	Net Acidity (%S)
				Assessment Criteria (pH units)		**<4**	**<3**	-	**1.0**	Action Criteria (%S)		Coarse texture: sands to loamy sands and peats							0.03
BH101	**0.90**	**1.00**	1.00 to 0.90		C	7.8	3.3		**4.5**										
BH101	**2.90**	**3.00**	-1.00 to -1.10		C	8.0	3.5		**4.5**										
BH102	0.50	0.60	1.60 to 1.50		C	8.2	6.8		**1.4**										
BH102	**3.00**	**1.60**	-0.90 to 0.50		C	5.2	3.3		**1.9**	4.8	0.040	NT	0.070	0.020	0.020	NT	NT	N	0.090
BH103	0.50	**1.10**	1.40 to 0.80		C	7.8	5.6		**2.2**										
BH103	**1.50**	**1.60**	0.40 to 0.30		C	6.5	**2.5**		**4.0**	6.5	0.020	NT	0.050	0.040	<0.01	NT	NT	N	0.050
BH111	**1.00**	**1.10**	0.80 to 0.70		C	7.3	4.0		**3.3**										
BH111	**2.50**	**2.60**	-0.70 to -0.80		C	8.1	5.1		**3.0**										
BH104	**1.50**	**1.60**	0.50 to 0.40		C	6.3	3.2		**3.1**										
BH105	**0.90**	**1.00**	1.10 to 1.00		C	7.3	3.7		**3.6**										
BH105	**4.40**	**4.50**	-2.40 to -2.50		C	7.6	8.3		**-**										
BH106	0.90	1.00	1.20 to 1.10		C	7.2	4.0		**3.2**										
BH106	**2.90**	**3.00**	-0.80 to -0.90		C	6.8	4.5		**2.3**										
BH107	**1.50**	**1.60**	0.60 to 0.50		C	7.3	3.3		**4.0**	5.8	0.010	NT	0.070	0.050	<0.01	NT	NT	N	0.070
BH107	**4.40**	**4.50**	-2.30 to -2.40		C	7.0	5.0		**2.0**										
BH104	**2.90**	**3.00**	-0.90 to -1.00		C	6.0	4.5		**1.5**										
			-																
			-																
			-																
			-																
			-																
			-																
			-																

Notes:
Adopted texutre - C = coarse, M = medium, F = fine
pH_F - Soil pH in water
pH_{FOX} - Soil pH in peroxide
Reaction strength: L - Low , M - Medium, H - High, X - Extreme, V - Volcanic, F - Frothing (indicative of organic material)
pH change = pH_F - pH_{FOX}
pH_{KCL} - KCl extractable pH
S_{KCl} - KCl extractable sulfur
S_{HCl} - HCl extractable sulfur
S_{cr} - potential sulfidic acidity
TAA - titratable actual acidity (reported if pH_{KCL}<6.5)
S_{NAS} – retained acidity (reported if pHkCl < 4.5)
ANC_{BT} – acid neutralising capacity (reported if $pH_{KCl} \geq 6.5$)
NT - Not tested
Blue depths indicate where samples have been collected at or below the groundwater table
Bold results are indicators of ASS conditions, noting:
- Assessment criteria are considered a reasonable initial screening for AASS or PASS
- pH_F<4 is indicative of the presence of Actual ASS (AASS), although it is not conclusive of ASS on its own as naturally occurring non ASS soils can have pH_F<5
- pH_{FOX}<3 or pH Change ≥1 may indicate potential ASS (PASS), although exception apply. Laboratory testing required to confirm presence of Reduced Inorganic Sulfur (RIS)
- Refer to Table 5.1, A2, A3 of Sullivan,L. et al (2018) for further details
Shaded results trigger action (i.e. equal to or exceed the action criteria). Criteria is specific for soil texture and anticpated tonnage of soil disturbed.
Net Acidity can only include the measured ANC where the ANC has been corroborated by other data (for example slab incubation data) that demonstrates the soil material does not experience acidification during complete oxidation under field conditions.
a - Action criterion for disturbance of 1-1000 tonnes of material
b - Action criterion for disturbance of more than 1000 tonnes of material
The action criteria apply only to ASS materials and not to other acidic soils such as acidic peatlands and coastal heaths.

Appendix D

Borehole and Test Pit Logs from Previous Report

BOREHOLE LOG

CLIENT: DPG Project 37 Pty Ltd
PROJECT: Proposed Mixed Use Development
LOCATION: 79-81 Queens Road & 2-8 Spencer Street, Five Dock NSW

SURFACE LEVEL: 1.9 AHD
COORDINATE: E:325978.4, N:6250752.3
DATUM/GRID: MGA2020 Zone 56
DIP/AZIMUTH: 90°/---°

LOCATION ID: BH101
PROJECT No: 224583.01
DATE: 01/05/24 - 02/05/24
SHEET: 1 of 3

GROUNDWATER	RL (m)	DEPTH (m)	DESCRIPTION OF STRATA	GRAPHIC	ORIGIN[#]	CONSIS.[^]	DENSITY.[^]	MOISTURE	REMARKS	TYPE	INTERVAL	DEPTH (m)	TEST TYPE	RESULTS AND REMARKS
seepage 01/05/24	1	0.15	CONCRETE 150MM THICK			ND		ND						
			FILL / Sandy CLAY: orange and brown; medium to high plasticity; fine to medium sand.		FILL	(S)		w>PL		A/ES		0.20 0.30		
										A/ES		0.50 0.60		
		0.90	Peaty CLAY (OH): dark grey and grey; medium plasticity.		ALV	VS to S			PFAS	A/ES		0.90 1.00	SPT	1,0,0 N=0
seepage 01/05/24	0	1.40	Clayey SAND (SC): red orange brown; fine to medium.		ALV	L		M		ES		1.40 1.50		
		2.00	CLAY (CI-CH): orange yellow brown mottled red; medium to high plasticity.			F to St						2	SPT	3,4,6 N=10
	-1	3	From 3.00m: pale grey orange mottled red; with ironstone bands		RS	VSt		w<PL		ES		2.90 3.00		
	-2	4										4	SPT	5,12,14 N=26
	-3	5	From 5.00m: orange-yellow; extremely weathered material							ES		4.40 4.50		
	-4	5.70	SANDSTONE: orange-brown, pale grey; inferred medium strength			ND				ES		5.65 5.75	SPT	24,25/100mm
		5.90	Continued as rock log									6		
	-5	7										7		
	-6	8										8		
	-7	9										9		
	-8	10										10		
	-9	11										11		

NOTES: [#] Soil origin is "probable" unless otherwise stated. [^] Consistency/Relative density shading is for visual reference only - no correlation between cohesive and granular materials is implied.

PLANT: Comacchio 305
METHOD: AD/T to 2.5m, WB to 5.9m, NMLC to 20.5m
REMARKS:

OPERATOR: Ground Test

LOGGED: JAL
CASING: HW to 2.5m, then HQ to 6m

Refer to explanatory notes for symbol and abbreviation definitions

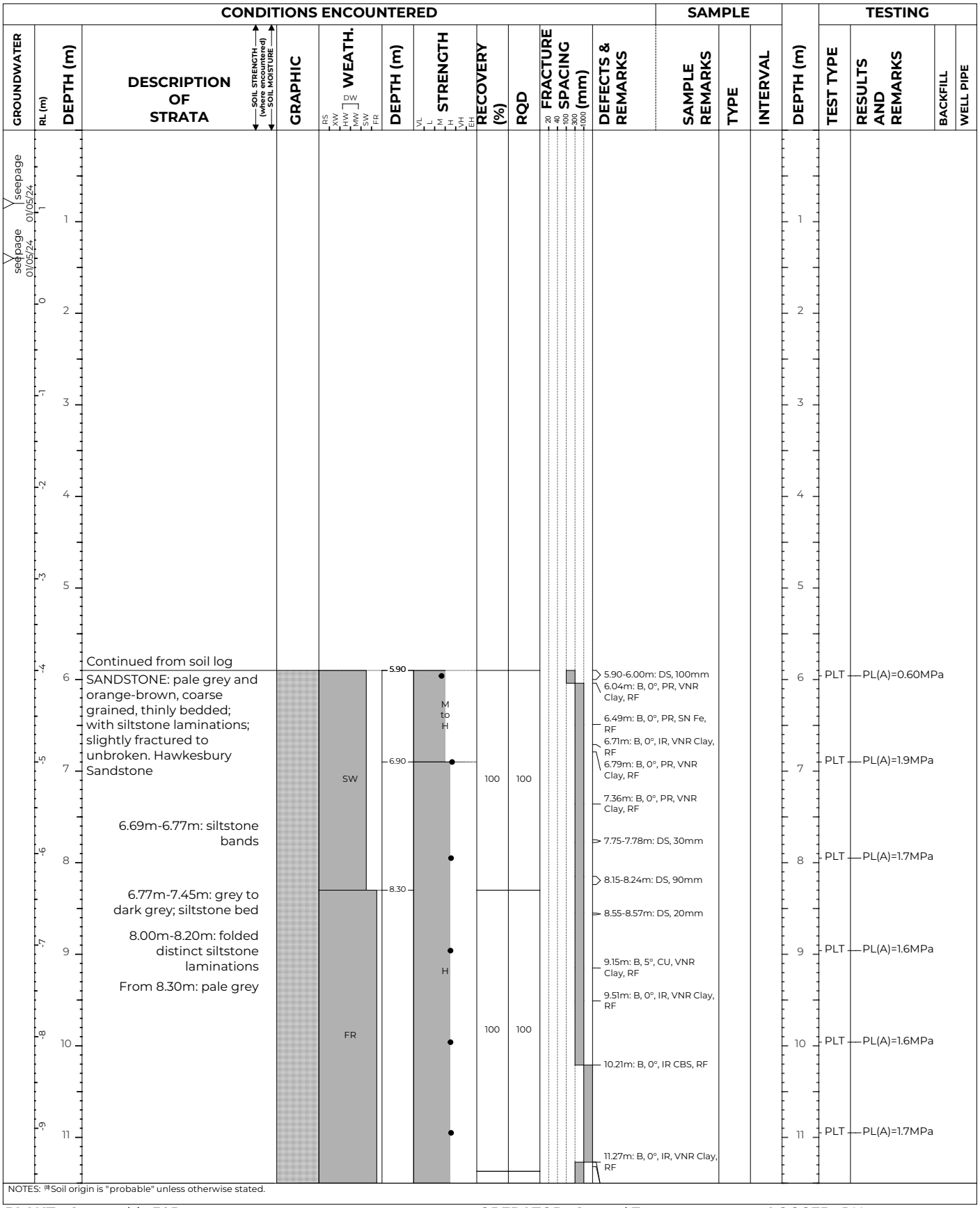
Douglas PARTNERS

BOREHOLE LOG

CLIENT: DPG Project 37 Pty Ltd
PROJECT: Proposed Mixed Use Development
LOCATION: 79-81 Queens Road & 2-8 Spencer Street, Five Dock NSW

SURFACE LEVEL: 1.9 AHD
COORDINATE: E:325978.4, N:6250752.3
DATUM/GRID: MGA2020 Zone 56
DIP/AZIMUTH: 90°/---°

LOCATION ID: BH101
PROJECT No: 224583.01
DATE: 01/05/24 - 02/05/24
SHEET: 2 of 3



NOTES: [a] Soil origin is "probable" unless otherwise stated.

Generated with CORE-GS by Geroc - Split Soil-Rock Log

PLANT: Comacchio 305
METHOD: AD/T to 2.5m, WB to 5.9m, NMLC to 20.5m
REMARKS:

OPERATOR: Ground Test

LOGGED: JAL
CASING: HW to 2.5m, then HQ to 6m

Refer to explanatory notes for symbol and abbreviation definitions

Douglas PARTNERS

BOREHOLE LOG

CLIENT: DPG Project 37 Pty Ltd
PROJECT: Proposed Mixed Use Development
LOCATION: 79-81 Queens Road & 2-8 Spencer Street, Five Dock NSW

SURFACE LEVEL: 1.9 AHD
COORDINATE: E:325978.4, N:6250752.3
DATUM/GRID: MGA2020 Zone 56
DIP/AZIMUTH: 90°/---°

LOCATION ID: BH101
PROJECT No: 224583.01
DATE: 01/05/24 - 02/05/24
SHEET: 3 of 3

GROUNDWATER	RL (m)	DEPTH (m)	DESCRIPTION OF STRATA	GRAPHIC	WEATH.	DEPTH (m)	STRENGTH	RECOVERY (%)	RQD	FRACTURE SPACING (mm)	DEFECTS & REMARKS	SAMPLE REMARKS	TYPE	INTERVAL	DEPTH (m)	TEST TYPE	RESULTS AND REMARKS
	-10	12	[CONT] SANDSTONE: pale grey and orange-brown, coarse grained, thinly bedded; with siltstone laminations; slightly fractured to unbroken. Hawkesbury Sandstone								11.27-11.32m: JT, 80°, UN, CN, RF 11.80m: B, 0°, PR, VNR Clay, RF				12	PLT	PL(A)=2.0MPa
	-11	13	11.71m-11.84m: siltstone bands					100	100		12.43m: B, 5°, IR, VNR Clay, RF 13.04m: B, 5°, IR, VNR Clay, RF				13	PLT	PL(A)=1.8MPa
	-12	14					H								14	PLT	PL(A)=2.4MPa
	-13	15	Borehole discontinued at 20.50m depth. Target depth reached.												15		
	-14	16			FR	15.95	H to VH	100	100						16	PLT	PL(A)=3.3MPa
	-15	17				16.95					17.20m: B, 5°, PR, VNR Clay, RF				17	PLT	PL(A)=2.6MPa
	-16	18													18	PLT	PL(A)=2.9MPa
	-17	19	19.48m-19.50m: siltstone bands From 19.55m: 30% siltstone laminations				H	100	100		18.68m: B, 0°, PR, VNR Clay, RF 18.87m: B, 5°, CU, VNR Clay, RF 19.47m: B, 0°, PR, VNR Clay, RF				19	PLT	PL(A)=2.7MPa
	-18	20									20.23m: B, 0°, PR, SN Fe, RF				20	PLT	PL(A)=2.0MPa
	-19	21														PLT	PL(A)=2.0MPa
	-20	22															
	-21																

NOTES: [#] Soil origin is "probable" unless otherwise stated.

PLANT: Comacchio 305
METHOD: AD/T to 2.5m, WB to 5.9m, NMLC to 20.5m
REMARKS:

OPERATOR: Ground Test

LOGGED: JAL
CASING: HW to 2.5m, then HQ to 6m

Refer to explanatory notes for symbol and abbreviation definitions

Generated with CORE-GS by Geroc - Split Soil-Rock Log

CORE PHOTO LOG

CLIENT: DPG Project 37 Pty Ltd
PROJECT: Proposed Mixed Use Development
LOCATION: 79-81 Queens Road & 2-8 Spencer Street, Five Dock NSW

SURFACE LEVEL: 1.9 AHD
COORDINATE: E:325978.4, N:6250752.3
DATUM/GRID: MGA2020 Zone 56
DIP/AZIMUTH: 90°/---°

LOCATION ID: BH101
PROJECT No: 224583.01
DATE: 01/05/24 - 02/05/24
SHEET: 1 of 2

5.90-10.00 m depth

10.00-15.00 m depth

CORE PHOTO LOG

CLIENT: DPG Project 37 Pty Ltd
PROJECT: Proposed Mixed Use Development
LOCATION: 79-81 Queens Road & 2-8 Spencer Street, Five Dock NSW

SURFACE LEVEL: 1.9 AHD
COORDINATE: E:325978.4, N:6250752.3
DATUM/GRID: MGA2020 Zone 56
DIP/AZIMUTH: 90°/---°

LOCATION ID: BH101
PROJECT No: 224583.01
DATE: 01/05/24 - 02/05/24
SHEET: 2 of 2

15.00-20.00 m depth

20.00-20.50 m depth

BOREHOLE LOG

CLIENT: DPG Project 37 Pty Ltd
PROJECT: Proposed Mixed Use Development
LOCATION: 79-81 Queens Road & 2-8 Spencer Street, Five Dock NSW

SURFACE LEVEL: 2.1 AHD
COORDINATE: E:325955.7, N:6250733.5
DATUM/GRID: MGA2020 Zone 56
DIP/AZIMUTH: 90°/---°

LOCATION ID: BH102
PROJECT No: 224583.01
DATE: 29/04/24
SHEET: 1 of 1

CONDITIONS ENCOUNTERED								SAMPLE				TESTING AND REMARKS	
GROUNDWATER	RL (m)	DEPTH (m)	DESCRIPTION OF STRATA	GRAPHIC	ORIGIN(#)	CONSIS.(*) / DENSITY.(*)	MOISTURE	REMARKS	TYPE	INTERVAL	DEPTH (m)	TEST TYPE	RESULTS AND REMARKS
	2	0.15	CONCRETE 150mm thick			ND	ND		A/ES		0.10 0.20		
seepage 29/04/24			FILL / Sandy CLAY: brown, orange and red; medium plasticity.		FILL	(S)	w>PL	PFAS	A/ES		0.50 0.60		
	1	1.10	Peaty CLAY (CI): grey and dark grey; medium plasticity.		ALV	S			A/ES		1.00 1.10	SPT	0,1,0 N=1
01/05/24		1.50	Silty SAND (SM): grey-brown; fine to medium.		ALV	L	W		ES		1.50 1.60		
	0	2.10	CLAY (CI-CH): orange, brown and red; medium to high plasticity. From 2.50m: pale grey; with ironstone bands		RS	St	w<PL		ES		3.00 3.10	SPT	3,5,6 N=11
	-1	3											
	-2	4									4	SPT	9,19,22 N=41
	-3	5				H			ES		4.50 4.60		
	-4	6									5	SPT	8,12,25 N=37
									ES		6.00 6.10		
									ES		6.25		
	-5	7	Borehole discontinued at 6.25m depth. Refusal on inferred medium strength sandstone.										
	-6	8											
	-7	9											
	-8	10											
	-9	11											

NOTES: (#) Soil origin is "probable" unless otherwise stated. (*) Consistency/Relative density shading is for visual reference only - no correlation between cohesive and granular materials is implied.

PLANT: Comacchio 305
METHOD: AD/T to 6.25m
REMARKS:

OPERATOR: Ground Test

LOGGED: JAL
CASING: HW to 2.5m, then HQ to 5.9m

Refer to explanatory notes for symbol and abbreviation definitions

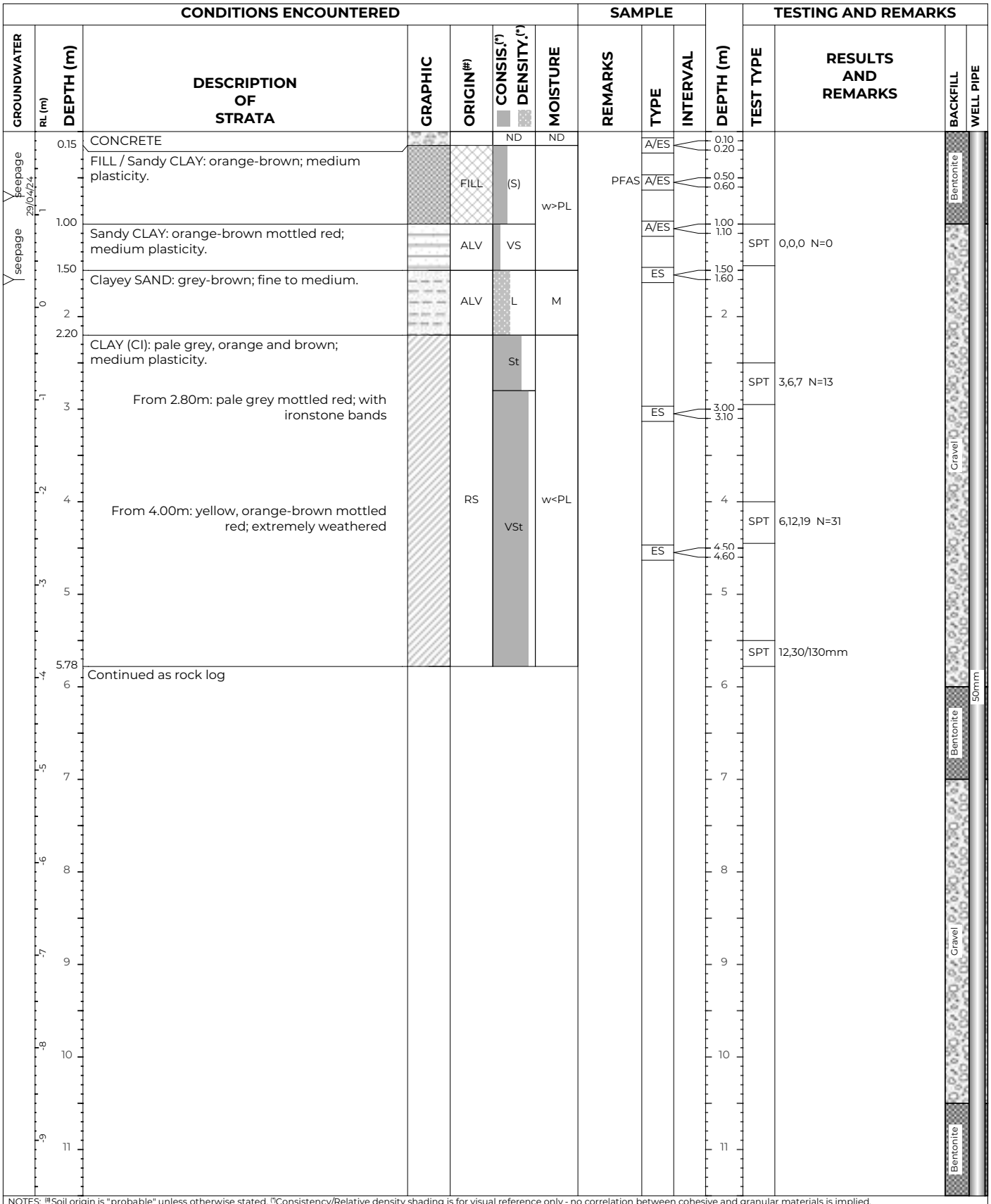
Douglas PARTNERS

BOREHOLE LOG

CLIENT: DPG Project 37 Pty Ltd
PROJECT: Proposed Mixed Use Development
LOCATION: 79-81 Queens Road & 2-8 Spencer Street, Five Dock NSW

SURFACE LEVEL: 1.9 AHD
COORDINATE: E:325956.0, N:6250755.5
DATUM/GRID: MGA2020 Zone 56
DIP/AZIMUTH: 90°/---°

LOCATION ID: BH103
PROJECT No: 224583.01
DATE: 29/04/24 - 30/04/24
SHEET: 1 of 4



NOTES: (#) Soil origin is "probable" unless otherwise stated. (*)Consistency/Relative density shading is for visual reference only - no correlation between cohesive and granular materials is implied.

PLANT: Comacchio 305
METHOD: AD/T to 2.5m, WB to 5.9m, NMLC to 30.24M
REMARKS:

OPERATOR: Ground Test

LOGGED: JAL
CASING: HW to 4m, then HQ to 5.9m

Refer to explanatory notes for symbol and abbreviation definitions

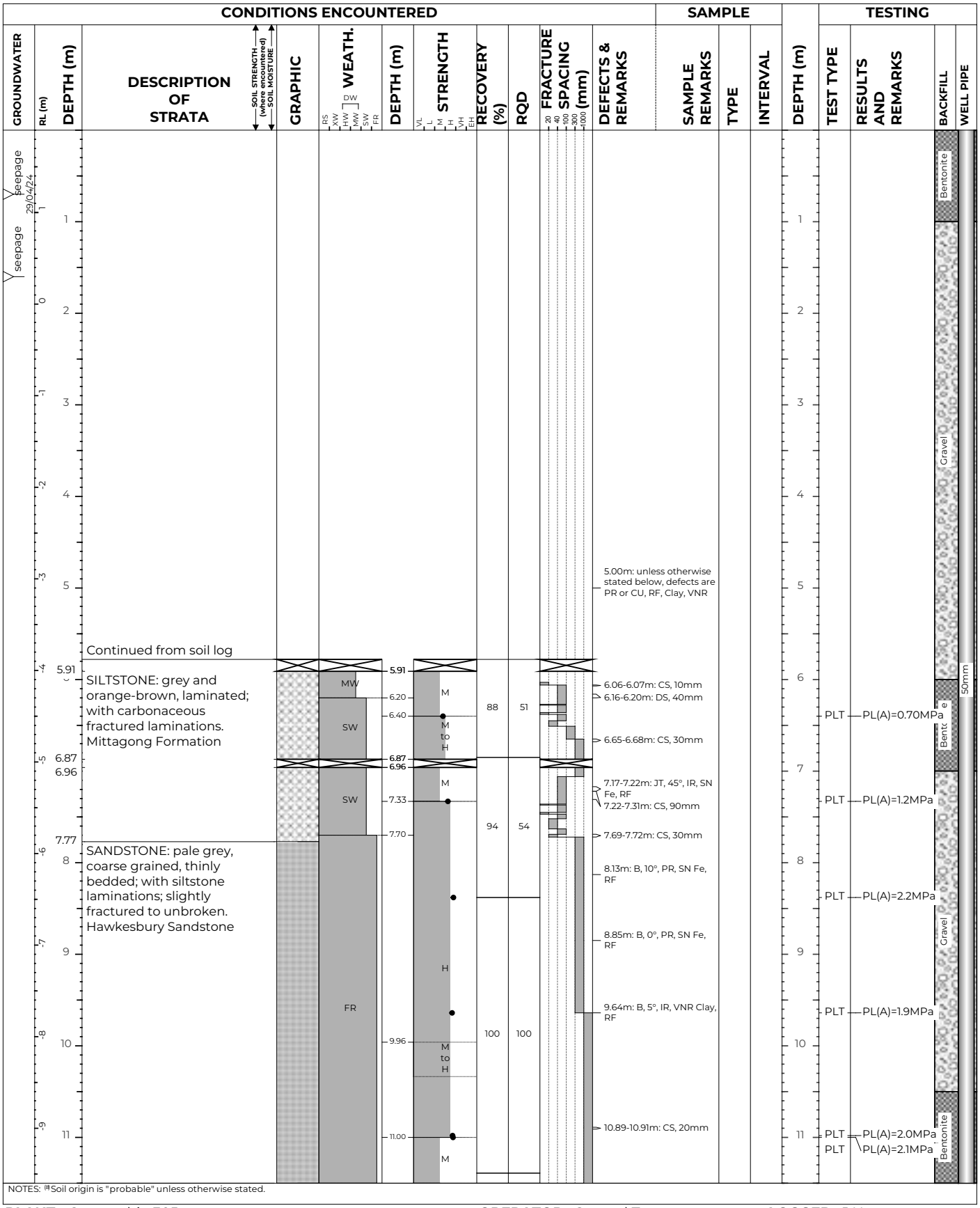
Douglas PARTNERS

BOREHOLE LOG

CLIENT: DPG Project 37 Pty Ltd
PROJECT: Proposed Mixed Use Development
LOCATION: 79-81 Queens Road & 2-8 Spencer Street, Five Dock NSW

SURFACE LEVEL: 1.9 AHD
COORDINATE: E:325956.0, N:6250755.5
DATUM/GRID: MGA2020 Zone 56
DIP/AZIMUTH: 90°/---°

LOCATION ID: BH103
PROJECT No: 224583.01
DATE: 29/04/24 - 30/04/24
SHEET: 2 of 4



Generated with CORE-GS by Geroc - Split Soil-Rock Log

NOTES: [a] Soil origin is "probable" unless otherwise stated.

PLANT: Comacchio 305
METHOD: AD/T to 2.5m, WB to 5.9m, NMLC to 30.24M
REMARKS:

OPERATOR: Ground Test

LOGGED: JAL
CASING: HW to 4m, then HQ to 5.9m

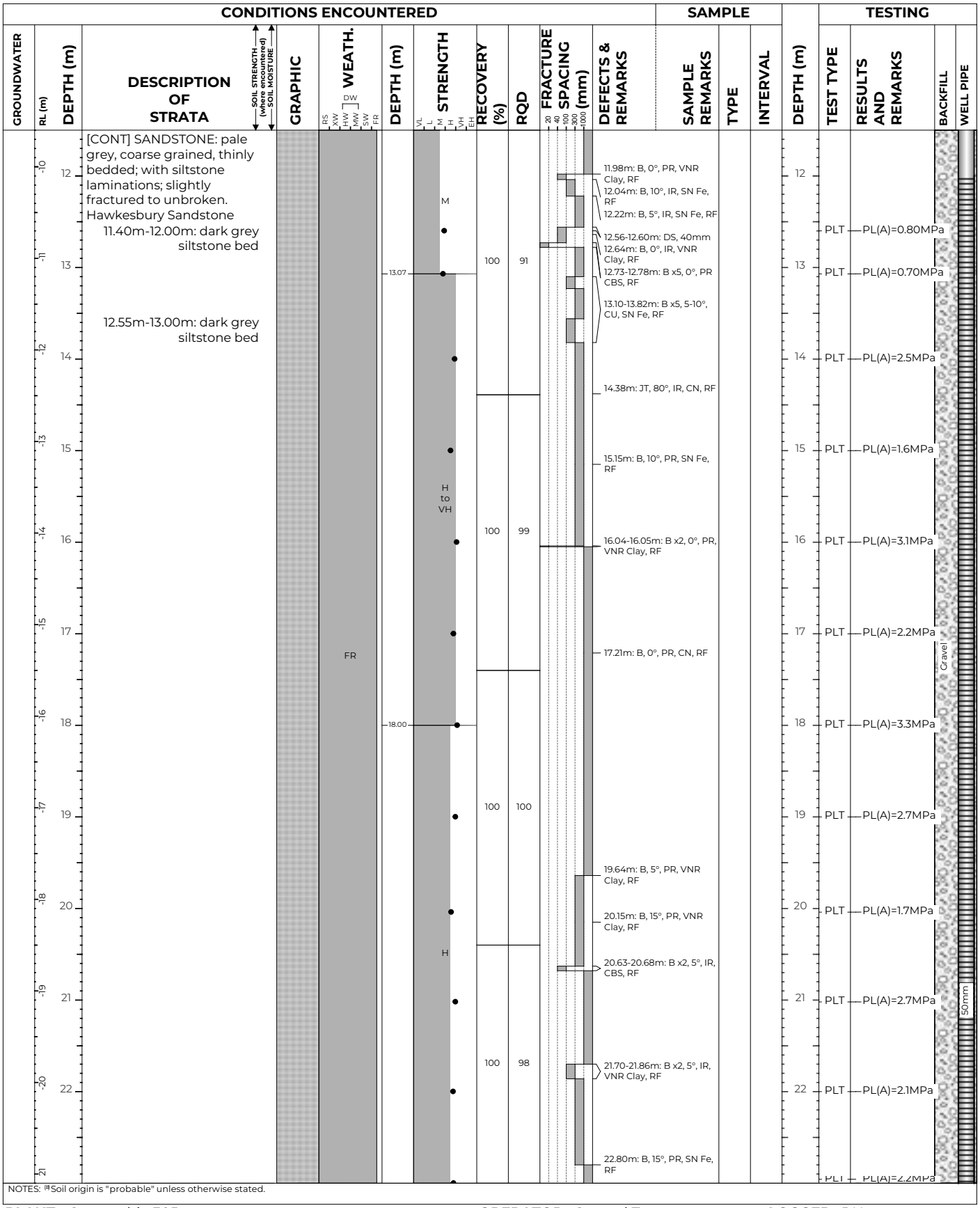
Douglas PARTNERS

BOREHOLE LOG

CLIENT: DPG Project 37 Pty Ltd
PROJECT: Proposed Mixed Use Development
LOCATION: 79-81 Queens Road & 2-8 Spencer Street, Five Dock NSW

SURFACE LEVEL: 1.9 AHD
COORDINATE: E:325956.0, N:6250755.5
DATUM/GRID: MGA2020 Zone 56
DIP/AZIMUTH: 90°/---°

LOCATION ID: BH103
PROJECT No: 224583.01
DATE: 29/04/24 - 30/04/24
SHEET: 3 of 4



NOTES: [a] Soil origin is "probable" unless otherwise stated.

Generated with CORE-GS by Geroc - Split Soil-Rock Log

PLANT: Comacchio 305
METHOD: AD/T to 2.5m, WB to 5.9m, NMLC to 30.24M
REMARKS:

OPERATOR: Ground Test

LOGGED: JAL
CASING: HW to 4m, then HQ to 5.9m

Douglas PARTNERS

BOREHOLE LOG

CLIENT: DPG Project 37 Pty Ltd
PROJECT: Proposed Mixed Use Development
LOCATION: 79-81 Queens Road & 2-8 Spencer Street, Five Dock NSW

SURFACE LEVEL: 1.9 AHD
COORDINATE: E:325956.0, N:6250755.5
DATUM/GRID: MGA2020 Zone 56
DIP/AZIMUTH: 90°/---°

LOCATION ID: BH103
PROJECT No: 224583.01
DATE: 29/04/24 - 30/04/24
SHEET: 4 of 4

GROUNDWATER	RL (m)	DEPTH (m)	DESCRIPTION OF STRATA (SOIL STRENGTH (where encountered) / SOIL MOISTURE)	GRAPHIC	WEATH. (PS, XW, DW, HW, MW, SW, FR)	DEPTH (m)	STRENGTH (VL, L, M, H, VH, EH)	RECOVERY (%)	RQD	FRACTURE SPACING (mm) (20, 40, 100, 300, 1000)	DEFECTS & REMARKS	SAMPLE REMARKS	TYPE	INTERVAL	DEPTH (m)	TEST TYPE	RESULTS AND REMARKS	BACKFILL	WELL PIPE
	-22	24	[CONT] SANDSTONE: pale grey, coarse grained, thinly bedded; with siltstone laminations; slightly fractured to unbroken. Hawkesbury Sandstone					100	98							24	PLT	PL(A)=1.7MPa		
	-23	25						100	100		24.78m: B, 0°, PR, SN Fe, RF				25	PLT	PL(A)=2.1MPa		
	-24	26			FR		H								26	PLT	PL(A)=2.4MPa	Gravel	
	-25	27													27	PLT	PL(A)=1.6MPa		
	-26	28						100	100		27.50m: B, 10°, IR, VNR Clay, RF				28	PLT	PL(A)=1.2MPa		
	-27	29	28.61m-28.67m: dark grey siltstone bed 28.81m-28.98m: dark grey siltstone bed												29	PLT	PL(A)=2.4MPa		
	-28	30						100	100						30	PLT	PL(A)=2.4MPa		
	-29	31	Borehole discontinued at 30.24m depth. Target depth reached.																
	-30	32																	
	-31	33																	
	-32	34																	

NOTES: [d] Soil origin is "probable" unless otherwise stated.

PLANT: Comacchio 305
METHOD: AD/T to 2.5m, WB to 5.9m, NMLC to 30.24M
REMARKS:

OPERATOR: Ground Test

LOGGED: JAL
CASING: HW to 4m, then HQ to 5.9m

Refer to explanatory notes for symbol and abbreviation definitions

Generated with CORE-GS by Geroc - Split Soil-Rock Log

CORE PHOTO LOG

CLIENT: DPG Project 37 Pty Ltd
PROJECT: Proposed Mixed Use Development
LOCATION: 79-81 Queens Road & 2-8 Spencer Street, Five Dock NSW

SURFACE LEVEL: 1.9 AHD
COORDINATE: E:325956.0, N:6250755.5
DATUM/GRID: MGA2020 Zone 56
DIP/AZIMUTH: 90°/---°

LOCATION ID: BH103
PROJECT No: 224583.01
DATE: 29/04/24 - 30/04/24
SHEET: 1 of 3

5.78-10.00 m depth

10.00-15.00 m depth

CORE PHOTO LOG

CLIENT: DPG Project 37 Pty Ltd
PROJECT: Proposed Mixed Use Development
LOCATION: 79-81 Queens Road & 2-8 Spencer Street, Five Dock NSW

SURFACE LEVEL: 1.9 AHD
COORDINATE: E:325956.0, N:6250755.5
DATUM/GRID: MGA2020 Zone 56
DIP/AZIMUTH: 90°/---°

LOCATION ID: BH103
PROJECT No: 224583.01
DATE: 29/04/24 - 30/04/24
SHEET: 2 of 3

15.00-20.00 m depth

20.00-25.00 m depth

CORE PHOTO LOG

CLIENT: DPG Project 37 Pty Ltd
PROJECT: Proposed Mixed Use Development
LOCATION: 79-81 Queens Road & 2-8 Spencer Street, Five Dock NSW

SURFACE LEVEL: 1.9 AHD
COORDINATE: E:325956.0, N:6250755.5
DATUM/GRID: MGA2020 Zone 56
DIP/AZIMUTH: 90°/---°

LOCATION ID: BH103
PROJECT No: 224583.01
DATE: 29/04/24 - 30/04/24
SHEET: 3 of 3

25.00-30.00 m depth

30.00-30.24 m depth

Douglas PARTNERS

BOREHOLE LOG

CLIENT: DPG Project 37 Pty Ltd
PROJECT: Proposed Mixed Use Development
LOCATION: 79-81 Queens Road & 2-8 Spencer Street, Five Dock NSW

SURFACE LEVEL: 2.0 AHD
COORDINATE: E:325968.2, N:6250732.6
DATUM/GRID: MGA2020 Zone 56
DIP/AZIMUTH: 90°/---°

LOCATION ID: BH104
PROJECT No: 224583.01
DATE: 29/04/24
SHEET: 1 of 1

GROUNDWATER	RL (m)	DEPTH (m)	DESCRIPTION OF STRATA	GRAPHIC	ORIGIN[#]	CONSIS.[^]	DENSITY.[^]	MOISTURE	REMARKS	SAMPLE TYPE	SAMPLE INTERVAL	DEPTH (m)	TESTING AND REMARKS: TEST TYPE	TESTING AND REMARKS: RESULTS AND REMARKS
		0.15	CONCRETE.			ND		ND						
Seepage 29/04/24	1	1.10	FILL / Sandy CLAY: orange, grey-brown; low to medium plasticity; fine to coarse sand.		FILL	MC		w<PL		A/ES	0.20–0.30	0.20 0.30	DCP9/150	5 10 15 23
										A/ES	0.50–0.60	0.50 0.60		
										A/ES	0.90–1.00	0.90 1.00		
Seepage 29/04/24	0	1.60	Silty CLAY (OH): orange, grey-brown; medium to high plasticity.		ALV	F		w>PL		A/ES	1.50–1.60	1.50 1.60		
		2.20	Silty SAND (SC): grey brown; fine to medium.		ALV	L		M				2		
	-1	3	CLAY (CI-CH): orange, red, brown; medium to high plasticity.							A/ES	2.90–3.00	2.90 3.00		
	-2	4										4		
	-3	5	From 4.50m: orange yellow brown		RS	St to VSt		w>PL		A/ES	4.40–4.50	4.40 4.50		
	-4	6										5		
	-5	7	From 6.80m: extremely weathered sandstone							A/ES	5.90–6.00	5.90 6.00		
			Borehole discontinued at 7.10m depth. TC bit refusal on inferred medium strength sandstone.							A/ES	7.00–7.10	7.00 7.10		
	-6	8												
	-7	9												
	-8	10												
	-9	11												

NOTES: [#] Soil origin is "probable" unless otherwise stated. [^] Consistency/Relative density shading is for visual reference only - no correlation between cohesive and granular materials is implied.

PLANT: Comacchio 205
METHOD: Diatube to 0.15m, AD/T to 7.1m
REMARKS:

OPERATOR: Ground Test (Jack)

LOGGED: JAL
CASING: Uncased

Refer to explanatory notes for symbol and abbreviation definitions

Douglas PARTNERS

Generated with CORE-GS by Geroc - Soil Log

BOREHOLE LOG

CLIENT: DPG Project 37 Pty Ltd
PROJECT: Proposed Mixed Use Development
LOCATION: 79-81 Queens Road & 2-8 Spencer Street, Five Dock NSW

SURFACE LEVEL: 2.0 AHD
COORDINATE: E:325961.7, N:6250700.0
DATUM/GRID: MGA2020 Zone 56
DIP/AZIMUTH: 90°/---°

LOCATION ID: BH105
PROJECT No: 224583.01
DATE: 14/05/24
SHEET: 1 of 3

GROUNDWATER	RL (m)	DEPTH (m)	DESCRIPTION OF STRATA	GRAPHIC	ORIGIN[#]	CONSIS.[^] / DENSITY.[^]	MOISTURE	REMARKS	TYPE	INTERVAL	DEPTH (m)	TEST TYPE	RESULTS AND REMARKS	BACKFILL	WELL PIPE
Seepage 14/05/24	2	0.15	CONCRETE			ND	ND		A/ES		0.20 0.30	DCP9/150	5 10 15	Backfill	50mm
	1	1.00	FILL / Sandy CLAY: grey, orange-brown; medium plasticity. From 0.60m: saturated		FILL	PC			A/ES		0.50 0.60				
	0	2	Sandy CLAY (CI): grey, orange-brown; medium plasticity.		ALV	F	w>LL		* A/ES		0.90 1.00				
		2.10							A/ES		1.50 1.60				
	-1	3	CLAY (CI-CH): grey mottled, orange-red; medium to high plasticity.					PFAS	A/ES		2.90 3.00				
	-2	4			RS	VSt to St	w<PL								
	-3	5	From 5.50m: extremely weathered sandstone						A/ES		4.40 4.50				
		5.75							A/ES		5.50 5.60				
	-4	6	Continued as rock log												
MW3 31/05/24	-5	7													
	-6	8													
	-7	9													
	-8	10													
	-9	11												Bentonite	

NOTES: [#] Soil origin is "probable" unless otherwise stated. [^] Consistency/Relative density shading is for visual reference only - no correlation between cohesive and granular materials is implied.

PLANT: Comacchio 205
OPERATOR: Ground Test (Jack)
LOGGED: JAL
METHOD: Diatube to 0.15m, AD/T to 2.5m, WB to 5.75m, NMLC to 19.17m
CASING: HW to 2.5m, then HQ to 5.8m
REMARKS: *Field replicate BD1/20240514 taken from 0.9-1.0m.
Per- and polyfluoroalkyl substances

Refer to explanatory notes for symbol and abbreviation definitions

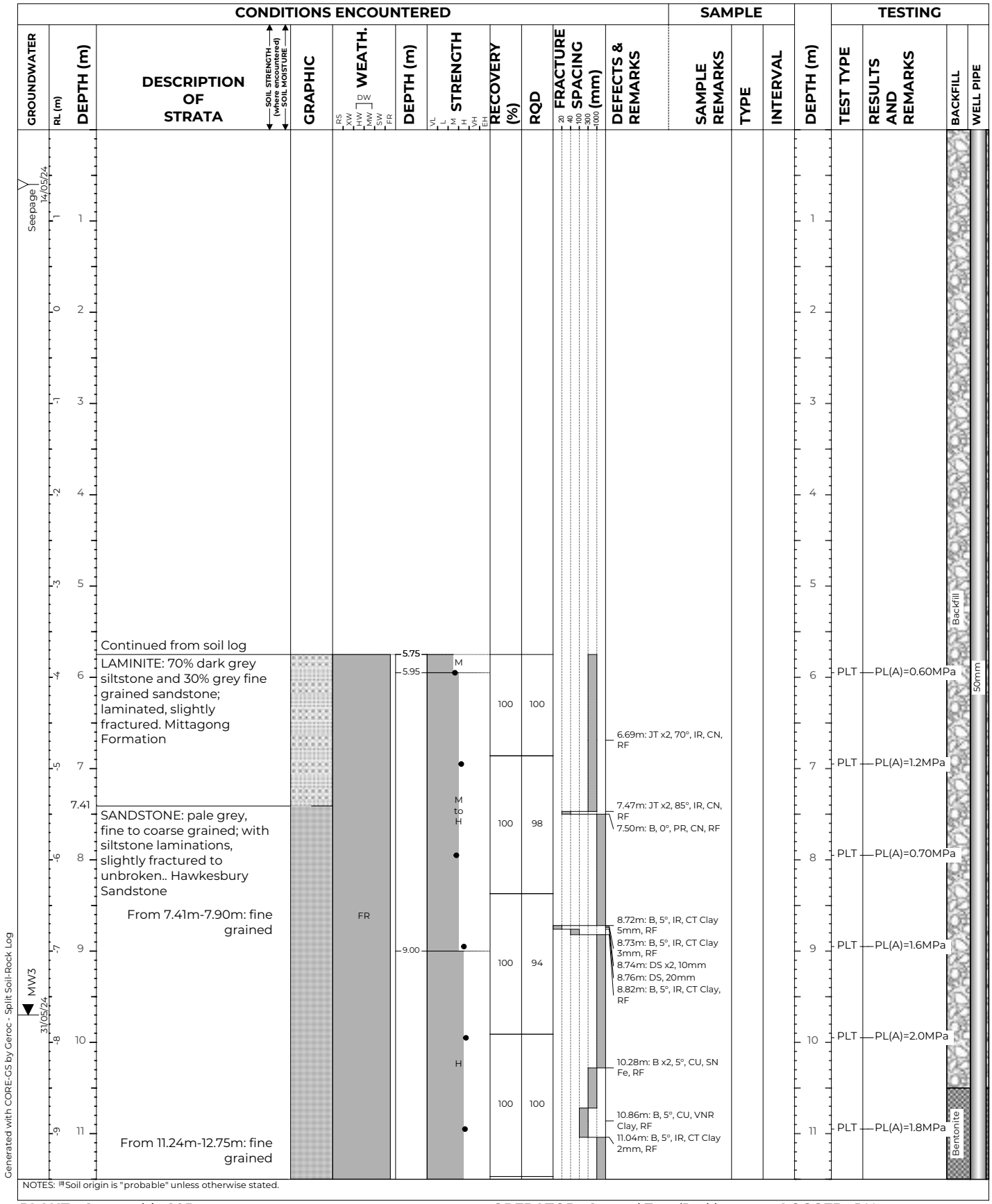
Douglas PARTNERS

BOREHOLE LOG

CLIENT: DPG Project 37 Pty Ltd
PROJECT: Proposed Mixed Use Development
LOCATION: 79-81 Queens Road & 2-8 Spencer Street, Five Dock NSW

SURFACE LEVEL: 2.0 AHD
COORDINATE: E:325961.7, N:6250700.0
DATUM/GRID: MGA2020 Zone 56
DIP/AZIMUTH: 90°/---°

LOCATION ID: BH105
PROJECT No: 224583.01
DATE: 14/05/24
SHEET: 2 of 3



NOTES: [a] Soil origin is "probable" unless otherwise stated.

PLANT: Comacchio 205
OPERATOR: Ground Test (Jack)
LOGGED: JAL
METHOD: Diatube to 0.15m, AD/T to 2.5m, WB to 5.75m, NMLC to 19.17m
CASING: HW to 2.5m, then HQ to 5.8m
REMARKS: *Field replicate BD1/20240514 taken from 0.9-1.0m.
Per- and polyfluoroalkyl substances

Refer to explanatory notes for symbol and abbreviation definitions

Douglas PARTNERS

BOREHOLE LOG

CLIENT: DPG Project 37 Pty Ltd
PROJECT: Proposed Mixed Use Development
LOCATION: 79-81 Queens Road & 2-8 Spencer Street, Five Dock NSW

SURFACE LEVEL: 2.0 AHD
COORDINATE: E:325961.7, N:6250700.0
DATUM/GRID: MGA2020 Zone 56
DIP/AZIMUTH: 90°/---°

LOCATION ID: BH105
PROJECT No: 224583.01
DATE: 14/05/24
SHEET: 3 of 3

GROUNDWATER	RL (m)	DEPTH (m)	DESCRIPTION OF STRATA	GRAPHIC	WEATH.	DEPTH (m)	STRENGTH	RECOVERY (%)	RQD	FRACTURE SPACING (mm)	DEFECTS & REMARKS	SAMPLE REMARKS	TYPE	INTERVAL	DEPTH (m)	TEST TYPE	RESULTS AND REMARKS	BACKFILL	WELL PIPE
	-10	12	[CONT] SANDSTONE: pale grey, fine to coarse grained; with siltstone laminations, slightly fractured to unbroken.. Hawkesbury Sandstone		FR		H	100	100		12.73m: B, 0°, PR, SN Fe, RF				12	PLT	PL(A)=1.9MPa		
	-11	13	From 12.27m-12.74m: siltstone band					100	98		13.39m: DS, 10mm 13.41m: B, 0°, PR, VNR Clay, RF 13.43m: B, 0°, PR, VNR Clay, RF				13	PLT	PL(A)=1.2MPa		
	-12	14													14	PLT	PL(A)=2.4MPa		
	-13	15						100	100						15	PLT	PL(A)=2.3MPa	Gravel	
	-14	16													16	PLT	PL(A)=2.2MPa	50mm	
	-15	17						100	100						17	PLT	PL(A)=2.4MPa		
	-16	18						100	100		18.17m: B, 10°, CU, VNR Clay, RF 18.43m: B, 0°, IR, VNR Clay, RF				18	PLT	PL(A)=1.9MPa		
	-17	19						100	100		19.06m: B, 0°, IR, CT Clay 3mm, RF				19	PLT	PL(A)=2.0MPa		
	-18	20	Borehole discontinued at 19.17m depth.																
	-19	21																	
	-20	22																	

NOTES: [#] Soil origin is "probable" unless otherwise stated.

PLANT: Comacchio 205
OPERATOR: Ground Test (Jack)
LOGGED: JAL

METHOD: Diatube to 0.15m, AD/T to 2.5m, WB to 5.75m, NMLC to 19.17m
CASING: HW to 2.5m, then HQ to 5.8m

REMARKS: *Field replicate BD1/20240514 taken from 0.9-1.0m.
Per- and polyfluoroalkyl substances

Refer to explanatory notes for symbol and abbreviation definitions

Generated with CORE-GS by Geroc - Split Soil-Rock Log

CORE PHOTO LOG

CLIENT: DPG Project 37 Pty Ltd
PROJECT: Proposed Mixed Use Development
LOCATION: 79-81 Queens Road & 2-8 Spencer Street, Five Dock NSW

SURFACE LEVEL: 2.0 AHD
COORDINATE: E:325961.7, N:6250700.0
DATUM/GRID: MGA2020 Zone 56
DIP/AZIMUTH: 90°/---°

LOCATION ID: BH105
PROJECT No: 224583.01
DATE: 14/05/24
SHEET: 1 of 2

5.75-10.00 m depth

10.00-15.00 m depth

CORE PHOTO LOG

CLIENT: DPG Project 37 Pty Ltd
PROJECT: Proposed Mixed Use Development
LOCATION: 79-81 Queens Road & 2-8 Spencer Street, Five Dock NSW

SURFACE LEVEL: 2.0 AHD
COORDINATE: E:325961.7, N:6250700.0
DATUM/GRID: MGA2020 Zone 56
DIP/AZIMUTH: 90°/---°

LOCATION ID: BH105
PROJECT No: 224583.01
DATE: 14/05/24
SHEET: 2 of 2

15.00-19.17 m depth

BOREHOLE LOG

CLIENT: DPG Project 37 Pty Ltd
PROJECT: Proposed Mixed Use Development
LOCATION: 79-81 Queens Road & 2-8 Spencer Street, Five Dock NSW

SURFACE LEVEL: 2.1 AHD
COORDINATE: E:325980.6, N:6250705.0
DATUM/GRID: MGA2020 Zone 56
DIP/AZIMUTH: 90°/---°

LOCATION ID: BH106
PROJECT No: 224583.01
DATE: 16/05/24
SHEET: 1 of 3

CONDITIONS ENCOUNTERED								SAMPLE				TESTING AND REMARKS	
GROUNDWATER	RL (m)	DEPTH (m)	DESCRIPTION OF STRATA	GRAPHIC	ORIGIN(#)	CONSIS.(*) / DENSITY.(*)	MOISTURE	REMARKS	TYPE	INTERVAL	DEPTH (m)	TEST TYPE	RESULTS AND REMARKS
	2	0.15	CONCRETE				NA				0.20	DCP9/150	5 10 15
			FILL / Sandy CLAY: orange-brown, mottled red; medium to high plasticity; trace gravel and bluestone.		FILL	MC	w<PL		A/ES		0.30		
		0.90							A/ES		0.50		
	1		Silty CLAY (CI-CH): orange-brown, mottled red; medium to high plasticity.		ALV	St	w>PL				0.60		
Seepage 16/05/24		1.20	Silty SAND (SC): orange-brown, mottled red; fine to medium.		ALV	L	W		* A/ES		0.90		
		1.90							A/ES		1.00		
	0		CLAY (CI-CH): pale grey mottled orange-red; medium to high plasticity.						A/ES		1.50		
											1.60		
	-1	3							A/ES		2		
			3.60m-5.00m: clay with ironstone		RS	St to VSt	w<PL		A/ES		2.90		
	-2	4									3.00		
									A/ES		4		
	-3	5									4.40		
									A/ES		4.50		
	-4	6	From 6.00m: extremely weathered sandstone								5		
		6.30	Continued as rock log								6		
	-5	7									7		
	-6	8									8		
	-7	9									9		
	-8	10									10		
	-9	11									11		

NOTES: (#) Soil origin is "probable" unless otherwise stated. (*) Consistency/Relative density shading is for visual reference only - no correlation between cohesive and granular materials is implied.

PLANT: Comacchio 205
OPERATOR: Ground Test (Jack)
LOGGED: JAL
METHOD: Diatube to 0.15m, AD/T to 2.5m, WB to 6.3m, NMLC to 19.0m
CASING: HW to 2.5m, then HQ to 6.3m
REMARKS: *Field replicate BD2/20240516 taken at 0.9-1.0m

Refer to explanatory notes for symbol and abbreviation definitions

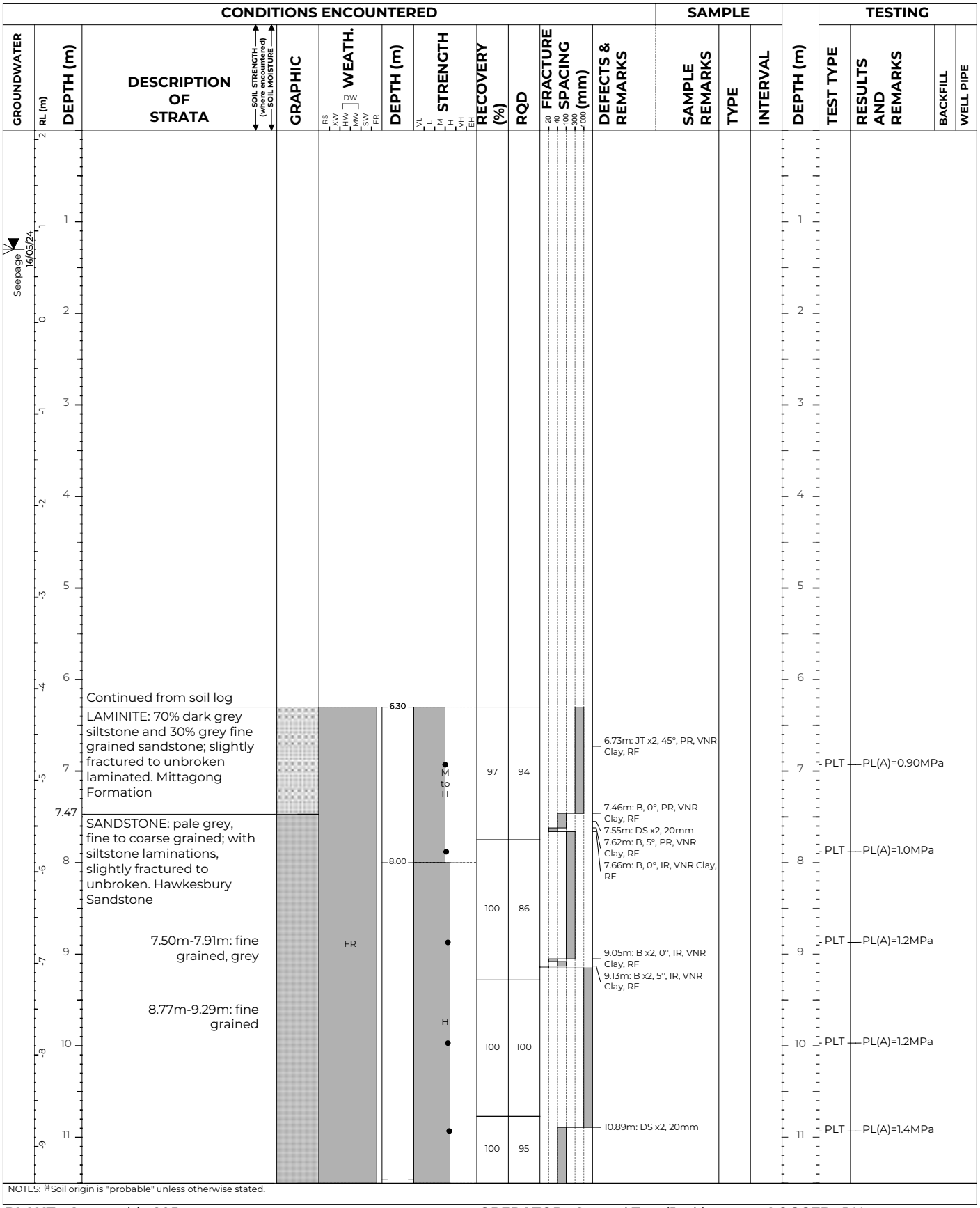
Douglas PARTNERS

BOREHOLE LOG

CLIENT: DPG Project 37 Pty Ltd
PROJECT: Proposed Mixed Use Development
LOCATION: 79-81 Queens Road & 2-8 Spencer Street, Five Dock NSW

SURFACE LEVEL: 2.1 AHD
COORDINATE: E:325980.6, N:6250705.0
DATUM/GRID: MGA2020 Zone 56
DIP/AZIMUTH: 90°/---°

LOCATION ID: BH106
PROJECT No: 224583.01
DATE: 16/05/24
SHEET: 2 of 3



NOTES: [a] Soil origin is "probable" unless otherwise stated.

PLANT: Comacchio 205
OPERATOR: Ground Test (Jack)
LOGGED: JAL
METHOD: Diatube to 0.15m, AD/T to 2.5m, WB to 6.3m, NMLC to 19.0m
CASING: HW to 2.5m, then HQ to 6.3m
REMARKS: *Field replicate BD2/20240516 taken at 0.9-1.0m

Douglas PARTNERS

BOREHOLE LOG

CLIENT: DPG Project 37 Pty Ltd
PROJECT: Proposed Mixed Use Development
LOCATION: 79-81 Queens Road & 2-8 Spencer Street, Five Dock NSW

SURFACE LEVEL: 2.1 AHD
COORDINATE: E:325980.6, N:6250705.0
DATUM/GRID: MGA2020 Zone 56
DIP/AZIMUTH: 90°/---°

LOCATION ID: BH106
PROJECT No: 224583.01
DATE: 16/05/24
SHEET: 3 of 3

GROUNDWATER	RL (m)	DEPTH (m)	DESCRIPTION OF STRATA (SOIL STRENGTH (where encountered) / SOIL MOISTURE)	GRAPHIC	WEATH. (PS, XW, HW, DW, MW, SW, FR)	DEPTH (m)	STRENGTH (VL, L, M, H, VH, EH)	RECOVERY (%)	RQD	FRACTURE SPACING (mm) (20, 60, 100, 300, 1000)	DEFECTS & REMARKS	SAMPLE REMARKS	TYPE	INTERVAL	DEPTH (m)	TEST TYPE	RESULTS AND REMARKS	BACKFILL	WELL PIPE
	-10	12	[CONT] SANDSTONE: pale grey, fine to coarse grained; with siltstone laminations, slightly fractured to unbroken. Hawkesbury Sandstone			11.50	M	100	95		11.97m: B, 0°, PR, SN Fe, RF				12	PLT	PL(A)=0.80MPa		
	-11	13				12.50	H	100	100		13.37m: B, 5°, CU, VNR Clay, RF 13.65m: B, 10°, CU, VNR Clay, RF				13	PLT	PL(A)=1.1MPa		
	-12	14													14	PLT	PL(A)=1.7MPa		
	-13	15			FR	14.50	M	100	100		14.50m: B, 10°, CU, SN Fe, RF				15	PLT	PL(A)=0.50MPa		
	-14	16				15.50		93	100		15.67m: B, 5°, PR, CT Clay 2mm, RF 15.79m: B, 0°, IR, VNR Clay, RF				16	PLT	PL(A)=2.0MPa		
	-15	17					H	100	100						17	PLT	PL(A)=1.7MPa		
	-16	18									18.16m: B, 10°, CU, VNR Clay, RF				18	PLT	PL(A)=1.6MPa		
	-17	19						100	100		18.95m: B, 0°, PR, VNR Clay, RF				19	PLT	PL(A)=1.2MPa		
	-18	20	Borehole discontinued at 19.00m depth.																
	-19	21																	
	-20	22																	

NOTES: [#] Soil origin is "probable" unless otherwise stated.

PLANT: Comacchio 205
OPERATOR: Ground Test (Jack)
LOGGED: JAL
METHOD: Diatube to 0.15m, AD/T to 2.5m, WB to 6.3m, NMLC to 19.0m
CASING: HW to 2.5m, then HQ to 6.3m
REMARKS: *Field replicate BD2/20240516 taken at 0.9-1.0m

Refer to explanatory notes for symbol and abbreviation definitions

Generated with CORE-GS by Geroc - Split Soil-Rock Log

CORE PHOTO LOG

CLIENT: DPG Project 37 Pty Ltd
PROJECT: Proposed Mixed Use Development
LOCATION: 79-81 Queens Road & 2-8 Spencer Street, Five Dock NSW

SURFACE LEVEL: 2.1 AHD
COORDINATE: E:325980.6, N:6250705.0
DATUM/GRID: MGA2020 Zone 56
DIP/AZIMUTH: 90°/---°

LOCATION ID: BH106
PROJECT No: 224583.01
DATE: 16/05/24
SHEET: 1 of 2

6.30-10.00 m depth

10.00-15.00 m depth

CORE PHOTO LOG

CLIENT: DPG Project 37 Pty Ltd
PROJECT: Proposed Mixed Use Development
LOCATION: 79-81 Queens Road & 2-8 Spencer Street, Five Dock NSW

SURFACE LEVEL: 2.1 AHD
COORDINATE: E:325980.6, N:6250705.0
DATUM/GRID: MGA2020 Zone 56
DIP/AZIMUTH: 90°/---°

LOCATION ID: BH106
PROJECT No: 224583.01
DATE: 16/05/24
SHEET: 2 of 2

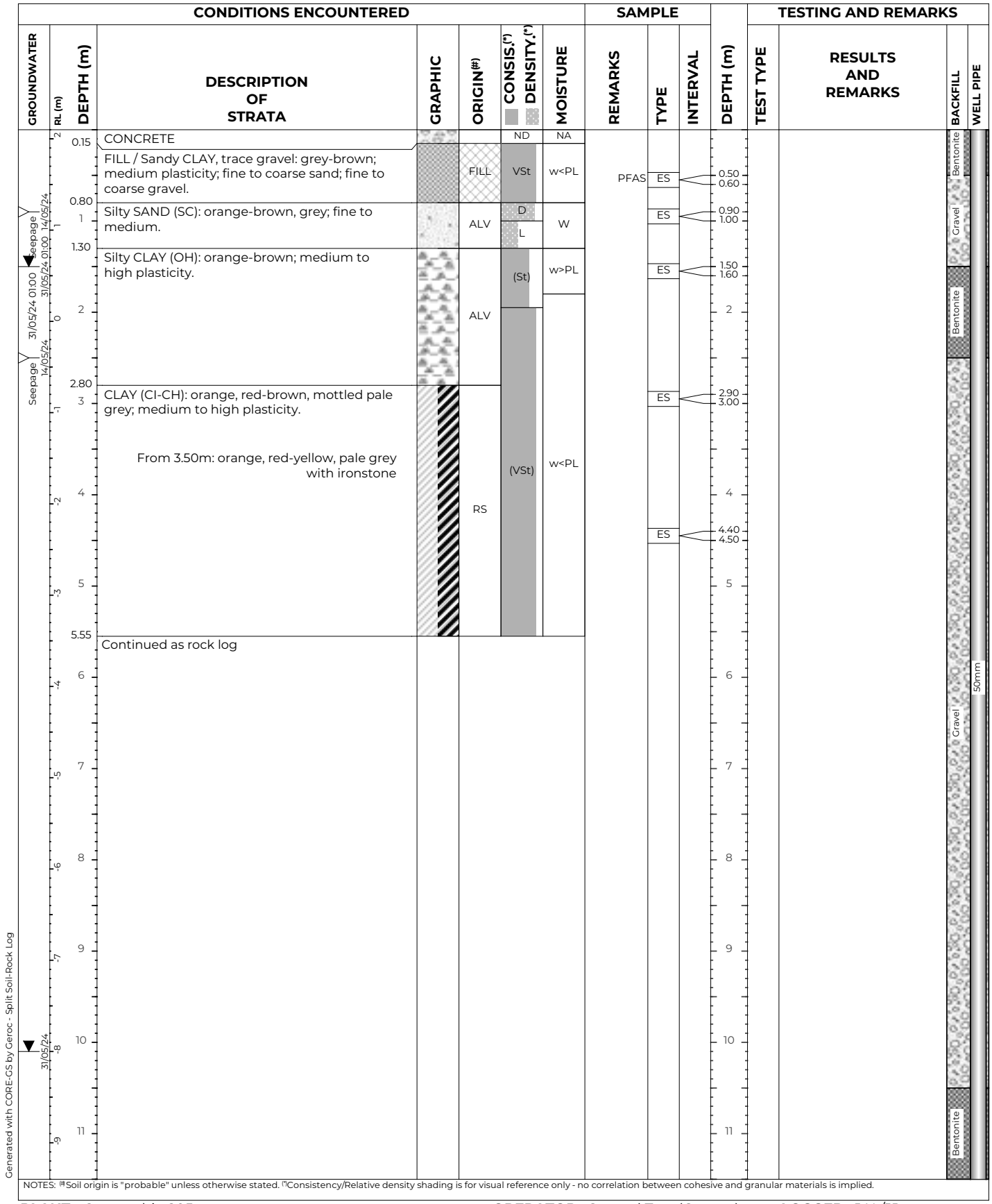
15.00-19.00 m depth

BOREHOLE LOG

CLIENT: DPG Project 37 Pty Ltd
PROJECT: Proposed Mixed Use Development
LOCATION: 79-81 Queens Road & 2-8 Spencer Street, Five Dock NSW

SURFACE LEVEL: 2.1 AHD
COORDINATE: E:325989.6, N:6250729.5
DATUM/GRID: MGA2020 Zone 56
DIP/AZIMUTH: 90°/---°

LOCATION ID: BH107
PROJECT No: 224583.01
DATE: 22/05/24 - 23/05/24
SHEET: 1 of 3



NOTES: (#) Soil origin is "probable" unless otherwise stated. (*)Consistency/Relative density shading is for visual reference only - no correlation between cohesive and granular materials is implied.

PLANT: Comacchio 205
METHOD: HA to 4.5m, WB to 5.5m, NMLC to 19.1
REMARKS:

OPERATOR: Ground Test (George)

LOGGED: JAL/JJ
CASING: HW to 2.5m, then HQ to 5.5m

Refer to explanatory notes for symbol and abbreviation definitions

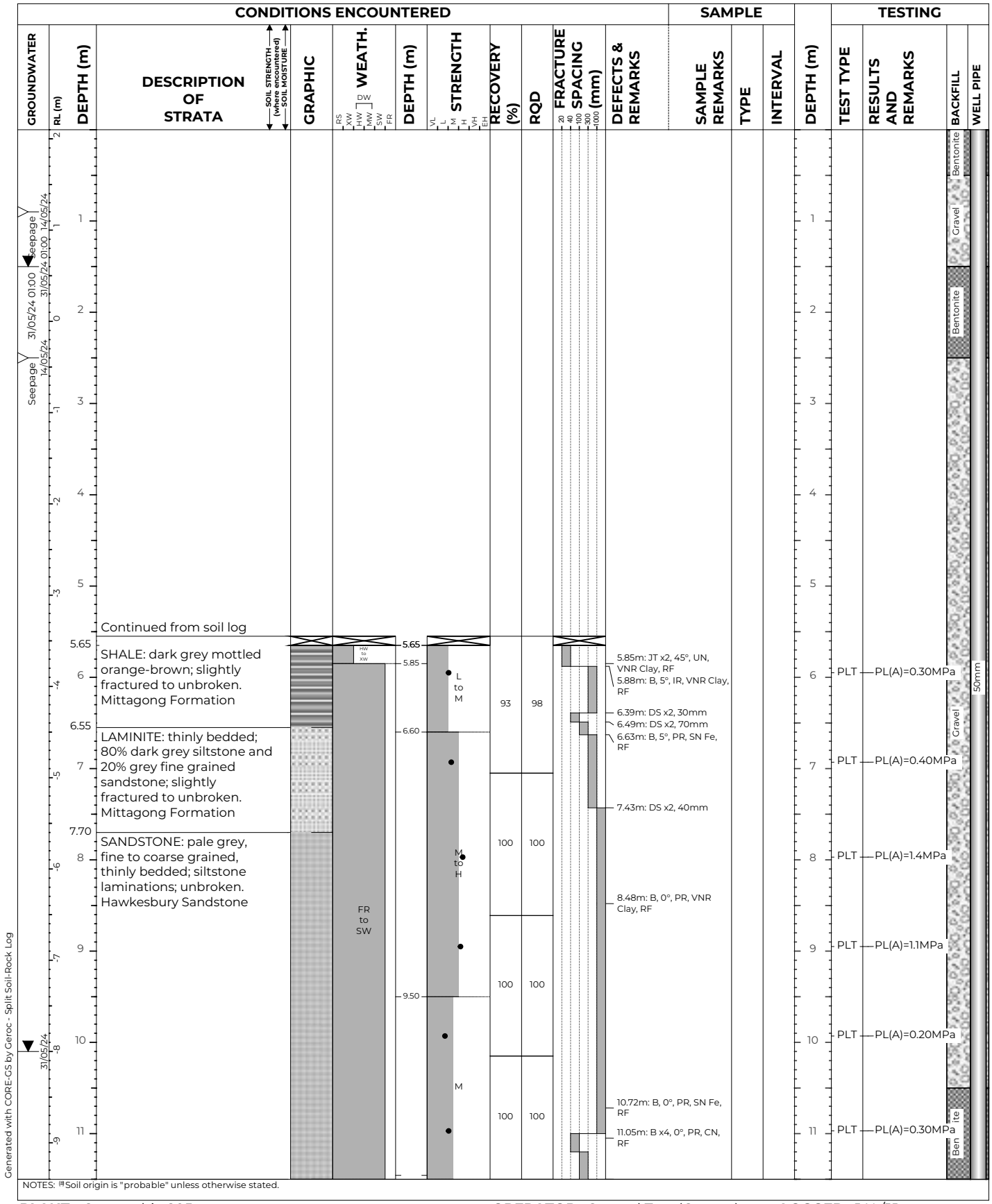
Generated with CORE-GS by Geroc - Split Soil-Rock Log

BOREHOLE LOG

CLIENT: DPG Project 37 Pty Ltd
PROJECT: Proposed Mixed Use Development
LOCATION: 79-81 Queens Road & 2-8 Spencer Street, Five Dock NSW

SURFACE LEVEL: 2.1 AHD
COORDINATE: E:325989.6, N:6250729.5
DATUM/GRID: MGA2020 Zone 56
DIP/AZIMUTH: 90°/---°

LOCATION ID: BH107
PROJECT No: 224583.01
DATE: 22/05/24 - 23/05/24
SHEET: 2 of 3



Generated with CORE-GS by Geroc - Split Soil-Rock Log

NOTES: [a] Soil origin is "probable" unless otherwise stated.

PLANT: Comacchio 205
METHOD: HA to 4.5m, WB to 5.5m, NMLC to 19.1
REMARKS:

OPERATOR: Ground Test (George)

LOGGED: JAL/JJ
CASING: HW to 2.5m, then HQ to 5.5m

Refer to explanatory notes for symbol and abbreviation definitions

Douglas PARTNERS

BOREHOLE LOG

CLIENT: DPG Project 37 Pty Ltd
PROJECT: Proposed Mixed Use Development
LOCATION: 79-81 Queens Road & 2-8 Spencer Street, Five Dock NSW

SURFACE LEVEL: 2.1 AHD
COORDINATE: E:325989.6, N:6250729.5
DATUM/GRID: MGA2020 Zone 56
DIP/AZIMUTH: 90°/---°

LOCATION ID: BH107
PROJECT No: 224583.01
DATE: 22/05/24 - 23/05/24
SHEET: 3 of 3

CONDITIONS ENCOUNTERED

GROUNDWATER	RL (m)	DEPTH (m)	DESCRIPTION OF STRATA	SOIL STRENGTH (where encountered) / SOIL MOISTURE	GRAPHIC	WEATH. (PS, XW, DW, HW, MW, SW, FR)	DEPTH (m)	STRENGTH (VL, L, M, H, VH, EH)	RECOVERY (%)	RQD	FRACTURE SPACING (mm) (20, 40, 100, 300, 1000)	DEFECTS & REMARKS
		0.00	[CONT] SANDSTONE: pale grey, fine to coarse grained, thinly bedded; siltstone laminations; 12cm siltstone band			FR to SW	11.50		100	100		11.50m: DB 11.63m: DB 11.94m: B, 5°, PR, CN 12.15m: DB
		1.50	Hawkesbury Sandstone 12.50m-13.00m: siltstone inclusions						96	87		12.51m: B, 0°, UN, CN, RF 12.62m: B x2, 5°, UN, CN, RF
		2.00	SANDSTONE: grey, fine to coarse grained, thinly laminated to thinly bedded; with dark grey laminations, unbronken. Hawkesbury Sandstone 14.60m-19.10m: unbroken				13.00	H	100	100		12.92m: B, 15°, PR, CN, RF 12.95m: B, 15°, PR, INF, RF, sand infill 13.00m: B, 15°, PR, CN, RF 13.60m: B, 5°, UN, CN, RF 13.80m: B, 10°, UN, CN, RF 14.24m: B, 5°, UN, CN, RF
		5.00				FR			100	100		14.65m: DB 14.70m: HB 14.74m: HB 14.84m: HB 15.25m: HB
		7.00							100	100		16.20m: DB 17.00m: HB
		8.00					17.50	M to H	100	100		17.70m: HB 17.80m: DB 18.00m: HB
		9.00					18.50	H				19.00m: HB 19.10m: DB
		10.00	Borehole discontinued at 19.10m depth. Target depth reached.									

SAMPLE

SAMPLE REMARKS	TYPE	INTERVAL

TESTING

DEPTH (m)	TEST TYPE	RESULTS AND REMARKS
12	PLT	PL(A)=1.4MPa
13	PLT	PL(A)=1.1MPa
14	PLT	PL(A)=0.90MPa
15	PLT	PL(A)=1.6MPa
16	PLT	PL(A)=1.4MPa
17	PLT	PL(A)=1.4MPa
18	PLT	PL(A)=0.40MPa
19	PLT	PL(A)=1.0MPa

BACKFILL: Gravel
WELL PIPE: 50mm

NOTES: [a] Soil origin is "probable" unless otherwise stated.

PLANT: Comacchio 205
METHOD: HA to 4.5m, WB to 5.5m, NMLC to 19.1
REMARKS:

OPERATOR: Ground Test (George)

LOGGED: JAL/JJ
CASING: HW to 2.5m, then HQ to 5.5m

Generated with CORE-GS by Geroc - Split Soil-Rock Log

Refer to explanatory notes for symbol and abbreviation definitions

Douglas PARTNERS

CORE PHOTO LOG

CLIENT: DPG Project 37 Pty Ltd
PROJECT: Proposed Mixed Use Development
LOCATION: 79-81 Queens Road & 2-8 Spencer Street, Five Dock NSW

SURFACE LEVEL: 2.1 AHD
COORDINATE: E:325989.6, N:6250729.5
DATUM/GRID: MGA2020 Zone 56
DIP/AZIMUTH: 90°/---°

LOCATION ID: BH107
PROJECT No: 224583.01
DATE: 22/05/24 - 23/05/24
SHEET: 1 of 2

5.55-10.00 m depth

10.00-14.00 m depth

Douglas PARTNERS

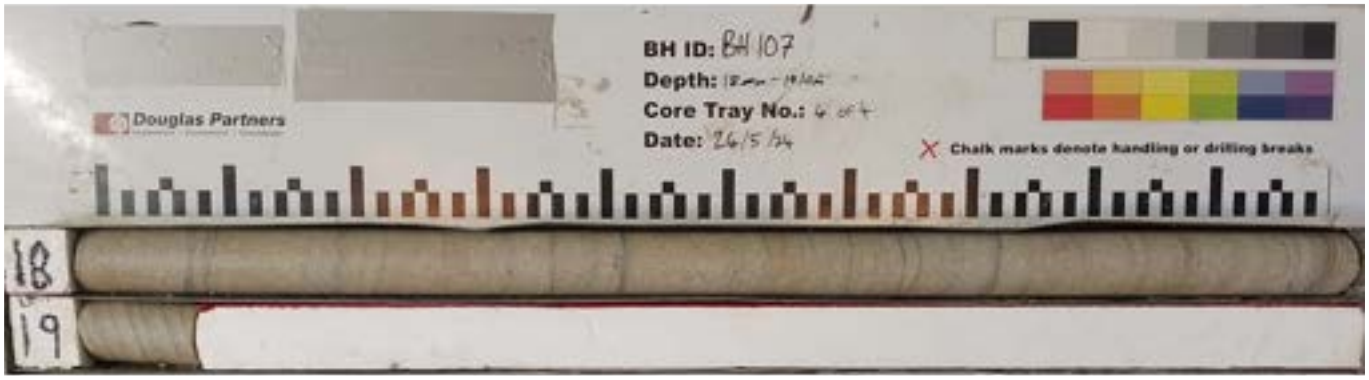
CORE PHOTO LOG

CLIENT: DPG Project 37 Pty Ltd
PROJECT: Proposed Mixed Use Development
LOCATION: 79-81 Queens Road & 2-8 Spencer Street, Five Dock NSW

SURFACE LEVEL: 2.1 AHD
COORDINATE: E:325989.6, N:6250729.5
DATUM/GRID: MGA2020 Zone 56
DIP/AZIMUTH: 90°/---°

LOCATION ID: BH107
PROJECT No: 224583.01
DATE: 22/05/24 - 23/05/24
SHEET: 2 of 2

14.00-18.00 m depth



18.00-19.10 m depth

BOREHOLE LOG

CLIENT: DPG Project 37 Pty Ltd
PROJECT: Proposed Mixed Use Development
LOCATION: 79-81 Queens Road & 2-8 Spencer Street, Five Dock NSW

SURFACE LEVEL: 2.0 AHD
COORDINATE: E:325963.7, N:6250709.8
DATUM/GRID: MGA2020 Zone 56
DIP/AZIMUTH: 90°/---°

LOCATION ID: BH109
PROJECT No: 224583.01
DATE: 24/04/24
SHEET: 1 of 1

CONDITIONS ENCOUNTERED								SAMPLE				TESTING AND REMARKS	
GROUNDWATER	RL (m) / DEPTH (m)	DESCRIPTION OF STRATA	GRAPHIC	ORIGIN(#)	CONSIS.(*) / DENSITY.(*)	MOISTURE	REMARKS	TYPE	INTERVAL	DEPTH (m)	TEST TYPE	RESULTS AND REMARKS
	0.10	CONCRETE								0.10		
		FILL / Crushed SANDSTONE, with clay, with gravel: orange-brown; brown clay; angular to sub-angular, igneous gravel.		FILL	ND	M		A/ES		0.20		
▼ 24/04/24	1 1.00					W				1.00		
	1.10	FILL / Sandy CLAY: grey, orange-brown mottled red; medium plasticity; fine to medium sand.		FILL				A/ES		1.10		
		Sandy CLAY (CI): grey, orange-brown mottled red; medium plasticity.		ALV		w>LL	PFAS	A/ES		1.50 1.60		
		Borehole discontinued at 1.60m depth. Target depth reached.										
	0 2											
	-1 3											
	-2 4											

NOTES: (#) Soil origin is "probable" unless otherwise stated. (*) Consistency/Relative density shading is for visual reference only - no correlation between cohesive and granular materials is implied.

PLANT: Hand Tools
METHOD: HA to 1.6m
REMARKS:

OPERATOR: Ground Test

LOGGED: JAL
CASING: Uncased

Refer to explanatory notes for symbol and abbreviation definitions

Douglas PARTNERS

BOREHOLE LOG

CLIENT: DPG Project 37 Pty Ltd
PROJECT: Proposed Mixed Use Development
LOCATION: 79-81 Queens Road & 2-8 Spencer Street, Five Dock NSW

SURFACE LEVEL: 2.0 AHD
COORDINATE: E:325972.0, N:6250693.7
DATUM/GRID: MGA2020 Zone 56
DIP/AZIMUTH: 90°/---°

LOCATION ID: BH110
PROJECT No: 224583.01
DATE: 24/04/24
SHEET: 1 of 1

CONDITIONS ENCOUNTERED								SAMPLE				TESTING AND REMARKS	
GROUNDWATER	RL (m) / DEPTH (m)	DESCRIPTION OF STRATA	GRAPHIC	ORIGIN(#)	CONSIS.(*) / DENSITY.(*)	MOISTURE	REMARKS	TYPE	INTERVAL	DEPTH (m)	TEST TYPE	RESULTS AND REMARKS
saturated from 0.5m 01/05/24	0.10	CONCRETE				ND						
		FILL / Sandy CLAY: grey, orange and brown; medium to high plasticity; suspected perched water in fill.		FILL	ND	w>LL		A/ES		0.10 0.20		
		0.40m-0.50m: layer of gravel (ash)						A/ES		0.40 0.50		
	1							A/ES		0.90 1.00		
	1.10	Sandy CLAY (CI): grey, orange-brown mottled red; medium plasticity.		ALV								
							PFAS	A/ES		1.40 1.50		
		Borehole discontinued at 1.50m depth. Target depth reached.										
	0 2											
	-1 3											
	-2 4											

NOTES: (#) Soil origin is "probable" unless otherwise stated. (*) Consistency/Relative density shading is for visual reference only - no correlation between cohesive and granular materials is implied.

PLANT: Hand Tools
METHOD: HA to 1.5m
REMARKS:

OPERATOR: Ground Test

LOGGED: JAL
CASING: Uncased

Refer to explanatory notes for symbol and abbreviation definitions

Douglas PARTNERS

BOREHOLE LOG

CLIENT: DPG Project 37 Pty Ltd
PROJECT: Proposed Mixed Use Development
LOCATION: 79-81 Queens Road & 2-8 Spencer Street, Five Dock NSW

SURFACE LEVEL: 1.8 AHD
COORDINATE: E:325968.0, N:6250749.3
DATUM/GRID: MGA2020 Zone 56
DIP/AZIMUTH: 90°/---°

LOCATION ID: BH111
PROJECT No: 224583.01
DATE: 24/04/24
SHEET: 1 of 1

CONDITIONS ENCOUNTERED								SAMPLE				TESTING AND REMARKS	
GROUNDWATER	RL (m) / DEPTH (m)	DESCRIPTION OF STRATA	GRAPHIC	ORIGIN(#)	CONSIS.(*) / DENSITY.(*)	MOISTURE	REMARKS	TYPE	INTERVAL	DEPTH (m)	TEST TYPE	RESULTS AND REMARKS
	0.15	CONCRETE						A/ES		0.10 – 0.20		
		FILL / Sandy CLAY: pale grey and orange-yellow; medium plasticity; fine to medium sand.		FILL	ND	ND		A/ES		0.50 – 0.60		
	0.80	Peaty CLAY (CI): dark grey and pale grey; medium plasticity.		ALV		w>PL						
seepage 29/04/24	1.00	Clayey SAND: red, orange and brown; fine to medium.		ALV	(L)	M		A/ES		1.00 – 1.10		
	1.20	CLAY (CI): brown-grey; medium plasticity.		RS		w>PL						
	1.50	CLAY (CI-CH): pale grey and brown; medium to high plasticity.		RS	ND	w<PL		A/ES		1.50 – 1.60		
	2							A/ES		2.00 – 2.10		
							PFAS	A/ES		2.50 – 2.60		
	3							A/ES		2.90 – 3.00		
		Borehole discontinued at 3.00m depth. Target depth reached.										

NOTES: (#) Soil origin is "probable" unless otherwise stated. (*) Consistency/Relative density shading is for visual reference only - no correlation between cohesive and granular materials is implied.

PLANT: Comacchio 305
METHOD: AD/T to 3.0m
REMARKS:

OPERATOR: Ground Test

LOGGED: JAL
CASING: Uncased

Refer to explanatory notes for symbol and abbreviation definitions

BOREHOLE LOG

CLIENT: DPG Project 37 Pty Ltd
PROJECT: Proposed Mixed Use Development
LOCATION: 79-81 Queens Road & 2-8 Spencer Street, Five Dock NSW

SURFACE LEVEL: 2.0 AHD
COORDINATE: E:325946.6, N:6250744.8
DATUM/GRID: MGA2020 Zone 56
DIP/AZIMUTH: 90°/---°

LOCATION ID: BH112
PROJECT No: 224583.01
DATE: 24/04/24
SHEET: 1 of 1

CONDITIONS ENCOUNTERED								SAMPLE				TESTING AND REMARKS	
GROUNDWATER	RL (m) / DEPTH (m)	DESCRIPTION OF STRATA	GRAPHIC	ORIGIN(#)	CONSIS.(*) / DENSITY.(*)	MOISTURE	REMARKS	TYPE	INTERVAL	DEPTH (m)	TEST TYPE	RESULTS AND REMARKS
01/05/24 No free groundwater observed whilst augering		CONCRETE										
	0.10	FILL / SAND, with clay, with gravel; fine to medium; brown clay; (ash) gravel.		FILL	ND	M to W	PFAS	A		0.10		
								A		0.20	PID	<1ppm
								A		0.30	PID	<1ppm
								A		0.40	PID	<1ppm
	0.90	FILL / Sandy CLAY: grey; fine to medium sand; (possibly reworked natural).		FILL								
	1							A		1.00		
								A		1.10	PID	<1ppm
		Borehole discontinued at 1.50m depth. Target depth reached.										
	0 2											
	-1 3											
	-2 4											

NOTES: (#) Soil origin is "probable" unless otherwise stated. (*) Consistency/Relative density shading is for visual reference only - no correlation between cohesive and granular materials is implied.

PLANT: Hand Tools
METHOD: HA to 1.5m
REMARKS:

OPERATOR: Ground Test

LOGGED: JAL
CASING: Uncased

Refer to explanatory notes for symbol and abbreviation definitions

Generated with CORE-GS by Geroc - Soil Log

BOREHOLE LOG

CLIENT: DPG Project 37 Pty Ltd
PROJECT: Proposed Mixed Use Development
LOCATION: 79-81 Queens Road & 2-8 Spencer Street, Five Dock NSW

SURFACE LEVEL: 1.9 AHD
COORDINATE: E:325956.0, N:6250755.5
DATUM/GRID: MGA2020 Zone 56
DIP/AZIMUTH: 90°/---°

LOCATION ID: BH103S
PROJECT No: 224583.01
DATE: 29/04/24 - 30/04/24
SHEET: 1 of 1

GROUNDWATER	RL (m)	DEPTH (m)	DESCRIPTION OF STRATA	GRAPHIC	ORIGIN(#)	CONSIS.(*) / DENSITY.(*)	MOISTURE	REMARKS	SAMPLE TYPE	SAMPLE INTERVAL	DEPTH (m)	TEST TYPE	RESULTS AND REMARKS	BACKFILL	WELL PIPE
		0.15	CONCRETE			ND	ND							Bentonite	50mm
Seepage 29/04/24	1	1.00	FILL / Sandy CLAY: orange-brown; medium plasticity.		FILL	(S)	w>PL				1				
	0	1.50	Sandy CLAY (CI): orange-brown mottled red; medium plasticity; fine to medium sand.		ALV	VS									
		2.20	Clayey SAND (SC): grey-brown; fine to medium.		ALV	L	M				2				
31/05/24 01:00	-1	3	CLAY (CI): pale grey, orange and brown; medium plasticity.			St								Gravel	50mm
	-2	4	From 2.80m: pale grey mottled red; with ironstone bands		RS	VSt	w<PL				4				
	-3	5	From 4.00m: yellow, orange-brown mottled red; extremely weathered								5				
	-4	6	Borehole discontinued at 6.00m depth. Target depth reached.												
	-5	7													
	-6	8													
	-7	9													
	-8	10													
	-9	11													

NOTES: (#) Soil origin is "probable" unless otherwise stated. (*)Consistency/Relative density shading is for visual reference only - no correlation between cohesive and granular materials is implied.

PLANT: Comacchio 305
METHOD: AD/T to 2.5m, WB to 5.9m, NMLC to 30.24M
REMARKS:

OPERATOR: Ground Test

LOGGED: JAL
CASING: HW to 4m, then HQ to 5.9m

Refer to explanatory notes for symbol and abbreviation definitions

Generated with CORE-GS by Geroc - Soil Log

BOREHOLE LOG

CLIENT: DPG Project 37 Pty Ltd
PROJECT: Proposed Mixed Use Development
LOCATION: 79-81 Queens Road & 2-8 Spencer Street, Five Dock NSW

SURFACE LEVEL: 2.1 AHD
COORDINATE: E:325989.6, N:6250729.5
DATUM/GRID: MGA2020 Zone 56
DIP/AZIMUTH: 90°/---°

LOCATION ID: BH107S
PROJECT No: 224583.01
DATE: 22/05/24 - 23/05/24
SHEET: 1 of 1

CONDITIONS ENCOUNTERED								SAMPLE				TESTING AND REMARKS			
GROUNDWATER	RL (m)	DEPTH (m)	DESCRIPTION OF STRATA	GRAPHIC	ORIGIN(#)	CONSIS.(*) DENSITY.(*)	MOISTURE	REMARKS	TYPE	INTERVAL	DEPTH (m)	TEST TYPE	RESULTS AND REMARKS	BACKFILL	WELL PIPE
	2	0.15	CONCRETE			ND	NA							Bentonite	50mm
			FILL / Sandy CLAY, trace gravel: grey-brown; medium plasticity; fine to coarse sand; fine to coarse gravel.		FILL	VSt	w<PL								
Seepage 14/05/24	1	0.80	Silty SAND (SC): orange-brown, grey; fine to medium.		ALV	D / L	W				1			Gravel	50mm
MW5 31/05/24 01:00		1.30	Peaty CLAY (OH): orange-brown; medium to high plasticity.		ALV	(St)	w>PL								
31/05/24 01:00 MW5 31/05/24	0	2	Borehole discontinued at 1.50m depth. Target depth reached.												
	-1	3													
	-2	4													

NOTES: (#) Soil origin is "probable" unless otherwise stated. (*) Consistency/Relative density shading is for visual reference only - no correlation between cohesive and granular materials is implied.

PLANT: Comacchio 205
METHOD: HA to 1.5 m
REMARKS:

OPERATOR: Ground Test (George)

LOGGED: JAL/JJ
CASING: HW to 2.5m

Refer to explanatory notes for symbol and abbreviation definitions

Terminology, Symbols and Abbreviations

November 2023

Introduction to Terminology, Symbols and Abbreviations

Douglas Partners' reports, investigation logs, and other correspondence may use terminology which has quantitative or qualitative connotations. To remove ambiguity or uncertainty surrounding the use of such terms, the following sets of notes pages may be attached Douglas Partners' reports, depending on the work performed and conditions encountered:

- Soil Descriptions;
- Rock Descriptions; and
- Sampling, insitu testing, and drilling methodologies

In addition to these pages, the following notes generally apply to most documents.

Abbreviation Codes

Site conditions may also be presented in a number of different formats, such as investigation logs, field mapping, or as a written summary. In some of these formats textual or symbolic terminology may be presented using textual abbreviation codes or graphic symbols, and, where commonly used, these are listed alongside the terminology definition. For ease of identification in these note pages, textual codes are presented in these notes in the following style XW. Code usage conforms with the following guidelines:

- Textual codes are case insensitive, although herein they are generally presented in upper case; and
- Textual codes are contextual (i.e. the same or similar combinations of characters may be used in different contexts with different meanings (for example `PL` is used for plastic limit in the context of soil moisture condition, as well as in `PL(A)` for point load test result in the testing results column)).

Data Integrity Codes

Subsurface investigation data recorded by Douglas Partners is generally managed in a highly structured database environment, where records "span" between a top and bottom depth interval. Depth interval "gaps" between records are considered to introduce ambiguity, and, where appropriate, our practice guidelines may require contiguous data sets. Recording meaningful data is not always appropriate (for example assigning a "strength" to a concrete pavement) and the following codes may be used to maintain contiguity in such circumstances.

Term	Description	Abbreviation Code
Core loss	No core recovery	KL
Unknown	Information was not available to allow classification of the property. For example, when auguring in loose, saturated sand auger cuttings may not be returned.	UK
No data	Information required to allow classification of the property was not available. For example if drilling is commenced from the base of a hole predrilled by others	ND
Not Applicable	Derivation of the properties not appropriate or beyond the scope of the investigation. For example providing a description of the strength of a concrete pavement	NA

Graphic Symbols

Douglas Partners' logs contain a "graphic" column which provides a pictorial representation of the basic composition of the material. The symbols used are directly representing the material name stated in the adjacent "Description of Strata" column, and as such no specific graphic symbology legend has been provided in these notes.

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Soil Descriptions

Terminology
Symbols
Abbreviations

March 2024

Introduction

All materials which are not considered to be "in-situ rock" are described in general accordance with the soil description model of AS 1726-2017 Part 6.1.3, and can be broken down into the following description structure:

The "classification" comprises a two character "group symbol" providing a general summary of dominant soil characteristics. The "name" summarises the particle sizes within the soil which most influence its behaviour. The detailed description presents more information about composition, condition, structure, and origin of the soil.

Classification, naming and description of soils require the relative proportion of particles of different sizes within the whole soil mixture to be considered.

Particle size designation and Behaviour Model

Solid particles within a soil are differentiated on the basis of size.

The engineering behaviour properties of a soil can subsequently be modelled to be either "fine grained" (also known as "cohesive" behaviour) or "coarse grained" ("non cohesive" behaviour), depending on the relative proportion of fine or coarse fractions in the soil mixture.

Particle Size Designation	Particle Size (mm)	Behaviour Model	
		Behaviour	Approximate Dry Mass
Boulder	>200	Excluded from particle behaviour model as "oversize"	
Cobble	63 - 200		
Gravel[1]	2.36 - 63	Coarse	>65%
Sand[1]	0.075 - 2.36		
Silt	0.002 - 0.075	Fine	>35%
Clay	<0.002		

[1] – refer grain size subdivision descriptions below

The behaviour model boundaries defined above are not precise, and the material behaviour should be assumed from the name given to the material (which considers the particle fraction which dominates the behaviour, refer "component proportions" below), rather than strict observance of the proportions of particle sizes. For example, if a material is named a "Sandy CLAY", this is indicative that the material exhibits fine grained behaviour, even if the dry mass of coarse grained material may exceed 65%.

Component proportions

The relative proportion of the dry mass of each particle size fraction is assessed to be a "primary", "secondary", or "minor" component of the soil mixture, depending on its influence over the soil behaviour.

Component Proportion Designation	Definition[1]	Relative Proportion	
		In Fine Grained Soil	In Coarse Grained Soil
Primary	The component (particle size designation, refer above) which dominates the engineering behaviour of the soil	The clay/silt component with the greater proportion	The sand/gravel component with the greater proportion
Secondary	Any component which is not the primary, but is significant to the engineering properties of the soil	Any component with greater than 30% proportion	Any granular component with greater than 30%; or Any fine component with greater than 12%
Minor[2]	Present in the soil, but not significant to its engineering properties	All other components	All other components

[1] As defined in AS1726-2017 6.1.4.4

[2] In the detailed material description, minor components are split into two further sub-categories. Refer "identification of minor components" below.

Composite Materials

In certain situations, a lithology description may describe more than one material, for example, collectively describing a layer of interbedded sand and clay. In such a scenario, the two materials would be described independently, with the names preceded or followed by a statement describing the arrangement by which the materials co-exist. For example, "INTERBEDDED Silty CLAY AND SAND".

Soil Descriptions

Classification

The soil classification comprises a two character group symbol. The first character identifies the primary component. The second character identifies either the grading or presence of fines in a coarse grained soil, or the plasticity in a fine grained soil. Refer AS1726-2017 6.1.6 for further clarification.

Soil Name

For most soils, the name is derived with the primary component included as the noun (in upper case), preceded by any secondary components stated in an adjective form. In this way, the soil name also describes the general composition and indicates the dominant behaviour of the material.

Component [1]	Prominence in Soil Name
Primary	Noun (eg "CLAY")
Secondary	Adjective modifier (eg "Sandy")
Minor	No influence

[1] – for determination of component proportions, refer component proportions on previous page

For materials which cannot be disaggregated, or which are not comprised of rock or mineral fragments, the names "ORGANIC MATTER" or "ARTIFICIAL MATERIAL" may be used, in accordance with AS1726-2017 Table 14.

Commercial or colloquial names are not used for the soil name where a component derived name is possible (for example "Gravelly SAND" rather than "CRACKER DUST").

Materials of "fill" or "topsoil" origin are generally assigned a name derived from the primary/secondary component (where appropriate). In log descriptions this is preceded by uppercase "FILL" or "TOPSOIL". Origin uncertainty is indicated in the description by the characters (?), with the degree of uncertainty described (using the terms "probably" or "possibly" in the origin column, or at the end of the description).

Identification of minor components

Minor components are identified in the soil description immediately following the soil name. The minor component fraction is usually preceded with a term indicating the relative proportion of the component.

Minor Component Proportion Term	Relative Proportion	
	In Fine Grained Soil	In Coarse Grained Soil
With	All fractions: 15-30%	Clay/silt: 5-12% sand/gravel: 15-30%
Trace	All fractions: 0-15%	Clay/silt: 0-5% sand/gravel: 0-15%

The terms "with" and "trace" generally apply only to gravel or fine particle fractions. Where cobbles/boulders are encountered in minor proportions (generally less than about 12%) the term "occasional" may be used. This term describes the sporadic distribution of the material within the confines of the investigation excavation only, and there may be considerable variation in proportion over a wider area which is difficult to factually characterise due to the relative size of the particles and the investigation methods.

Soil Composition

Plasticity

Descriptive Term	Laboratory liquid limit range	
	Silt	Clay
Non-plastic materials	Not applicable	Not applicable
Low plasticity	≤50	≤35
Medium plasticity	Not applicable	>35 and ≤50
High plasticity	>50	>50

Note, Plasticity descriptions generally describe the plasticity behaviour of the whole of the fine grained soil, not individual fine grained fractions.

Grain Size

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

Grading

Grading Term	Particle size (mm)
Well	A good representation of all particle sizes
Poorly	An excess or deficiency of particular sizes within the specified range
Uniformly	Essentially of one size
Gap	A deficiency of a particular size or size range within the total range

Note, AS1726-2017 provides terminology for additional attributes not listed here.

Soil Condition

Moisture

The moisture condition of soils is assessed relative to the plastic limit for fine grained soils, while for coarse grained soils it is assessed based on the appearance and feel of the material. The moisture condition of a material is considered to be independent of stratigraphy (although commonly these are related), and this data is presented in its own column on logs.

Applicability	Term	Tactile Assessment	Abbreviation code
Fine	Dry of plastic limit	Hard and friable or powdery	w<PL
	Near plastic limit	Can be moulded	w=PL
	Wet of plastic limit	Water residue remains on hands when handling	w>PL
	Near liquid limit	"oozes" when agitated	w=LL
	Wet of liquid limit	"oozes"	w>LL
Coarse	Dry	Non-cohesive and free running	D
	Moist	Feels cool, darkened in colour, particles may stick together	M
	Wet	Feels cool, darkened in colour, particles may stick together, free water forms when handling	W

The abbreviation code NDF, meaning "not-assessable due to drilling fluid use" may also be used.

Note, observations relating to free ground water or drilling fluids are provided independent of soil moisture condition.

Consistency/Density/Compaction/Cementation/Extremely Weathered Material

These concepts give an indication of how the material may respond to applied forces (when considered in conjunction with other attributes of the soil). This behaviour can vary independent of the composition of the material, and on logs these are described in an independent column and are generally mutually exclusive (i.e it is inappropriate to describe both consistency and compaction at the same time). The method by which the behaviour is described depends on the behaviour model and other characteristics of the soil as follows:

- In fine grained soils, the "consistency" describes the ease with which the soil can be remoulded, and is generally correlated against the materials undrained shear strength;
- In granular materials, the relative density describes how tightly packed the particles are, and is generally correlated against the density index;
- In anthropogenically modified materials, the compaction of the material is described qualitatively;
- In cemented soils (both natural and anthropogenic), the cemented "strength" is described qualitatively, relative to the difficulty with which the material is disaggregated; and
- In soils of extremely weathered material origin, the engineering behaviour may be governed by relic rock features, and expected behaviour needs to be assessed based the overall material description.

Quantitative engineering performance of these materials may be determined by laboratory testing or estimated by correlated field tests (for example penetration or shear vane testing). In some cases, performance may be assessed by tactile or other subjective methods, in which case investigation logs will show the estimated value enclosed in round brackets, for example (VS).

Consistency (fine grained soils)

Consistency Term	Tactile Assessment	Undrained Shear Strength (kPa)	Abbreviation Code
Very soft	Extrudes between fingers when squeezed	<12	VS
Soft	Mouldable with light finger pressure	>12 - ≤25	S
Firm	Mouldable with strong finger pressure	>25 - ≤50	F
Stiff	Cannot be moulded by fingers	>50 - ≤100	St
Very stiff	Indented by thumbnail	>100 - ≤200	VSt
Hard	Indented by thumbnail with difficulty	>200	H
Friable	Easily crumbled or broken into small pieces by hand	-	Fr

Relative Density (coarse grained soils)

Relative Density Term	Density Index	Abbreviation Code
Very loose	<15	VL
Loose	>15 - ≤35	L
Medium dense	>35 - ≤65	MD
Dense	>65 - ≤85	D
Very dense	>85	VD

Note, tactile assessment of relative density is difficult, and generally requires penetration testing, hence a tactile assessment guide is not provided.

Compaction (anthropogenically modified soil)

Compaction Term	Abbreviation Code
Well compacted	WC
Poorly compacted	PC
Moderately compacted	MC
Variably compacted	VC

Cementation (natural and anthropogenic)

Cementation Term	Abbreviation Code
Moderately cemented	MOD
Weakly cemented	WEK

Extremely Weathered Material

AS1726-2017 considers weathered material to be soil if the unconfined compressive strength is less than 0.6 MPa (i.e. less than very low strength rock). These materials may be identified as "extremely weathered material" in reports and by the abbreviation code XWM on log sheets. This identification is not correlated to any specific qualitative or quantitative behaviour, and the engineering properties of this material must therefore be assessed according to engineering principles with reference to any relic rock structure, fabric, or texture described in the description.

Soil Origin

Term	Description	Abbreviation Code
Residual	Derived from in-situ weathering of the underlying rock	RS
Extremely weathered material	Formed from in-situ weathering of geological formations. Has strength of less than 'very low' as per as1726 but retains the structure or fabric of the parent rock.	XWM
Alluvial	Deposited by streams and rivers	ALV
Fluvial	Deposited by channel fill and overbank (natural levee, crevasse splay or flood basin)	FLV
Estuarine	Deposited in coastal estuaries	EST
Marine	Deposited in a marine environment	MAR
Lacustrine	Deposited in freshwater lakes	LAC
Aeolian	Carried and deposited by wind	AEO
Colluvial	Soil and rock debris transported down slopes by gravity	COL
Slopewash	Thin layers of soil and rock debris gradually and slowly deposited by gravity and possibly water	SW
Topsoil	Mantle of surface soil, often with high levels of organic material	TOP
Fill	Any material which has been moved by man	FILL
Littoral	Deposited on the lake or seashore	LIT
Unidentifiable	Not able to be identified	UID

Cobbles and Boulders

The presence of particles considered to be "oversize" may be described using one of the following strategies:

- Oversize encountered in a minor proportion (when considered relative to the wider area) are noted in the soil description; or
- Where a significant proportion of oversize is encountered, the cobbles/boulders are described independent of the soil description, in a similar manner to composite soils (described above) but qualified with "MIXTURE OF".

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Rock Strength

Rock strength is defined by the unconfined compressive strength, and it refers to the strength of the rock substance and not the strength of the overall rock mass, which may be considerably weaker due to defects.

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

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

[1] Rock strength classification is based on UCS. The UCS to $I_{s(50)}$ ratio varies significantly for different rock types and specific ratios may be required for each site. The point load Index ranges shown above are as suggested in AS1726 and should not be relied upon without supporting evidence.

The following abbreviation codes are used for soil layers or seams of material "within rock" but for which the equivalent UCS strength is less than 0.6 MPa.

Scenario	Abbreviation Code
The material encountered has an equivalent UCS strength of less than 0.6 MPa, and therefore is considered to be soil (as per Note 1 of Table 20 of AS 1726-2017). The properties of the material encountered over this interval are described in the "Description of Strata" and soil properties columns.	SOIL
The material encountered has an equivalent UCS strength of less than 0.6 MPa, and therefore is considered to be soil (as per Note 1 of Table 20 of AS 1726-2017). The prominence of the material is such that it can be considered to be a seam (as defined in Table 22 of AS1726-2017) and the properties of the material are described in the defect column.	SEAM

Degree of Weathering

The degree of weathering of rock is classified as follows:

Weathering Term	Description	Abbreviation Code
Residual Soil[1]	Material is weathered to such an extent that it has soil properties. Mass structure and material texture and fabric of original rock are no longer visible, but the soil has not been significantly transported.	RS
Extremely weathered[1]	Material is weathered to such an extent that it has soil properties. Mass structure and material texture and fabric of original rock are still visible	XW
Highly weathered	The whole of the rock material is discoloured, usually by iron staining or bleaching to the extent that the colour of the original rock is not recognisable. Rock strength is significantly changed by weathering. Some primary minerals have weathered to clay minerals. Porosity may be increased by leaching or may be decreased due to deposition of weathering products in pores.	HW
Moderately weathered	The whole of the rock material is discoloured, usually by iron staining or bleaching to the extent that the colour of the original rock is not recognisable but shows little or no change of strength from fresh rock.	MW
Slightly weathered	Rock is partially discoloured with staining or bleaching along joints but shows little or no change of strength from fresh rock.	SW
Fresh	No signs of decomposition or staining.	FR
Note: If HW and MW cannot be differentiated use DW (see below)		
Distinctly weathered	Rock strength usually changed by weathering. The rock may be highly discoloured, usually by iron staining. Porosity may be increased by leaching or may be decreased due to deposition of weathered products in pores.	DW

[1] The parent rock type, of which the residual/extremely weathered material is a derivative, will be stated in the description (where discernible).

Degree of Alteration

The degree of alteration of the rock material (physical or chemical changes caused by hot gasses or liquids at depth) is classified as follows:

Term	Description	Abbreviation Code
Extremely altered	Material is altered to such an extent that it has soil properties. Mass structure and material texture and fabric of original rock are still visible.	XA
Highly altered	The whole of the rock material is discoloured, usually by staining or bleaching to the extent that the colour of the original rock is not recognisable. Rock strength is changed by alteration. Some primary minerals are altered to clay minerals. Porosity may be increased by leaching or may be decreased due to precipitation of secondary materials in pores.	HA
Moderately altered	The whole of the rock material is discoloured, usually by staining or bleaching to the extent that the colour of the original rock is not recognisable but shows little or no change of strength from fresh rock.	MA
Slightly altered	Rock is slightly discoloured but shows little or no change of strength from fresh rock	SA
Note: If HA and MA cannot be differentiated use DA (see below)		
Distinctly altered	Rock strength usually changed by alteration. The rock may be highly discoloured, usually by staining or bleaching. Porosity may be increased by leaching or may be decreased due to precipitation of secondary minerals in pores.	DA

Degree of Fracturing

The following descriptive classification apply to the spacing of natural occurring fractures in the rock mass. It includes bedding plane partings, joints and other defects, but excludes drilling breaks. These terms are generally not required on investigation logs where fracture spacing is presented as a histogram, and where used are presented in an unabbreviated format.

Term	Description
Fragmented	Fragments of <20 mm
Highly Fractured	Core lengths of 20-40 mm with occasional fragments
Fractured	Core lengths of 30-100 mm with occasional shorter and longer sections
Slightly Fractured	Core lengths of 300 mm or longer with occasional sections of 100-300 mm
Unbroken	Core contains very few fractures

Rock Quality Designation

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

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

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

Stratification Spacing

These terms may be used to describe the spacing of bedding partings in sedimentary rocks. Where used, these terms are generally presented in an unabbreviated format

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

Defect Descriptions

Defect Type

Term	Abbreviation Code
Bedding plane	B
Cleavage	CL
Crushed seam	CS
Crushed zone	CZ
Drilling break	DB
Decomposed seam	DS
Drill lift	DL
Extremely Weathered seam	EW
Fault	F
Fracture	FC
Fragmented	FG
Handling break	HB
Infilled seam	IS
Joint	JT
Lamination	LAM
Shear seam	SS
Shear zone	SZ
Vein	VN
Mechanical break	MB
Parting	P
Sheared Surface	S

Rock Defect Orientation

Term	Abbreviation Code
Horizontal	H
Vertical	V
Sub-horizontal	SH
Sub-vertical	SV

Rock Defect Coating

Term	Abbreviation Code
Clean	CN
Coating	CT
Healed	HE
Infilled	INF
Stained	SN
Tight	TI
Veneer	VNR

Rock Defect Infill

Term	Abbreviation Code
Calcite	CA
Carbonaceous	CBS
Clay	CLAY
Iron oxide	FE
Manganese	MN
Pyrite	Py
Secondary material	MS
Silt	M
Quartz	Qz
Unidentified material	MU

Rock Defect Shape/Planarity

Term	Abbreviation Code
Curved	CU
Discontinuous	DIS
Irregular	IR
Planar	PR
Stepped	ST
Undulating	UN

Rock Defect Roughness

Term	Abbreviation Code
Polished	PO
Rough	RF
Smooth	SM
Slickensided	SL
Very rough	VR

Defect Orientation

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

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Cone Penetration Testing

November 2023

Introduction

The Cone Penetration Test (CPT) is a sophisticated soil profiling test carried out in-situ. A special cone shaped probe is used which is connected to a digital data acquisition system. The cone and adjoining sleeve section contain a series of strain gauges and other transducers which continuously monitor and record various soil parameters as the cone penetrates the soils.

The soil parameters measured depend on the type of cone being used, however they always include the following basic measurements

- Cone tip resistance q_c
- Sleeve friction f_s
- Inclination (from vertical) i
- Depth below ground z

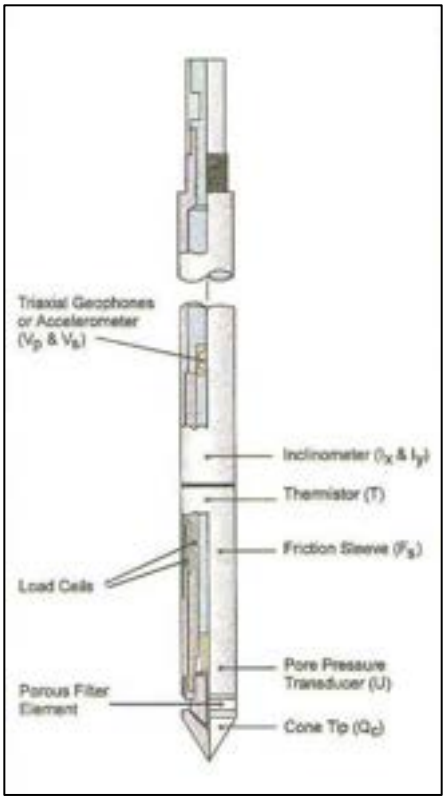

Figure 1: Cone Diagram

The inclinometer in the cone enables the verticality of the test to be confirmed and, if required, the vertical depth can be corrected.

The cone is thrust into the ground at a steady rate of about 20 mm/sec, usually using the hydraulic rams of a purpose built CPT rig, or a drilling rig. The testing is carried out in accordance with the Australian Standard AS1289 Test 6.5.1.

Figure 2: Purpose built CPT rig

The CPT can penetrate most soil types and is particularly suited to alluvial soils, being able to detect fine layering and strength variations. With sufficient thrust the cone can often penetrate a short distance into weathered rock. The cone will usually reach refusal in coarse filling, medium to coarse gravel and on very low strength or better rock. Tests have been successfully completed to more than 60 m.

Types of CPTs

Douglas Partners (and its subsidiary GroundTest) owns and operates the following types of CPT cones:

Type	Measures
Standard	Basic parameters (qc, fs, i & z)
Piezocone	Dynamic pore pressure (u) plus basic parameters. Dissipation tests estimate consolidation parameters
Conductivity	Bulk soil electrical conductivity (□) plus basic parameters
Seismic	Shear wave velocity (Vs), compression wave velocity (Vp), plus basic parameters

Strata Interpretation

The CPT parameters can be used to infer the Soil Behaviour Type (SBT), based on normalised values of cone resistance (Qt) and friction ratio (Fr). These are used in conjunction with soil classification charts, such as the one below (after Robertson 1990)

Cone Penetration testing

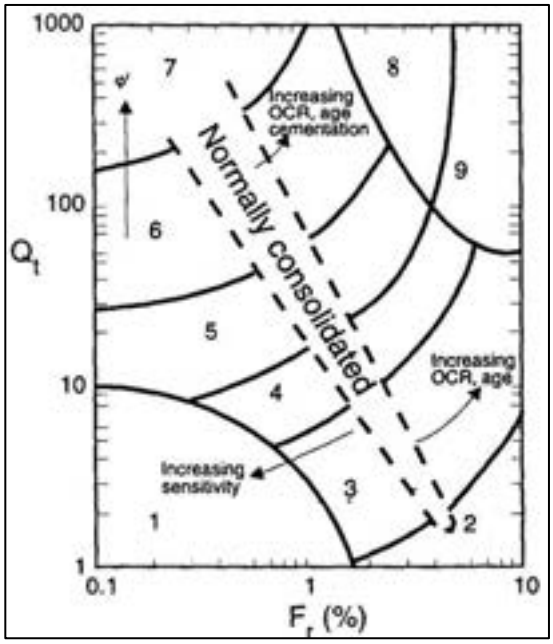

Figure 3: Soil Classification Chart

DP's in-house CPT software provides computer aided interpretation of soil strata, generating soil descriptions and strengths for each layer. The software can also produce plots of estimated soil parameters, including modulus, friction angle, relative density, shear strength and over consolidation ratio.

DP's CPT software helps our engineers quickly evaluate the critical soil layers and then focus on developing practical solutions for the client's project.

Engineering Applications

There are many uses for CPT data. The main applications are briefly introduced below:

Settlement

CPT provides a continuous profile of soil type and strength, providing an excellent basis for settlement analysis. Soil compressibility can be estimated from cone derived moduli, or known consolidation parameters for the critical layers (eg. from laboratory testing). Further, if pore pressure dissipation tests are undertaken using a piezocone, in-situ consolidation coefficients can be estimated to aid analysis.

Pile Capacity

The cone is, in effect, a small scale pile and, therefore, ideal for direct estimation of pile capacity. DP's in-house program ConePile can analyse most pile types and produces pile capacity versus depth plots. The analysis methods are based on proven static theory and empirical studies, taking account of scale effects, pile materials and method of installation.

The results are expressed in limit state format, consistent with the Piling Code AS2159.

Dynamic or Earthquake Analysis

CPT and, in particular, Seismic CPT are suitable for dynamic foundation studies and earthquake response analyses, by profiling the low strain shear modulus G0. Techniques have also been developed relating CPT results to the risk of soil liquefaction.

Other Applications

Other applications of CPT include ground improvement monitoring (testing before and after works), salinity and contaminant plume mapping (conductivity cone), preloading studies and verification of strength gain.

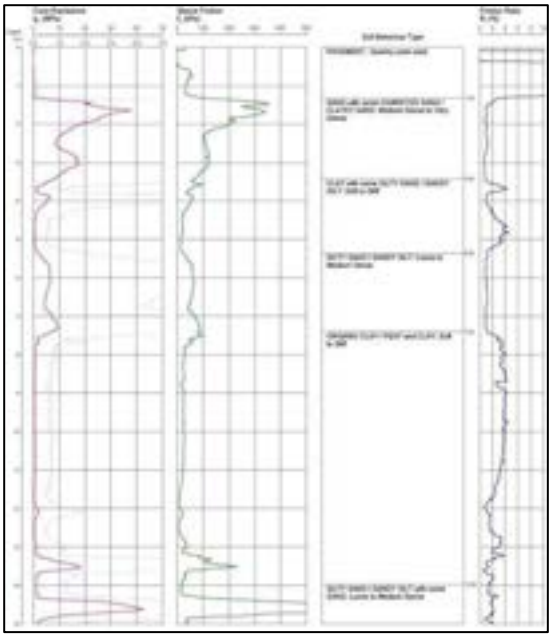

Figure 4: Sample Cone Plot

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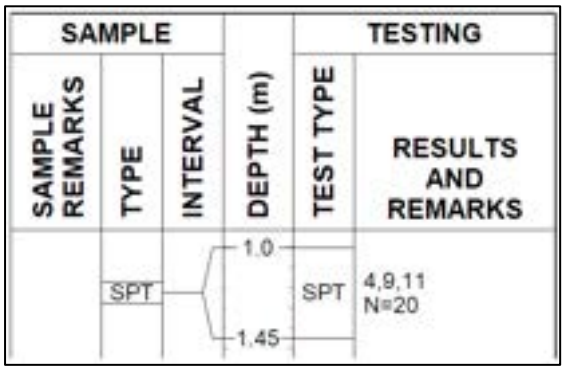
Sampling and Testing

A record of samples retained, and field testing performed is usually shown on a Douglas Partners' log with samples appearing to the left of a depth scale, and selected field and laboratory testing (including results, where relevant) appearing to the right of the scale, as illustrated below:



Sampling

The type or intended purpose for which a sample was taken is indicated by the following abbreviation codes.

Sample Type	Code
Auger sample	A
Acid Sulfate sample	ASS
Bulk sample	B
Core sample	C
Disturbed sample	D
Environmental sample	ES
Driven Tube sample	DT
Gas sample	G
Piston sample	P
Sample from SPT test	SPT
Undisturbed tube sample	U[1]
Water sample	W
Material Sample	MT
Core sample for unconfined compressive strength testing	UCS

[1] – numeric suffixes indicate tube diameter/width in mm

The above codes only indicate that a sample was retained, and not that testing was scheduled or performed.

Field and Laboratory Testing

A record that field and laboratory testing was performed is indicated by the following abbreviation codes.

Test Type	Code
Pocket penetrometer (kPa)	PP
Photo ionisation detector (ppm)	PID
Standard Penetration Test x/y =*x* blows for *y* mm penetration HB = hammer bouncing HW = fell under weight of hammer	SPT
Shear vane (kPa)	V
Unconfined compressive strength, (MPa)	UCS
Point load test, (MPa), axial (A), diametric (D), irregular (I)	PLT(_)
Dynamic cone penetrometer, followed by blow count penetration increment in mm (cone tip, generally in accordance with AS1289.6.3.2)	DCP9/150
Perth sand penetrometer, followed by blow count penetration increment in mm (flat tip, generally in accordance with AS1289.6.3.3)	PSP/150
Dynamic probe super heavy, followed by blow count penetration increment in mm	DPSH/100

Groundwater Observations

	water seepage/inflow
	water seepage/outflow
	standing or observed water level
NFGWO	no free groundwater observed
OBS	observations obscured by drilling fluids

Drilling or Excavation Methods/Tools

The drilling/excavation methods used to perform the investigation may be shown either in a dedicated column down the left-hand edge of the log, or stated in the log footer. In some circumstances abbreviation codes may be used.

Method	Abbreviation Code
Direct Push	DP
Solid flight auger. Suffixes: /T = tungsten carbide tip, /V = v-shaped tip	AD[1]
Air Track	AT
Diatube	DT[1]
Hand auger	HA[1]
Hand tools (unspecified)	HAND
Existing exposure	X
Hollow flight auger	HSA[1]
HQ coring	HQ3
HMLC series coring	HMLC
NMLC series coring	NMLC
NQ coring	NQ3
PQ coring	PQ3
Predrilled	PD
Push tube	PT[1]
Ripping tyne/ripper	R
Rock roller	RR[1]
Rock breaker/hydraulic hammer	EH
Sonic drilling	SON[1]
Mud/blade bucket	MB[1]
Toothed bucket	TB[1]
Vibrocore	VC[1]
Vacuum excavation	VE
Wash bore (unspecified bit type)	WB[1]

[1] – numeric suffixes indicate tool diameter/width in mm

Appendix E

Remediation Options Assessment and Evaluation

1. Introduction

The following key guidelines and technical reports were consulted in the preparation of this remediation options assessment:

- NEPC *National Environment Protection (Assessment of Site Contamination) Measure 1999 (as amended 2013) [NEPM])* (NEPC, 2013); and
- CRC CARE *Remediation Action Plan: Development - Guideline on Performing Remediation Options Assessment* (CRC CARE, 2019a).

The first stage of developing a remediation strategy is to establish clear and measurable remediation objectives and remediation criteria (clean-up levels). These will form the requirements against which remediation options are assessed.

The next stage of the remediation options assessment is to select technology and management options, or combinations of options, that have the potential to reduce contaminant concentrations and/or apply management controls as necessary so that the remediation objectives are achieved and no unacceptable risk is posed by the contamination in the context of the current and proposed site use. Where several viable options have been identified, an assessment of each of the options will be required to determine which option will most adequately and sustainably meet the remediation objectives (CRC CARE, 2019a).

The remediation objectives are to:

- Address potentially unacceptable risks to relevant environmental values from contamination (refer to the CSM in Section 7); and
- Render the site suitable, from a contamination perspective, for the proposed development (refer to Section 2).

2. Hierarchy of remediation options

NEPC (2013) stipulates the preferred hierarchy of options for site clean-up (remediation) and/or management which is outlined as follows:

- On-site treatment of the contamination so that it is destroyed, or the associated risk is reduced to an acceptable level; and
- Off-site treatment of excavated soil, so that the contamination is destroyed, or the associated risk is reduced to an acceptable level, after which soil is returned to the site.

or, if these two options are not practicable:

- Consolidation and isolation of the soil on site by containment with a properly designed barrier; and
- Removal of contaminated material to an approved site or facility, followed, where necessary, by replacement with appropriate material.

or,

- Where the assessment indicates remediation would have no net environmental benefit or would have a net adverse environmental effect, implementation of an appropriate management strategy.

3. Remediation options assessment

3.1 Introduction

The following issues have been identified at the site which require remediation:

- Asbestos-impacted fill.

In addition, some local potential source of contamination (sump or pit, oil water separator, chemical storage and potential for an unidentified underground petroleum storage system(s) (UPSS).

Further data gap assessment is recommended to confirm the extent of asbestos impacted fill, validate the removal of the existing infrastructure (oil / water separator, unknown pit / sum and chemical stores) and provide final waste classification.

3.2 Remediation options assessment

Given the straightforward nature of the contamination issues at the site and the necessary earthworks (final landform) as part of the proposed development, only three options for the soil contamination have been considered, as follows:

- Do nothing;
- On-site management / cap and contain (consolidation and isolation by containment); and
- Excavation and off-site disposal.

The following key guidelines have therefore been consulted:

- CRC CARE *Technology Guide: Soil - Containment* (CRC CARE, 2019c);
- CRC CARE *Technology Guide: Soil - Excavation* (CRC CARE, 2019b);
- WA DoH *Guidelines for the Assessment, Remediation and Management of Asbestos-Contaminated Sites in Western Australia* (WA DoH, 2021); and
- WorkCover NSW *Managing Asbestos in or on Soil* (WorkCover NSW, 2014).

Relevant technical considerations include:

- Asbestos cannot be physically destroyed; and
- Excavation is proposed at the site resulting in a net deficit of soil / rock such that the majority of the fill within the site will require off-site disposal, irrespective of the contamination issues.

Accordingly, the preferred remediation strategy is excavation and off-site disposal. However, if fill is retained at the site boundary / beyond the practical extent of excavation and asbestos (or other contamination is identified within the residual fill a cap and contain strategy may be required for these areas.

4. Preferred remediation strategy

The preferred option selected in consultation with the client, taking in to account technical considerations and other project specific considerations (such as program, cost and consideration of ongoing liability implications) is off-site disposal of contaminated fill within the proposed basement footprint and (if required) cap and contain outside of the basement.

5. References

CRC CARE. (2019a). *Remediation Action Plan: Development - Guideline on Performing Remediation Options Assessment*. National Remediation Framework: CRC for Contamination Assessment and Remediation of the Environment.

CRC CARE. (2019b). *Technology Guide: Soil - Excavation*. National Remediation Framework: CRC for Contamination Assessment and Remediation of the Environment.

CRC CARE. (2019c). *Technology Guide: Soil - Containment*. National Remediation Framework: CRC for Contamination Assessment and Remediation of the Environment.

NEPC. (2013). *National Environment Protection (Assessment of Site Contamination) Measure 1999 (as amended 2013) [NEPM]*. Australian Government Publishing Services Canberra: National Environment Protection Council.

WA DoH. (2021). *Guidelines for the Assessment, Remediation and Management of Asbestos-Contaminated Sites in Western Australia*. WA Department of Health.

WorkCover NSW. (2014). *Managing Asbestos in or on Soil*. March 2014: WorkCover NSW, NSW Government.

Appendix F

Site Assessment Criteria

1. Introduction

1.1 Guidelines

The following key guidelines were consulted for deriving the site assessment criteria (SAC):

- NEPC *National Environment Protection (Assessment of Site Contamination) Measure 1999 (as amended 2013) [NEPM]* (NEPC, 2013).
- CRC CARE *Health screening levels for petroleum hydrocarbons in soil and groundwater* (CRC CARE, 2011).
- HEPA *PFAS National Environmental Management Plan (NEMP)* (HEPA, 2025).
- ANZG *Australian and New Zealand Guidelines for Fresh and Marine Water Quality* (ANZG, 2018).
- ANZECC *Australian and New Zealand Guidelines for Fresh and Marine Water Quality* (ANZECC, 2000).

1.2 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 site is proposed for mixed use development including commercial and residential. It is understood that the planning proposal for Stage 1 shall include a ground level commercial space (retail, loading docks and a lobby) over a five-level basement carpark with residential apartments on Levels 1 to 20.

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

- For the derivation of health investigation levels (HILs) Land use: residential:
    - Corresponding to land use category 'B', residential with minimal opportunities for soil access includes dwellings with fully and permanently paved yard space such as high-rise buildings and flats.
- For the derivation of health screening levels (HSL) for vapour intrusion:
    - The HSL are applicable to ground floor land use. If the vapour exposure is acceptable at ground level, it can be assumed that it is also acceptable for floors above ground level. For multistorey buildings where non-residential uses (e.g. car parking or commercial use) exist in a basement or at ground level, then land use category D (commercial / industrial) should be applied. Any sensitive land uses e.g. childcare or day care centre will require application of HSL A irrespective of their planning zoning.

- The assessment is based on the assumption that the ground floor will comprise commercial land use including retail, a lobby and a loading bay and will not include childcare facilities. retail space will not include. Therefore, the appropriate land use category for the derivation of HSLs is considered to be commercial / industrial (Category D). If more sensitive land use is considered for the ground floor such as childcare then HSL A would need to be considered.
- Soil type: clay.

Following completion of detailed design, the application of the appropriate land use category should be given further consideration. If the final design does not include significant open space then HIL D may be appropriate for commercial land use at the ground level. However, if there are significant soft landscaping areas in the final design then HIL B (as adopted for this assessment) or HIL C (open space) may be appropriate. Therefore, for the purpose of this assessment in the absence of detailed design drawings HIL B has been adopted.

2. Soils

2.1 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 Table 2.

Table 1: Health investigation levels (mg/kg)

Contaminant	HIL-B
Metals	
Arsenic	500
Cadmium	150
Chromium (VI)	500
Copper	30 000
Lead	1200
Mercury (inorganic)	120
Nickel	1200
Zinc	60 000
PAH	
B(a)P TEQ	4
Total PAH	400
Phenols	
Phenol	45 000

Contaminant	HIL-B
Pentachlorophenol	130
OCP	
DDT+DDE+DDD	600
Aldrin and dieldrin	10
Chlordane	90
Endosulfan	400
Endrin	20
Heptachlor	10
HCB	15
Methoxychlor	500
OPP	
Chlorpyrifos	340
PCB	
PCB	1

Table 2: Health screening levels (mg/kg)

Contaminant	HSL-D
CLAY	**0 m to <1 m**
Benzene	4
Toluene	NL
Ethylbenzene	NL
Xylenes	NL
Naphthalene	NL
TRH F1	310
TRH F2	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-B	DC HSL-IMW
Benzene	140	1100
Toluene	21 000	120 000
Ethylbenzene	5900	85 000
Xylenes	17 000	130 000
Naphthalene	2200	29 000
TRH F1	5600	82 000
TRH F2	4200	62 000
TRH F3	5800	85 000
TRH F4	8100	120 000

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

2.2 Health investigation levels for per- and poly-fluoroalkyl substances in soil

The laboratory analytical results for per- and poly-fluoroalkyl substances (PFAS) in soil have been assessed against HIL published in HEPA (2020). The HIL represent a nationally-agreed suite that should be used to inform site investigations. The HIL are intentionally conservative, and an exceedance of these criteria may not constitute a risk if other exposure pathways are controlled. An exceedance of the HIL should trigger further investigations, such as a site-specific risk assessment. At the time of this investigation, screening values were available only for perfluorooctane sulfonate (PFOS), perfluorooctanoic acid (PFOA) and perfluorohexane sulfonate (PFHxS).

The HIL derived from Table 2 of HEPA (2020) are in Table 4.

Table 4: Health investigation levels (mg/kg)

Contaminant	HIL-B
PFOS and PFHxS *	2
PFOA	20

Notes: * Includes PFOS only, PFHxS only and the sum of the two.

2.3 Asbestos in soil

The HSL for asbestos in soil are based on likely exposure levels for different scenarios published in NEPC (2013) for the following forms of asbestos:

- Bonded asbestos containing material (ACM); and
- Fibrous asbestos and asbestos fines (FA and AF).

The HSL are in Table 5.

Table 5: Health screening levels for asbestos

Form of asbestos	HSL-B
ACM	0.04%
FA and AF	0.001%
FA and AF and ACM	No visible asbestos for surface soil *

Notes: Surface soils defined as top 10 cm.
* Based on site observations at the sampling points and the analytical results of surface samples.

Given the limitation of the sampling method (i.e. drilling), wherever not enough soil recovered, the presence or absence of asbestos at a limit of reporting of 0.1 g/kg (AS:4964) has been adopted as an initial screen.

2.4 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 6, with inputs into their derivation shown in Table 7.

The EIL apply to soils within 2 m of the ground surface, and as such would not apply to the area of the basement.

Table 6: Inputs to the derivation of the ecological investigation levels

Variable	Input	Rationale
Age of contaminants	Aged" (>2 years)	-
pH	8.45	Average of measured pH
CEC	23.25 $cmol_c/kg$	Average of measured CEC
Clay content	10%	Assumed based on the soil profile encountered
Traffic volumes	high	-
State / Territory	NSW	-

Table 7: Ecological investigation levels (mg/kg)

Contaminant	EIL-A-B-C
Metals	
Arsenic	100
Copper	240
Nickel	300
Chromium III	410
Lead	1100

Contaminant	EIL-A-B-C
Zinc	900
PAH	
Naphthalene	170
OCP	
DDT	180

EIL-A-B-C urban residential and public open space

2.5 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 8.

The ESL apply to soils within 2 m of the ground surface, and as such would not apply to the area of the basement.

Table 8: Ecological screening levels (mg/kg)

Contaminant	Soil Type	ESL-A-B-C
Benzene	Fine	65
Toluene	Fine	105
Ethylbenzene	Fine	125
Xylenes	Fine	45
TRH F1	Coarse/ Fine	180*
TRH F2	Coarse/ Fine	120*
TRH F3	Fine	1300
TRH F4	Fine	5600
B(a)P	Fine	0.7

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
ESL-A-B-C urban residential and public open space

2.6 Ecological soil guideline values

The interim ecological soil guideline values (EGV) derived from Table3 of HEPA (2020) are in Table 9.

The EGV apply to soils within 2 m of the ground surface, and as such would not apply to the area of the basement.

Table 9: Ecological soil guideline values (mg/kg) – all land uses

Contaminant	Direct exposure	Indirect exposure
PFOS	1	0.003
PFOA	10	0.003
PFHxS	NC	NC

Notes: NC no criterion
For intensely developed sites with no secondary consumers and minimal potential for indirect ecological exposure, a higher criterion of up to 0.14 mg/kg PFOS may be appropriate.
The interim screening value for reptiles (PFOA 0.005 mg/kg) does not apply in this instance due to the proposed development which will involve bulk excavation for basement levels and minimal exposure of surface soils

2.7 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 e.g. penetration of, or damage to, in-ground services.

The adopted management limits are in Table 10.

Table 10: Management limits (mg/kg)

Contaminant	Soil type	ML-A-B-C
TRH F1	Fine	800
TRH F2	Fine	1000
TRH F3	Fine	3500
TRH F4	Fine	10 000

Notes: TRH F1 is TRH C_6-C_{10} including BTEX
TRH F2 is TRH >C_{10}-C_{16} including naphthalene
ML-A-B-C residential, parkland and public open space

3. Soil Vapour

3.1 Interim soil vapour health investigation levels

Soil vapour interim HIL for specific chlorinated VOC were published by NEPC (2013) to assess the vapour intrusion exposure pathway.

The interim HIL for chlorinated VOC methodology employs a simple though conservative approach using an attenuation factor that relates the concentration of a volatile contaminant in indoor air to the concentration in soil gas immediately below a building foundation slab.

The interim health investigation levels (IHIL) derived from NEPC (2013) are in Table 11.

Table 11: Soil vapour interim health investigation levels, chlorinated hydrocarbons (µg/m3)

Chemical	IHIL-A&B
TCE	20
1,1,1–TCA	60 000
PCE	2000
cis-DCE	80
VC	30

Notes: TCE trichloroethene
1,1,1–TCA 1,1,1-trichloroethane
PCE tetrachloroethene
cis-DCE cis-1,2-dichloroethene
VC chloromethane / vinyl chloride

3.2 Health screening levels

Soil vapour HSL for petroleum hydrocarbons were published by NEPC (2013) to assess the vapour intrusion exposure pathway.

The HSL derived from NEPC (2013) are in Table 12.

Table 12: Soil vapour health screening levels for vapour intrusion (µg/m^3)

Contaminant	HSL-D
CLAY	0-1 m
Benzene	5000
Toluene	6 500 000
Ethylbenzene	1 800 000
Xylene Total	1 200 000
Naphthalene	4000
TRH F1	1 000 000
TRH F2	800 000

Notes: TRH F1 is TRH C_6-C_{10} minus BTEX
TRH F2 is TRH >C_{10}-C_{16} minus naphthalene
The maximum possible soil vapour concentrations have been calculated based on vapour pressures of the pure chemicals. Where soil vapour HSL exceed these values, a soil-specific source concentration for a petroleum mixture could not exceed a level that would result 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'

3.3 World health organisation (WHO)

The World health Organisation (WHO) published toxicity data for selected chemicals WHO CICAD (WHO, 2004). Relevant available tolerable concentrations in air, for which there are no NEPC (2013) IHILs are provided in Table 13. The tolerable concentrations are applicable to ambient air. Douglas has used these concentrations to calculate screening levels for soil vapour by multiplying by 10, consistent with NEPC (2013) assumptions.

Table 13: WHO tolerable concentrations in Air (µg/m³)

Chemical	Tolerable concentration	Calculated soil vapour screening level
1,1-dichloroethene	200	2000

3.4 US EPA regional screening levels (RSL)

Where concentrations were recorded above the PQL without either NEPC (2013) criteria or other NSW or Australian endorsed contaminated land guidance, results were compared against the Regional Screening Level (RSL) from the US EPA summary table[1] as an initial screen (the USEPA RSL).

The reference USEPA RSL are for ambient air exposure for a composite worker. They are based on a Target Risk (TR) of 1E-05 and a Target Hazard Quotients (THQ)of 0.1.

Given that all buildings at the site are on concrete slabs, the USEPA RSL, have therefore been amended to make them consistent with the approach of NEPC (2013) as follows:

- RSL derived from carcinogenic target risk multiplied by 10 in line with the TR of 1E-05 adopted by NEPC (2013).
- The lowest of the RSL for carcinogenic risk (1E-05) and non-carcinogenic risk (THQ=0.1) was adopted.

The adopted RSL was divided by 0.1 in accordance with the factor adopted by NEPC (2013) for attenuation through concrete slabs to provide a screening level for soil vapour. This has been applied on the basis that any future development will have a concrete slab between the soil and the workers.

4. Groundwater

4.1 Introduction

The groundwater investigation levels (GIL) used for interpretation of the groundwater data (as a Tier 1 assessment) have been selected based on the potential risks posed from contamination sourced from the site to receptors at or down-gradient of the site, as identified by the conceptual site model (CSM). The receptors, exposure points and pathways are summarised in Table 14.

Table 14: Summary of potential receptors and potential risks

Receptor	Location	Exposure point	Exposure pathway
Surface water aquatic ecosystem	Down-gradient from site.	Receiving surface water body at the groundwater discharge point.	Exposure to contaminants.

[1] https://www.epa.gov/risk/regional-screening-levels-rsls-generic-tables

Receptor	Location	Exposure point	Exposure pathway
Occupants of buildings	On site and down-gradient from site.	Enclosed buildings (existing or proposed).	Inhalation of VOC (including TRH and BTEX) overlying VOC impacted groundwater via the vapour intrusion pathway.

The rationale for the selection of GIL is in Table 15.

Table 15: Groundwater investigation level rationale

Receptor / beneficial use	GIL	Source	Comments / rationale
Aquatic ecosystem	DGV	ANZG (2018)	Freshwater 99% LOP for bioaccumulative contaminants 95% LOP for non-bioaccumulative contaminants
Aquatic ecosystem	DGV	HEPA (2020)	Freshwater 99% LOP as recommended for potential bioaccumulation Screening values were only available for PFOS and PFOA at the time of this investigation.
Building occupants (vapour intrusion)	HSL	NEPC (2013)	2 m to <4 m The HSLs are adopted as initial screening levels only in conjunction with the laboratory detection limits. Further consideration of site specific screening levels may be required where TPH is greater than the detection limits with consideration to the basement design and seepage risk noting that the current basement design has not been finalised.

Notes: DGV default guideline value
% LOP percentage level of protection of species
HSL health screening level
GV guideline value
LTV long term value (up to 100 years)
STV short term value (up to 20 years)

4.2 Groundwater investigation levels for aquatic ecosystems

The DGV for the protection of aquatic ecosystems derived from ANZG (2018) are in Table 16.

Table 16: Groundwater investigation levels for protection of aquatic ecosystems (µg/L)

Contaminant	Freshwater DGV 95% LOP	Notes
Metals / metalloids		
Arsenic	24 / 13	Levels provided for As III / As IV respectively. Moderate reliability.
Cadmium	0.2	Very high reliability.

Contaminant	Freshwater DGV 95% LOP	Notes
Chromium (VI)	1	Chromium VI levels adopted as initial screen for total chromium. Very high reliability.
Copper	1.4	Very high reliability.
Lead	3.4	Moderate reliability.
Mercury (inorganic)	0.06	99% LOP adopted as recommended due to potential for bioaccumulation. Moderate reliability.
Nickel	11	Low reliability.
Zinc	8	Very high reliability.
BTEX		
Benzene	950	Moderate reliability.
Ethylbenzene	80	Unknown reliability.
m-Xylene	75	Unknown reliability.
o-xylene	350	Low reliability.
p-Xylene	200	Low reliability.
Toluene	180	Unknown reliability.
PAH		
Anthracene	0.01	99% LOP adopted as recommended due to potential for bioaccumulation. Unknown reliability.
Benzo(a)pyrene	0.1	99% LOP adopted as recommended due to potential for bioaccumulation. Unknown reliability.
Fluoranthene	1	99% LOP adopted as recommended due to potential for bioaccumulation. Unknown reliability.
Naphthalene	16	Low reliability.
Phenanthrene	0.6	99% LOP adopted as recommended due to potential for bioaccumulation. Unknown reliability.
Phenols		
Phenol	320	Moderate reliability.
Pentachlorophenol	3.6	99% LOP adopted as recommended due to potential for bioaccumulation. Moderate reliability.
2,4,6-Trichlorophenol	3	99% LOP adopted as recommended due to potential for bioaccumulation. Moderate reliability.
OCP		
Aldrin	0.001	Unknown reliability and LOP.

Contaminant	Freshwater DGV 95% LOP	Notes
Chlordane	0.03	99% LOP adopted as recommended due to potential for bioaccumulation. Moderate reliability.
DDT	0.006	99% LOP adopted as recommended due to potential for bioaccumulation. Moderate reliability.
Dieldrin	0.01	Unknown reliability and LOP.
Endosulfan	0.03	99% LOP adopted as recommended due to potential for bioaccumulation. Moderate reliability.
Endrin	0.01	99% LOP adopted as recommended due to potential for bioaccumulation. Moderate reliability.
Heptachlor	0.01	99% LOP adopted as recommended due to potential for bioaccumulation. Moderate reliability.
Methoxychlor	0.005	Unknown reliability and LOP.
OPP		
Chlorpyrifos	0.01	Moderate reliability.
Diazinon	0.01	Moderate reliability.
Dimethoate	0.15	Low reliability.
Fenitrothion	0.2	Moderate reliability.
Malathion	0.05	Moderate reliability.
Parathion	0.004	Moderate reliability.
PCB		
Aroclor 1242	0.3	99% LOP adopted as recommended due to potential for bioaccumulation. Low reliability.
Aroclor 1254	0.01	99% LOP adopted as recommended due to potential for bioaccumulation. Moderate reliability.
VOC		
Tetrachloroethene (PCE)	70	Unknown reliability.
Trichloroethene (TCE)	330	Unknown reliability.
cis-1,2-dichloroethene (DCE)	700	Unknown reliability.
Chloroethene (vinyl chloride / VC)	100	Unknown reliability.
Tetrachloromethane (carbon tetrachloride / CT)	240	Unknown reliability.
Trichloromethane (chloroform / TCM)	370	99% LOP adopted as recommended to protect key species from chronic toxicity. Unknown reliability.

Contaminant	Freshwater DGV 95% LOP	Notes
Inorganics		
Ammonia	900	Very high reliability.

Notes: 95% LOP for non-bioaccumulative contaminants
99% LOP for bioaccumulative contaminants

The DGV for the protection of aquatic ecosystems derived from HEPA (2020) are in Table 17.

Table 17: Groundwater investigation levels for protection of aquatic ecosystems (µg/L)

Contaminant / LOP	Freshwater DGV
PFOS 99% LOP	0.00023
PFOA 99% LOP	19
PFOS 95% LOP	0.13
PFOA 95% LOP	220

4.3 Health screening levels for vapour intrusion

The HSL to evaluate potential vapour intrusion risks derived from NEPC (2013) are in Table 18.

Table 18: Groundwater health screening levels for vapour intrusion (µg/L)

Contaminant	HSL-D*
CLAY	**2 m to <4 m**
Benzene	30,000
Toluene	NL
Ethylbenzene	NL
Xylenes	NL
Naphthalene	NL
TRH F1	NL
TRH F2	NL

Notes: TRH F1 is TRH C_6-C_{10} minus BTEX
TRH F2 is TRH >C_{10}-C_{16} minus naphthalene
The solubility limit is defined as the groundwater concentration at which the water cannot dissolve any more of an individual chemical based on a petroleum mixture. The soil vapour that is in equilibrium with the groundwater will be at its maximum. If the derived groundwater HSL exceeds the water solubility limit, a soil vapour source concentration for a petroleum mixture could not exceed a level that would result in the maximum allowable vapour risk for the given scenario. For these scenarios, no HSL is presented for these chemicals and the HSL is shown as 'not limiting' or 'NL'.
*Groundwater HSLs will require further consideration following the final basement design (tanked or drained or combination). TPH should also be compared to the laboratory detection limits as a initial screening level and site specific screening levels may be required if TPH is detected in groundwater that comes into contact with the basement.

5. References

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NEPC. (2013). *National Environment Protection (Assessment of Site Contamination) Measure 1999 (as amended 2013) [NEPM]*. Australian Government Publishing Services Canberra: National Environment Protection Council.

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Warne, M., Batley, G., van Dam, R., Chapman, J., Fox, D., Hickey, C., & Stauber, J. (2018). *Revised Method for Deriving Australian and New Zealand Water Quality Guideline Values for Toxicants*. Canberra: Australian Government Department of Agriculture and Water Resources.

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Appendix G

Data Quality Objectives

1. Introduction

The objective of the validation plan is to assess whether the site has been remediated in accordance with the RAP, assess the resultant suitability of the site for the intended land use, and to provide information on any environmental impacts which may have resulted from the works.

The validation assessment will be conducted with reference to the seven step data quality objectives process (DQO) as outlined in NEPC (2013), described below.

2. Data quality objectives

Table 1: Data quality objectives

Step	Summary
1: State the problem	The site requires remediation and validation of remediation in order to render it suitable for mixed residential and commercial land use. The objective of the validation plan is to confirm the successful implementation of this remediation action plan. A conceptual site model (CSM) for the proposed development has been prepared (Section 7).
2: Identify the decisions / goal of the study	The decision is to determine the site is suitable for the proposed mixed use commercial and residential land use following remediation of the site. The CSM identifies contamination at the site which posed potentially unacceptable risks to human health. The remediation strategy requires the removal of fill within the proposed development basement excavation which was confirmed to contain asbestos. The remaining fill outside the basement (if it contains asbestos) could be retained within the development site beneath a marker layer and a capping layer. The decision is to establish whether the development site has been remediated in accordance with the RAP and if a capping strategy is adopted if capping layer has been placed in general accordance with the RAP and whether the development site has been remediated in general accordance with the RAP.

Step	Summary
3: Identify the information inputs	Relevant inputs to the decision include: • The CSM identifying CoPC and affected media; • Results analysed for the relevant CoPC using NATA accredited laboratories and methods, where possible; • Field and laboratory QA/QC data to assess the suitability of the environmental data for the validation assessment; • Results compared with the RAC; • Inspections of the maker layer prior to capping works; • Assessments of aggregates, soil, etc imported to site including materials used as part of the capping (if capping required); • Inspections of the capping (if capping required); • Review of the survey of the installed capping (if capping required); • If asbestos contaminated soils are capped on site an enforceable long term environmental management plan (LTEMP) has been prepared for implementation during use of the land for secondary school purposes; and • Details of the proposed development.
4: Define the study boundaries	The lateral boundaries of the site are shown on Drawing 1, Appendix A. The vertical boundaries are to the extent of contamination impact as determined from the site history assessment, site observations and previous investigations used to inform the RAP.
5: Develop the analytical approach (or decision rule)	The decision rule for an excavation and disposal option is to compare all analytical results with RAC. Where applicable initial comparisons will be with individual results then, 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 (note: statistical analysis not applicable to asbestos). The decision rule for a capping option will be is the construction of the capping to at least the minimum thicknesses included in Section 10. Quality control results are to be assessed according to their relative percent difference (RPD) values. For field and laboratory duplicate results, RPDs should generally be below 30%; for field blanks, results should be at or less than the limits of reporting (NEPC, 2013). The field and laboratory quality assurance assessment is included in Section 15.
6: Specify the performance or acceptance criteria	<u>For excavation and disposal</u> Baseline condition: Contaminants at the development site and/or statistical analysis of data exceed the RAC and pose a potentially unacceptable risk to receptors (null hypothesis). Alternative condition: Contaminants at the development site and statistical analysis of data complies with the RAC and as such, do 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.

Step	Summary
	<u>For capping strategy</u> Baseline condition: The capping has not been constructed in accordance with this RAP (null hypothesis). Alternative condition: The capping has been constructed in accordance with this RAP (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.
7: Optimise the design for obtaining data	Sampling design and procedures to be implemented to optimise data collection for achieving the DQO include the following: • Sampling frequencies in accordance with Section 12, 13 and 14; • Analysis for the CoPC at NATA accredited laboratories using NATA endorsed methods will be used to perform laboratory analysis whenever possible; and • Adequately experienced environmental scientists / engineers will conduct field work and sample analysis interpretation. • If capping adopted: o Visual inspections of the cap construction by the Environmental Consultant; and o Registered survey of the capping layer.

3. References

NEPC. (2013). *National Environment Protection (Assessment of Site Contamination) Measure 1999 (as amended 2013) [NEPM]*. Australian Government Publishing Services Canberra: National Environment Protection Council.

Appendix H

Site Management Plan

1. Introduction

This general site management plan (SMP) has been developed to minimise potentially adverse impacts on the environment, and worker and public health as a result of the proposed remediation works.

The Remediation Contractor must have in place a construction environmental management plan (CEMP) (or similar) which is specific to the equipment used for the remediation and the proposed methods to be adopted by the Remediation Contractor. This SMP has been prepared to augment the Remediation Contractor's CEMP and contains general details for aspects of the work, as per reporting requirements for a remediation action plan (RAP) under NSW EPA *Guidelines for Consultants Reporting on Contaminated Land* (NSW EPA, 2020).

Apart from the management principles outlined in this SMP, the Remediation Contractor must also ensure compliance with all relevant environmental legislation and regulations, including (but not limited to) the following:

- *Contaminated Land Management Act 1997* NSW (CLM Act);
- *Protection of the Environment Operations Act 1997* NSW (POEO Act);
- *Protection of the Environment Operations (Waste) Regulation 2014*;
- Protection of the Environment Operations Amendment (Scheduled Activities and Waste) Regulation 2008 NSW;
- Pesticide Act 1999 NSW and Pesticides Regulation 2017; and
- Work Health and Safety Act 2017 NSW (WHS Act) and Work Health and Safety Regulations 2017 NSW.

2. Roles and responsibilities

2.1 Principal / Principal Contractor

The Principal is responsible for the environmental performance of the proposed remediation works, including implementation of acceptable environmental controls during remediation works. The Principal will retain the overall responsibility for ensuring this RAP is appropriately implemented. The Principal is to nominate a representative (the Principal's Representative), who is responsible for overseeing the implementation of this RAP. The actual implementation of the RAP will, however, be conducted by the Remediation Contractor on behalf of the Principal.

The Principal is responsible for providing appropriate information to the Remediation Contractor to allow them to safely plan the required works. This includes the asbestos register for the site and this RAP.

The Principal is also responsible for implementing an appropriate communications plan.

2.2 Remediation contractor

The Remediation Contractor will be the party responsible for daily implementation of this RAP and shall fulfil the responsibilities of the Remediation Contractor as defined by SafeWork NSW. It is noted that the Remediation Contractor may appoint appropriately qualified sub-contractors or sub-consultants to assist in fulfilling the requirements of the procedures. The Remediation Contractor will appoint a Site Manager.

In addition to the implementation of the RAP it will be the Remediation Contractors responsibility to:

- Obtain / ensure relevant sub-contractors obtain specific related approvals as necessary to implement the earthworks including permits for removal of asbestos-containing material, SafeWork NSW notification etc.;
- Develop or request and review any site plans to manage the works to be conducted; and
- Ensure that all remediation works and other related activities are undertaken in accordance with this RAP.
- Maintain all site records related to the implementation of this RAP including but not limited to:
    - Tracking of all movement of soil within the site, on to site and off-site from cradle to grave;
    - Transportation Record: comprising a record of all truckloads of soil (including aggregate) entering the site, including truck identification (e.g. registration number), date, time, source site, load characteristics (e.g. type of material, i.e. quarried aggregate, etc.), approximate volume, use (e.g. general site raising, service trenches, etc.);
    - Disposal dockets: for any soil disposed off-site including transportation records, spoil source, spoil disposal location, receipt provided by the receiving waste facility / site;
    - Imported materials records: records for any soil imported onto the site, including source site, classification reports, inspection records of soil upon receipt at site and transportation records;
    - Records relating to any unexpected finds and contingency plans implemented;
    - Photographic records by all contractors and consultants of the works undertaken within their purview of responsibilities;
    - If asbestos is capped on site - surveys pre- and post-installation of geotextile marker layer and clean fill cap;
    - Airborne asbestos monitoring records (where asbestos works are undertaken; and
    - Interim / final visual and sampling clearances for any asbestos related works.
- Ensure sufficient information is provided to engage or direct all required parties, including sub-contractors, to implement the requirements of the RAP other than those that are the direct responsibility of the Remediation Contractor;
- Manage the implementation of any recommendation made by those parties in relation to work undertaken in accordance with the RAP;
- Inform, if appropriate, the relevant regulatory authorities of any non-conformances with the procedures and requirements of the RAP in accordance with the procedures outlined in this document;

- Retain records of any contingency actions;
- On completion of the project, to review the RAP records for completeness and update as necessary; and
- Recommend any modification to general documentation which would further improve the environmental outcomes of this RAP.

2.3 Surveyor

The project surveyor will be a registered surveyor engaged by the Remediation Contractor to undertake surveying works as required by this RAP.

2.4 Asbestos Contractor

The Asbestos Contractor will be responsible for undertaking all asbestos work involving any asbestos impacted fill and will hold a Class A licence for the removal of asbestos (issued by SafeWork NSW), on the basis that the asbestos identified at the site to date has included both friable and bonded asbestos.

The Asbestos Contractor can be the same entity as the Remediation Contractor.

2.5 Sub-contractors

All sub-contractors will be inducted onto the site, informed of their responsibilities in relation to this RAP and sign their agreement to abide by the RAP requirements. Where necessary, sub-contractors will also be trained in accordance with the requirements of this document. All sub-contractors must conduct their operations in accordance with the RAP as well as all applicable regulatory requirements.

2.6 Environmental Consultant

The Environmental Consultant will provide advice on implementing the RAP. The Environmental Consultant will be responsible for:

- Undertake any required assessments where applicable (e.g. waste classification, validation);
- Provide advice and recommendations arising from monitoring and/or inspections, including unexpected finds; and
- Notify the Client with any results of assessments, and any observed non-conformances.

2.7 Licenced Asbestos Assessor

A Licenced Asbestos Assessor will be required to be engaged independently of the Asbestos Contractor to undertake the following:

- Review and approve documentation prepared by the Asbestos Contractor;
- Prepare any WHS plans and advice required by the Remediation Contractor;
- Undertake airborne asbestos monitoring;
- Undertake clearance inspections;

- Provide advice and recommendations arising from monitoring and/or inspections; and
- Notify the client with the results of any assessments and any observed non-conformances.

2.8 Site workers

All workers on the site are responsible for observing the requirements of this RAP and other management plans. These responsibilities include the following:

- Being inducted on the site and advised of the general nature of the remediation / environmental issues at the site;
- Being aware of the requirements of this plan;
- Wearing appropriate personal protective equipment (PPE) as required by this plan;
- Only entering restricted areas when permitted; and
- Requesting clarification when unclear of requirements of this or any other plans (e.g. safe work method statements (SWMS)).

3. Water management

3.1 Stormwater

Stormwater must be managed during the remediation works such that potential adverse impacts from surface runoff (e.g. cross contamination, mobilisation of contaminants in soil particles, etc.) are appropriately mitigated. Accordingly, the Remediation Contractor will take appropriate measures which may include:

- Construction, where necessary, of stormwater diversion channels, bunding and linear drainage sumps with catch pits in and around the remediation areas to divert stormwater from the contaminated areas;
- Provision of appropriately located sediment traps including geotextiles; and
- Discharge of excess water in excavations / low points on a regular basis to limit the potential for flooding.

3.2 Dewatering of excavations

Any runoff or seepage water accumulated in site excavations must be managed in accordance with the DMP (Douglas 2024b) and ASSMP (Douglas 2025c).

4. Soil management plan

The Remediation Contractor will develop a plan to mitigate cross contamination as part of the CEMP to be implemented throughout the works.

4.1 Stockpiling of contaminated material

Contaminated material shall be excavated and stockpiled at a suitably segregated location(s) away from sensitive areas (e.g. water bodies, drainage lines, stormwater pits, etc.) and ongoing excavations, and in a manner that will not cause nuisance to the neighbouring properties. Soil stockpiles are to be managed as follows:

- An impermeable membrane such as plastic sheeting should be provided at the surface by the Remediation Contractor prior to stockpiling. Plastic sheeting should be taped at joins, as necessary;
- All stockpiles of contaminated material shall be surrounded by star pickets and marking tape or other suitable material to clearly delineate their boundaries;
- Stockpiles shall be lightly conditioned by sprinkler or covered by geotextile or similar cover to prevent dust generation (if remaining overnight);
- Stockpiles impacted, or potentially impacted, with asbestos must be covered by geotextile or similar cover to prevent dust generation;
- Measures should be taken by the Remediation Contractor to prevent the migration of stockpile materials (i.e. perimeter bunds, hay bales, silt fences, etc.); and
- A record of stockpile locations (stockpile register), dimensions, descriptions, environmental controls, etc. should be maintained by the Remediation Contractor.

All movement of soil within the site is to be tracked by the Remediation Contractor, from cradle to grave. Copies of tracking records must be provided to the Environmental Consultant.

4.2 Stockpiling imported material

Imported material shall be stockpiled at a suitably segregated location(s) away from sensitive areas (e.g. water bodies, drainage lines, stormwater pits, etc.) and ongoing excavations, and in a manner that will not cause nuisance to the neighbouring properties. Soil stockpiles are to be managed as follows:

- Imported material should not be stockpiled within un-remediated areas of the site. If this is unavoidable an impermeable membrane such as plastic sheeting should be provided at the surface by the Remediation Contractor prior to stockpiling. Plastic sheeting should be taped at joins, as necessary;
- All stockpiles shall be surrounded by star pickets and marking tape or other suitable material to clearly delineate their boundaries;
- Stockpiles shall be lightly conditioned by sprinkler or covered by geotextile or similar cover to prevent dust generation (if remaining overnight); and
- A record of stockpile locations (stockpile register), dimensions, descriptions, environmental controls, etc. should be maintained by the Remediation Contractor.

All movement of soil within the site is to be tracked by the Remediation Contractor, from cradle to grave. Copies of tracking records must be provided to the Environmental Consultant.

4.3 Transport of material off-site and on to site

Transport of contaminated material from the site and imported material to the site shall be via a clearly delineated haul route(s) and this route shall be used exclusively for entry and egress of vehicles used to transport contaminated materials within and away from the site, and onto and within the site. The proposed transport route(s) (to be determined by the Remediation Contractor) will be notified to Council and truck dispatch shall be logged and recorded by the Remediation Contractor for each load leaving or arriving the site. A record of the truck dispatch will be provided to the Environmental Consultant.

All haulage routes for trucks transporting soil, materials, equipment or machinery to and from the site should be selected to meet the following objectives:

- Comply with all road traffic rules;
- Minimise noise, vibration and dust to adjacent premises; and
- Use State roads and minimise use of local roads as far as practicable.

The remediation work will be conducted such that all vehicles:

- Conduct deliveries of soil, materials, equipment or machinery only during the specified hours of remediation;
- Have securely covered loads to prevent any dust or odour emissions during transportation; and
- Exit the site in a forward direction.

In addition, measures will be implemented to ensure no contaminated material is spilled onto public roadways or tracked off-site on vehicle wheels. Roadways will be kept clean throughout the remediation works and will be broomed, if necessary, to achieve a clean environment.

All loads will be securely covered and may be lightly wetted, if required, to ensure that no materials or dust are dropped or deposited outside or within the site. Prior to exiting the site each truck should be inspected by Remediation Contractor personnel and either noted as clean (wheels and chassis) or broomed prior to leaving the site. Any soil spilled onto surrounding streets will be cleaned by mechanical or hand methods, on a daily basis.

Removal of waste materials from the site shall only be carried out contractors holding the appropriate license(s), consent or approvals to dispose the waste materials according to the waste classification and with the appropriate approvals obtained from the EPA, were required.

Materials imported onto the site shall only be carried out contractors holding the appropriate license(s), consent or approvals to transport the materials with the appropriate approvals obtained from the EPA, were required.

All movement of soil within the site is to be tracked by the Remediation Contractor, from cradle to grave. Copies of tracking records must be provided to the Environmental Consultant.

5. Noise and vibration control plan

All equipment and machinery should be operated in an efficient manner to minimise the emission of noise. The use of any plant and/or machinery should not cause unacceptable vibrations to nearby properties and should meet Council requirements.

6. Dust control plan

Dust emissions must be confined within the site boundary as far as is practicable. The following example dust control procedures could be employed to comply with this requirement, as necessary:

- Erection of dust screens around the perimeter of the site (as applicable);
- Securely covering all loads entering or exiting the site;
- Use of water sprays across the site to suppress dust;
- Stockpiles shall be lightly conditioned by sprinkler or covered by geotextile or similar cover to prevent dust generation (if remaining overnight);
- Stockpiles impacted, or potentially impacted, with asbestos must be covered by geotextile or similar cover to prevent dust generation;
- Include wheel wash (if applicable); and
- Keeping excavation and stockpile surfaces moist.

Regular checking of the fugitive dust issues is to be undertaken. Remedial measures are to be undertaken to rectify any cases of excessive dust.

7. Odour control plan

No odours should be detected at any boundary of the site during remediation works by an authorised Council Officer relying solely on sense of smell. The following example procedures could be employed to comply with this requirement as necessary:

- Use of appropriate covering techniques such as plastic sheeting, polythene or geotextile membranes to cover excavation faces or stockpiles;
- Fine spray of water and/or hydrocarbon mitigating agent on impacted areas / stockpiles or loads to lightly condition the material;
- If required, restrict uncovered stockpiles to appropriate sizes to minimise odour generation;
- Ceasing works during periods of inclement weather such as high winds or heavy rain;
- Regular checking of the fugitive dust and odour issues to ensure compliance. Undertake immediate remediation measures to rectify any cases of excessive dust or odour (e.g. use of misting sprays or odour masking agent); and
- Adequate maintenance of equipment and machinery to minimise exhaust emissions.

8. Work health and safety plan

8.1 General

It is the Remediation Contractor's responsibility to devise a SWMS[1] (or series thereof, for various respective tasks) and to implement proper controls that enable the personnel undertaking the remediation to work in a safe environment. This RAP and SMP does not relieve the Remediation Contractor or other contractors of their ultimate responsibility for occupational health and safety of their workforce and to prevent contamination of areas outside the 'remediation' workspace. This RAP and SMP sets out general procedures and the minimum standards and guidelines for remediation that will need to be used in preparing the safe work method statement.

This work health safety plan (WHSP) has been prepared with refence to CRC CARE *Remediation Action Plan: Implementation - Guideline on Health and Safety* (CRC CARE, 2019). The requirements of this WHSP must be incorporated into the Remediation Contractor's SWMS.

All site work must be undertaken in a controlled and safe manner with due regard to potential hazards, training and safe work practices. To attain this the SWMS developed by the Remediation Contractor must comply with policies specified in the Work Health and Safety Regulation 2011.

All appropriate permits, licences and notifications required for the remediation activities must be obtained prior to the commencement of remediation works.

8.2 Site access

Appropriate fencing and signage must be installed around and within the site to prevent unauthorised access and restrict access to remediation areas and/or deep excavations. Access restrictions and administrative arrangements for management of entry of workers or related personnel on site is the responsibility of the Remediation Contractor.

Any existing pits or unstable areas on site that may generate potential safety, or operational risk should be demarcated and taped off, with appropriate rectification action undertaken (e.g. backfilling of pits).

8.3 Personnel and responsibilities

Before undertaking works on site, all personnel will be made aware of the officer responsible for implementing WHS procedures. All personnel must read and understand this WHSP and over-arching SWMS prior to commencing site works and sign a statement to that effect. Contractors employed at the site will be responsible for ensuring that their employees are aware of, and comply with, the requirements of this WHSP and Remediation Contractor's SWMS.

[1] Either a SWMS or construction environmental management plan (CEMP), or other equivalent document incorporating health and safety aspects of the proposed remedial works.

8.4 Chemical contamination hazards

Chemical compounds or substances that may be present in the soils at the site include the key CoPC metals, PAH and asbestos. There is also a lower probability of other contaminants being present.

The risks associated with the identified contaminants to site personnel and workers involved in the remediation are considered to be low due to the concentrations within groundwater and soil vapour and limited exposure durations. These risks are associated with:

- Ingestion of contaminated soil and/or water;
- Dermal contact with contaminated soil and/or water; and
- Inhalation of dusts (in particular asbestos) or vapours of the CoPC.

The remediation contractor must, in consultation with their occupational hygienist develop appropriate asbestos controls and management procedures within their construction environmental management plan.

Personnel will endeavour, wherever possible, to avoid direct contact with potentially contaminated material. Workers must avoid the potential exposures listed above as far as is practicable. Appropriate personal protective equipment (PPE) must be used to mitigate potential risks.

8.5 Physical hazards

The following physical hazards are associated with conditions that may be created during remediation works:

- Heat exposure;
- Excavations;
- Buried services;
- Noise;
- Dust;
- Electrical equipment;
- Heavy equipment and truck operation; and
- Asbestos.

Safe work practices must be employed to manage the physical risks identified above. For the most part these risks can be managed through appropriate demarcation, access controls and the use of appropriate PPE.

8.6 Safe work practices

The appropriate safe work practices should be clearly defined by the Remediation Contractor in their SWMS. As a minimum, all personnel on site will be required to wear the following PPE:

- Steel-capped boots (mandatory);

- High visibility clothing / vest (mandatory);
- Safety glasses or safety goggles with side shields requirements (as necessary);
- Hard hat (as necessary);
- Appropriate respiratory and protective equipment for any works involving asbestos (as necessary); and
- Hearing protection when working in the vicinity of machinery or plant equipment if noise levels exceed exposure standards (as necessary).

Each item of PPE should meet the corresponding relevant Australian Standard(s).

Specific safe work practices will be adopted when working with asbestos, in accordance with (but not limited to) the following codes of practice:

- SafeWork NSW *Code of Practice, How to Manage and Control Asbestos in the Workplace* (SafeWork NSW, 2019a);
- SafeWork *NSW Code of Practice, How to Safely Remove Asbestos* (SafeWork NSW, 2019b);
- WorkCover *NSW Managing Asbestos in or on Soil* (WorkCover NSW, 2014); and
- NOHSC *Guidance Note on the Membrane Filter Method for Estimating Airborne Asbestos Fibres 2nd Ed* (NOHSC, 2005).

9. Remediation schedule and hours of operation

The remediation works will be conducted within the days and hours specified in the development consent.

10. Response to incidents

The key to effective management of incidents is the timely action taken before any situation reaches a reportable or critical level. Therefore, surveillance activities are extremely important and should be conducted for the measures prescribed herein and any other measures prescribed in any additional environmental management plan developed subsequently. During construction activities on the site, the following inspection or preventative actions should be performed by the Remediation Contractor:

- Regular inspection of works;
- Completion of routine environmental checklists and follow-up of non-compliance situations;
- Maintenance and supervision on-site; and
- An induction process for site personnel involved in the remediation works that includes relevant information on the contamination status of the site, the remediation works being undertaken, worker health and environmental protection requirements and ensures that all site personnel are familiar with the site emergency procedures.

An emergency response plan will be in place for all aspects of site works. Any emergency will be reported immediately to the site office and/or the Site Manager (and Safety Officer), and the appropriate emergency assistance should be sought. The Site Manager should be responsible for initiating an immediate emergency response using the resources available on the site. Where external assistance is required, the relevant emergency services should be contacted. A table such as that below, containing contact details for key personnel who may be involved in an environmental emergency response should be completed and be readily available to personnel at all times. The table should be completed, and thereafter amended, as required.

The Remediation Contractor will be responsible for ensuring that site personnel are aware of the emergency services available and the appropriate contact details. A site Safety Officer should be contactable, or available, on-site during remediation and development works.

Contact details for key utilities are included in the event of needing to respond to incidents. Blank cells are 'to be confirmed' and should be completed prior to works commencing when all entities are confirmed.

Table 1: Summary of roles and contact details

Role	Personnel / contact	Phone contact details
Principal		
Principal's Representative		
Site Manager		
Remediation Contractor and Builder		
Site Office		
Environmental Consultant		
Consent Authority		
Regulator	NSW EPA (pollution line and general enquiries)	131 555
Utility Provider	Water (Sydney Water Corporation)	13 20 92
Utility Provider	Power (Ausgrid)	13 13 88
Utility Provider	Gas (Jemena Limited)	131 909
Utility Provider	Telecommunications (Telstra Corporation Limited)	13 22 03
Utility Provider	Telecommunications (Optus)	1800 505 777
Utility Provider	Telecommunications (NBN Co Limited)	1800 687 626

11. References

ANZG. (2018). *Australian and New Zealand Guidelines for Fresh and Marine Water Quality.* Canberra, ACT: Australian and New Zealand Governments and Australian state and territory governments.

CRC CARE. (2019). *Remediation Action Plan: Implementation - Guideline on Health and Safety.* National Remediation Framework: CRC for Contamination Assessment and Remediation of the Environment.

NOHSC. (2005). *Guidance Note on the Membrane Filter Method for Estimating Airborne Asbestos Fibres 2nd Ed.* Canberra, April 2005, NOHSC:3003: National Occupational Health and Safety Commission, Commonwealth of Australia.

NSW EPA. (2020). *Guidelines for Consultants Reporting on Contaminated Land.* Contaminated Land Guidelines: NSW Environment Protection Authority.

SafeWork NSW. (2019a). *Code of Practice, How to Manage and Control Asbestos in the Workplace.* August 2019.

SafeWork NSW. (2019b). *Code of Practice, How to Safely Remove Asbestos.* August 2019: SafeWork NSW, NSW Government.

WorkCover NSW. (2014). *Managing Asbestos in or on Soil.* March 2014: WorkCover NSW, NSW Government.

Appendix I

Contingency Plan and Unexpected Finds Protocol

1. General

Where the site conditions are found to be different than that anticipated during the remediation works, the proposed remediation approach may not be appropriate for the contamination encountered. In such cases the Environmental Consultant is to re-assess the contamination and remediation approach. Where necessary the Environmental Consultant will prepare an addendum to, or revision of, this RAP.

2. Contingency plan

This contingency plan has been developed to provide guidance on processes to follow if contamination (or indicators of contamination), other than that included in the remediation strategy, (Section 10) is encountered during the remediation works. Any such finds shall be surveyed and the location documented.

Although the site has been subject to previous investigation(s), there remains a potential for soil contamination to be present between sampled locations. In the event that signs of soil contamination, other than that included in the remediation strategy, are encountered during remediation e.g. evidence of additional asbestos containing material (ACM), petroleum, or other chemical odours which weren't previously identified the following protocols will apply:

- The Site Manager is to be notified and the affected area closed off by the use of barrier tape and warning signs;
- The Environmental Consultant is to be notified to inspect the area and assess the significance of the potential contamination and determine extent of remediation works (if deemed necessary) to be undertaken. An assessment report and management plan detailing this information will be compiled by the Environmental Consultant and provided to the Principal's Representative;
- The assessment results together with a suitable management plan shall be provided by the Principal's Representative to the Consent Authority (if required by the development consent);
- The agreed management / remedial strategy, based on the RAP and relevant guidelines (e.g. WA DoH (2021), for asbestos issues), shall be implemented; and
- All details of the assessment and remedial works are to be included in the site validation report.

3. Unexpected finds protocol

This unexpected finds protocol (UFP) has been developed to provide guidance on processes to follow if any unexpected find is encountered during the remediation or future civil and construction works. Any unexpected finds should be surveyed and the location documented.

All site personnel are to be inducted into their responsibilities under this (UFP), which should be included or referenced in the Remediation Contractors Environmental Management Plan.

All site personnel are required to report unexpected signs of environmental concern to the Site Manager if observed during the course of their works e.g. presence of potential unexploded ordinance, unnatural staining, potential contamination sources (such as buried drums or tanks) or chemical spills.

Should signs of concern be observed, the Site Manager, as soon as practical, will:

- Stop work in the affected area and ensure the area is barricaded to prevent unauthorised access;
- Notify authorities needed to obtain emergency response for any health or environmental concerns (e.g. fire brigade);
- Notify the Principal's Representative of the occurrence;
- Notify any of the authorities that the Remediation Contractor is legally / contractually required to notify (e.g. EPA, Council); and
- Notify the Environmental Consultant.

The Principal's Representative is to notify any of the authorities which the Principal is legally / contractually required to notify (e.g. EPA, Council). Where appropriate the Principals Representative will also implement appropriate community consultation.

The Environmental Consultant will assess the extent and significance of the find and develop an investigation, remediation or management approach using (where possible) the principles and procedures already outlined in the RAP. Where a Site Auditor is involved, the proposed approach will be discussed and agreed with the Site Auditor prior to implementation.

4. Underground Petroleum Storage System Find Contingency Plan

Based on the site history and use of the site as auto mechanics and car dealership it is considered that there is a risk that unidentified underground petroleum storage system(s) (UPSS) may be present within the site. In the event that a UPSS is encountered the following general sequence for the removal and validation is to be followed:

1. The UPSS will be exposed by the Remediation Contractor and examined for potential leaks and general condition. The Environmental Consultant should inspect the UPSS prior to removal;
2. The UPSS will be removed, and the structures disposed of by a qualified contractor in accordance with AS 4976 – 2008, including removal of potentially flammable or explosive vapours. Disposal records should be provided to the Environmental Consultant for inclusion in the validation report;
3. All associated infrastructure, if present (i.e. the remnants including fuel lines etc) will be removed and disposed in a similar manner;
4. Excavation and stockpiling of impacted materials (based on field observations) by the Remediation Contractor for classification. Materials which meet the criteria adopted for site re-use suitability (i.e. site assessment criteria – SAC) can be retained on site. Materials that are surplus to the development and/or fail the SAC will require off-site disposal to a licensed landfill unless otherwise advised by the environmental consultant. Land farming of impacted soils may be considered upon further advice from the environmental consultant based on

the nature and extent of impacted soils and consideration of the potential impacts on off-site receptors;

5. Off-site disposal by the Remediation Contractor of soils in accordance with the assessment results (including waste classification assessment) and the requirements of this RAP;
6. Collection by the Environmental Consultant (with the assistance of the Remediation Contractor) of validation samples from the tank pit at a minimum rate of one location per side wall or one sample per soil type and at the depth of observed groundwater, whichever is the greater and at least one sample in the excavation base. Note that the actual number of samples may vary depending on the size of the tank pit excavation and the degree of contamination, the soil profile encountered and the presence of groundwater;
7. Collection by the Environmental Consultant (with the assistance of the Remediation Contractor) of validation samples below the fuel lines (following removal). Validation samples should be collected at a rate of one sample per 5 m linear metres of the fuel lines;
8. The validation samples will be analysed at a NATA accredited laboratory for the following analytical scope; TRH, PAH, BTEX, and VOC. Additional analysis may be required as advised by the Environmental Consultant based on the contents of the tank or field observations;
9. Excavated material from the tank pits / fuel line will be placed by the Remediation Contractor into a stockpile for assessment for potential reuse and/or waste classification as appropriate: and
10. If water is encountered in the pit, a grab sample will be collected by the Environmental Consultant. The grab sample will be analysed for heavy metals, TPH, BTEX, PAH, VOC and hardness.

Based on the location of the UPSS and the results of the above validation testing the Environmental Consultant may recommend that a groundwater monitoring well is required to complete the validation.

The excavation and validation process will continue as above until the Environmental Consultant confirms that the UPSS pit has been appropriately validated as being remediated.

5. References

NEPC. (2013). *National Environment Protection (Assessment of Site Contamination) Measure 1999 (as amended 2013) [NEPM]*. Australian Government Publishing Services Canberra: National Environment Protection Council.

WA DoH. (2021). *Guidelines for the Assessment, Remediation and Management of Asbestos-Contaminated Sites in Western Australia*. WA Department of Health.