Douglas PARTNERS

GROUNDED EXPERTISE

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

16 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.

Signature		Date
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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.

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1. Introduction

This report prepared by Douglas Partners Pty Ltd (Douglas) presents the results of a geotechnical investigation undertaken for a proposed mixed use development at 79-81 Queens Road & 2-8 Spencer Street, Five Dock NSW (the site). The investigation was commissioned by email dated 16 April 2024 from Alexander Lekovski of DPG Project 37 Pty Ltd and was undertaken in accordance with Douglas' proposal 224583.01.P.001.Rev1 dated 5 April 2024. This report is to be submitted to the Department of Planning, Housing and Infrastructure (DPHI) in support of a State Significant Development Application (SSDA) SSD-78287462.

It is understood that the proposed development of the site includes the demolition of the existing site structures and construction of new 5 storey and 26 storey buildings with five levels of basement.

Douglas has previously prepared a geotechnical desktop assessment report for the site (Ref.: 224583.00.R.001.Rev0, dated 29 September 2023). The aim of the current investigation was to assess the subsurface conditions across the site in order to provide information on the subsurface soil, rock and groundwater conditions to inform the design and planning of the proposed structure and to support an SSDA lodgement.

The investigation included the drilling of seven boreholes, the installation of three groundwater monitoring wells, and laboratory testing of selected samples. The details of the field work are presented in this report, together with comments and recommendations for the proposed development.

A detailed contamination assessment was also carried out in conjunction with the current geotechnical investigation, and reported separately. The contamination investigation involved the drilling of four boreholes, undertaken concurrently with the geotechnical investigation. The details of the subsurface profile at these borehole locations have been included in this report.

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

1.1 SEARs Requirements

In accordance with section 4.39 of the Environmental Planning & Assessment Act 1979 (EP&A Act), Secretary's Environmental Assessment Requirements (SEARs) for SSD-78287462 were issued on 25 February 2025. This report has been prepared to respond to the relevant issued SEARs, as set out below.

SEARs and Relevant Reference

SEARs Item	Report Reference and Comments
Assess potential impacts on soil resources and related infrastructure and riparian lands on and near the site, including soil erosion.	This Geotechnical Report Sections 3.4 and 3.5
Where required provide a Groundwater Impact Assessment in accordance with relevant Groundwater Guidelines. If the proposed development is on land identified as having high salinity or acid sulfate soil potential in an EPI provide a Salinity Management Plan or Acid Sulfate Soil Management Plan that includes appropriate management measures and strategies	Sections 3.2, 3.3, 3.5, and 9.5 Note that a Groundwater Impact Assessment and Acid Sulfate Soil Management Plan have been reported separately.

2. Site Description

The site is located at 79-81 Queens Road & 2-8 Spencer Street, Five Dock. The site is rectangular in shape and covers an area of approximately 3,158.4 m^2 and is located within the Local Government Area of City of Canada Bay Council. The following lots make up the site:

- Lot 17 DP1117;
- Lot 20 DP1117;
- Lot 21 DP1117;
- Lot 22 DP1117
- Lot 1 DP540151; and
- Lot 18 DP651570.

Based on the supplied 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 AHD and RL 2.3 m AHD.

The site is currently occupied by light industrial facilities including vehicle workshops, warehouses, and a micro-brewery across most of the site, with on-grade pavements elsewhere. The general pavement condition within the site appeared to be in a moderate condition, with some areas of cracking and pavement damage. The closest body of water to the site is Kings Bay located approximately 500 m to the north.

Based on the Before-You-Dig-Australia results obtained for the site, it is understood that a 225 mm Cast Iron Cement Lining sewer main runs east to west through the centre of the site and a 750 mm diameter reinforced concrete stormwater pipe runs south to north through the western portion of the site below 81 Queens Road and 10-12 Spencer Street.

Two brick walled culverts both with dimensions of approximately 1.7 m by 0.9 m run along the eastern site boundary beneath William Street. A 300 mm diameter Cast Iron stormwater pipe runs adjacent and parallel to the stormwater culverts.

Details of the adjacent land uses are given in Table 1.

Table 1 – Adjacent Land Uses

Direction Relative to Site	Land Use Description
North	Queens Road, followed by Charles Heath Reserve and Five Dock Leisure Centre
East	William Street followed by industrial properties
South	Spencer Street, followed by industrial properties including car mechanics
West	Car mechanic/industrial properties

3. Published Data

3.1 Geology

Reference to the Sydney 1:100 000 Seamless Geology Sheet indicates that the site is underlain by 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; 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 Kings Bay to the north. Large man-made clasts and quarried building rubble were not observed on the site during the geotechnical investigation.

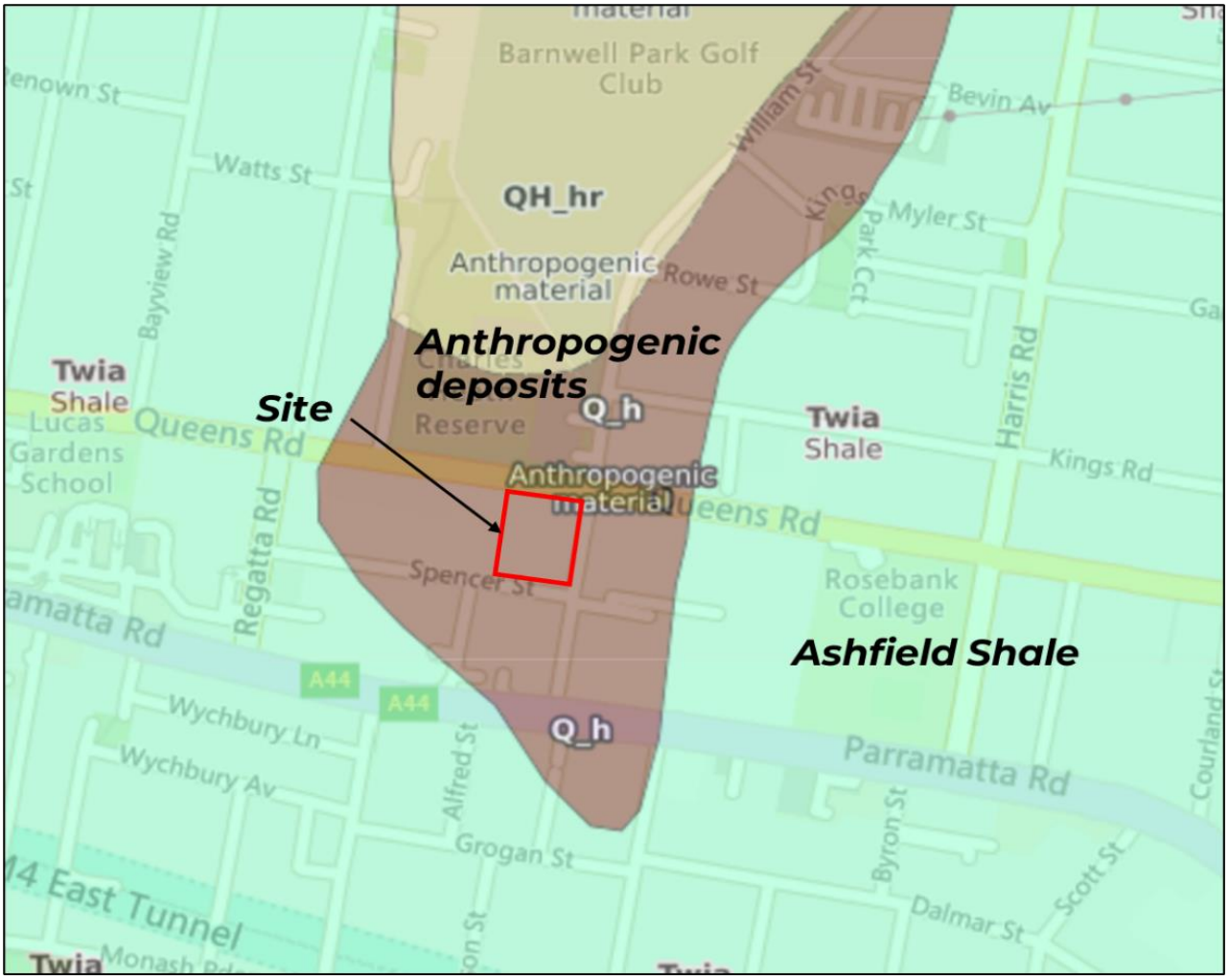

Figure 1 - Extract of Geological Mapping

3.2 Hydrogeology

A search of the available WaterNSW Groundwater well data indicates there are no groundwater extraction bores located within 1 km of the site. Four groundwater monitoring wells are located within 1 km of the site. Details of these bores from the available WaterNSW records do not record standing water levels and as such have been disregarded.

Reference to the Australian Bureau of Meteorology GDE Atlas indicates that there are no mapped groundwater dependant ecosystems (GDEs) in proximity to the site. The nearest being a Sydney Turpentine Ironbark Forest 3.5 km to the northwest.

The surface waters in the vicinity of the site include two unnamed canal-drains located around 95 m north and 780 m west of the site which drain into Kings Bay located around 490 m north of the site. No other surface waters are mapped within 1 km of the site to the east or south.

3.3 Acid Sulfate Soils

Reference to the regional Acid Sulfate Soils (ASS) Risk map indicates that the site is located within an area of 'disturbed terrain' with a potential to contain acid sulfate soils.

Results of the acid sulfate soil laboratory testing are detailed within the separate Acid Sulfate Soil Assessment Report (ref.: 224583.01.R.002.Rev0) prepared by Douglas.

Based on the results of the Acid Sulfate Soil Assessment Report, a subsequent Acid Sulfate Soils Management Plan (ASSMP) has also been prepared (ref.: 224583.03.R.002.Rev0).

3.4 Riparian Lands

A search of the NSW DPHI Riparian Lands and Watercourses map indicates that the site is not located within 2 km from an area of riparian land and watercourse. Riparian lands are therefore not likely to be impacted by the proposed development.

3.5 Salinity

The site is not located in an area mapped of known salinity or in an area for salinity potential. It is therefore considered that a salinity management plan is not required for the development.

4. Field Work Methods

The field work for the investigation included the drilling of five deep cored and two shallow augered boreholes at the locations shown on Drawing 1 in Appendix B. A summary of the field work is presented as follows:

- Borehole locations set out and scanning undertaken for underground services at each location using an accredited services locator with supervision by a geotechnical engineer from Douglas;
- Concrete coring of pavement surface materials using a 150 mm diameter diamond core barrel;
- Boreholes were drilled using a track-mounted drilling rig between 29 April and 23 May 2024. Boreholes drilled within the existing building were drilled in short-mast mode due to height restrictions;
- Drilling of seven boreholes (BH101 – BH107). One borehole (BH103) was drilled to a target depth of 30 m to satisfy the DPIE requirements. Five boreholes (BH101, BH105, BH106, and BH107) were drilled to a target depth of 19 m, and two boreholes (BH102 and BH104) were drilled to the top of weathered bedrock at depths of 5.8 m and 6.3 m. The boreholes were initiated using solid flight augering to the top of weathered rock, then extended to their target depths using NMLC diamond coring;
- Drilling of one borehole (BH111) to a target depth of 3 m using solid flight augers for contamination sampling and laboratory testing;
- Drilling of three boreholes (BH109, BH110, and BH112) to a target depth of 1.5 m using a hand auger for contamination sampling and laboratory testing;

- Standard Penetration Tests (SPT) were undertaken in boreholes BH101 to BH103 at regular depth intervals to determine soil consistency / density. SPTs were not undertaken in boreholes BH104 to BH107 as the short-mast drilling rig cannot operate the equipment required for testing;
- Dynamic Cone Penetrometer (DCP) tests were undertaken in boreholes BH104 to BH107 prior to drilling to assess the near surface soil consistency / density;
- Disturbed soil samples were collected for subsequent laboratory testing and identification purposes;
- Boreholes were logged by Douglas' experienced geotechnical engineer based on visual and tactile observations of soil and rock core samples;
- Groundwater (standpipe) monitoring wells were installed in boreholes BH103, BH105 and BH107 to a depth of 30 m, 19 m, and 19 m respectively. Additional wells (BH103S and BH107S) were installed adjacent to BH103 and BH107 to depths of 6.0 m, and 1.5 m, respectively. Well construction details are provided on the borehole logs;
- A permeability test was carried out in four of the groundwater wells (BH103, BH103S, BH105, BH107) on 31 May 2024. Falling head tests were carried out whereby water was introduced to the well to raise the water level and then the fall in water within the well was measured using dataloggers; and
- Data loggers were installed in groundwater wells BH103, BH105, and BH107 on 31 May 2024, which will periodically at one hour intervals monitor variation of groundwater levels for a period of three months (this will be reported separately).

The borehole locations are shown on Drawing 1 in Appendix B. Coordinates and surface levels for boreholes BH101 to BH103 were determined using a differential Global Positioning System (dGPS) receiver. Coordinates of the remaining locations were determined by measuring the distance of the boreholes from site features and estimated using GIS software and are approximate. Reference to the supplied survey drawings was made to infer the levels of internal boreholes (BH104 – BH107). Coordinates are reported in GDA2020/MGA Zone 56 format (Geocentric Datum of Australia 2020 base with Map Grid of Australia projection) and levels are relative to AHD.

5. Field Work Results

The detailed subsurface conditions encountered are presented in the borehole logs in Appendix C along with notes defining descriptive terms and classification methods. Photographs of the recovered rock cores are also included.

The general subsurface profile encountered at the borehole locations may be summarised as follows:

CONCRETE	-	Concrete slab at the start of BH101 and BH104 to BH112. The concrete was measured to be between 150 mm and 160 mm thick at all locations. Concrete was absent at locations 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 0.8 m to 1.1 m. Some ash was logged in BH110 and 112.

ALLUVIAL SOIL - Comprising medium plasticity, soft, silty clay and organic peaty clay varying in thickness between 0.2 m and 0.5 m, overlying fine to medium grained loose silty sand or clayey 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 within 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. Some very high strength bands were noted within BH101 and BH102 between 13.0 m and 18.0 m depth.

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 was encountered at depths of between 1.2 m and 1.5 m during the augering of all boreholes with the exception of BH104 and BH105. The use of water as a drilling fluid during diamond coring precluded measurement of the groundwater level during the drilling of the boreholes. The results of the ground water level monitoring from the installed wells are summarised in Table 2. Data loggers were installed in the groundwater wells for BH103, BH105, and BH107 to allow for long term monitoring. The monitoring results will be provided separately via monthly reports for three consecutive months.

Table 2 - Summary of Groundwater Level Measurements

Date	Measured Groundwater Depth (m) and *RL (m AHD)*				
	BH103/MW1	BH103S/MW2	BH105/MW3	BH107/MW4	BH107S/MW5
31 May 2024	10.1 / *-8.2*	3.3 / *-1.4*	9.7 / *-7.7*	10.1 / *-8.0*	DRY to 1.5 m / *NA*
7 June 2024	10.2 / *-8.1*	1.1 / *0.8*	10.2 / *-8.2*	10.1 / *-8.0*	DRY to 1.5 m / *NA*
4 July 2024	10.4 / *-8.5*	0.7 / *1.2*	10.4 / *-8.4*	10.0 / *-7.9*	DRY to 1.5 m / *NA*

The results of permeability tests carried out are given in Appendix D and are summarised in Table 3.

Table 3 – Results of Permeability Testing

Test Location	Screened Depth (m)	Test Method	Material	Permeability (m/s)
BH103/MW1	12.0 – 30.0	Falling Head	Sandstone	4.5×10^{-7}
BH103S/MW2	1.0 – 6.0	Falling Head	Clay and Clayey Sand	1.4×10^{-6}
BH105/MW3	12.0 – 19.0	Falling Head	Sandstone	4.9×10^{-7}
BH107/MW4	12.0 – 19.0	Falling Head	Sandstone	4.3×10^{-7}

6. Laboratory Testing

6.1 Soils

Laboratory testing on soil samples included aggressivity and Atterberg Limits with Linear Shrinkage. Table 4 shows a summary of the laboratory test results and the detailed reports are included in Appendix E.

Table 4 – Summary of Laboratory Test Results

Sample/Depth (m)	pH Units	EC µS/cm	Cl^- mg/kg	SO_4^{2-} mg/kg	W_L %	W_P %	PI %	LS %
BH101/4.04.45	7.3	1,800	2,200	670	*NT*	*NT*	*NT*	*NT*
BH102/1.0-1.45	6.6	210	26	140	*NT*	*NT*	*NT*	*NT*
BH104/2.9-3.0	6.5	310	190	350	*NT*	*NT*	*NT*	*NT*
BH105/0.5-0.6	7.5	160	34	59	*NT*	*NT*	*NT*	*NT*
BH106/1.5-1.6	7.4	54	<10	27	*NT*	*NT*	*NT*	*NT*
BH103/2.5-2.95	*NT*	*NT*	*NT*	*NT*	81	24	57	21.5
BH105/1.5-1.6	*NT*	*NT*	*NT*	*NT*	24	15	9	6.5

Notes: NT = not tested; EC = electrical conductivity; Cl = chloride ion; SO_4 = sulfate ion; W_L = liquid limit; W_P = Plastic limit; PI = plasticity index; LS = linear shrinkage

6.2 **Rock**

81 samples selected from the better quality rock core were tested for axial point load strength index (Is_{50}). The results ranged between 0.3 MPa and 3.3 MPa which correspond to medium strength and very high strength rock, respectively. These Is_{50} results suggest an unconfined compressive strength (UCS) in excess of 50 MPa for the high strength rock encountered during the investigation (based on typical correlation of 20:1 UCS:Is_{50}) . One test result of 0.2 MPa was noted, corresponding to low strength rock. The individual values are shown on the relevant borehole logs in Appendix C.

7. Proposed Development

It is understood that the proposed development of the site includes the demolition of the existing structures and the construction of two 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. In addition, the proposed development will include the construction of a shared basement carpark accessed from Spencer Street with five levels of basement, anticipated to require excavations of up to 16.3 m depth, or to RL – 13.3 m AHD. It is understood the development will also public domain and landscaping upgrades, including landscaped street setbacks to all boundaries, provision of part of a shared through site link connecting Queens Road to Spencer Street, and associated infrastructure upgrades and diversions.

8. Geotechnical Model

The field work results are summarised on interpreted geotechnical cross-sections in Appendix B, which show the interpreted layers of soil and rock units between the test locations. The interpreted boundaries shown on the sections are accurate only at the test locations and layers shown diagrammatically on the drawing are inferred only.

The shallow soil profile encountered in the boreholes generally included sandy clay fill (Unit 1) to depths of between 0.8 m and 1.1m, over medium to high plasticity silty and peaty clay, and loose silty sand alluvial soil (Unit 2) to depths of between 1.8 m and 2.2 m, followed by stiff to hard, medium to high plasticity clay residual soil (Unit 3) to depths of between 5.6 m and 7.1 m.

The rock encountered in the boreholes has been classified in accordance with Pells et al (2019) "Classification of Sandstone and Shale in the Sydney Region: A Forty Year Review" Aust. Geomechanics Journal, June, 2019. There are five classes of rock (I to V) based on strength, fracturing and the amount of defects such as sheared zones and clay seams. Class I rock is the best quality (high strength with very few defects) while Class V represents the lowest quality rock (very low strength and/or numerous defects) in the classification system.

A summary of soil and rock classification and the interpreted depths and RLs at the top of the various units are shown in Table 5 and Table 6.

Table 5 – Summary of Units

Rock Unit / Classification	Description
Unit 4 – Medium strength shale and laminite and low strength sandstone (Class IV)	Mittagong Formation shale and laminite – Generally medium strength, moderately weathered to fresh, fractured to slightly fractured, orange-brown, dark grey and grey, shale and laminite; and low strength, fresh, pale grey, slightly fractured sandstone (Hawkesbury Sandstone).
Unit 5 – Medium strength sandstone (Class III)	Hawkesbury Sandstone – medium strength, slightly weathered to fresh, slightly fractured, pale grey, medium to coarse grained sandstone
Unit 6 – Medium to high strength sandstone (Class II)	Hawkesbury Sandstone – medium to high and high strength, slightly weathered to fresh, unbroken, pale grey, medium to coarse grained sandstone
Unit 7 – High strength sandstone (Class I)	Hawkesbury Sandstone – high strength, with some very high strength bands, fresh, unbroken, pale grey, medium to coarse grained sandstone

Table 6 - Summary of Depths (and Reduced Levels) to Top of Various Units

Bore	Surface RL (AHD)	Depth (*RL*) to top of units (m)						
		Unit 1	Unit 2	Unit 3	Unit 4	Unit 5	Unit 6	Unit 7
BH101	1.9	0.0 *(1.9)*	0.9 *(1.0)*	2.0 *(-0.1)*	5.7 *(-3.8)*	5.9 *(-4.0)*	8.6 *(-6.7)*	13.1 *(-11.2)*
BH102	2.1	0.0 *(2.1)*	1.1 *(1.0)*	2.1 *(0.0)*	6.3[3] *(-4.2)*	N.E	N.E	N.E
BH103	1.9	0.0 *(1.9)*	1.0 *(0.9)*	2.2 *(-0.3)*	5.8 *(-3.9)*	N.E	7.7 *(-5.6)*	14.5 *(-12.4)*
BH104	2.0[2]	0.0 *(2.0)*	1.1 *(0.9)*	2.2 *(-0.2)*	7.1[3] *(-5.1)*	N.E	N.E	N.E
BH105	2.0[2]	0.0 *(2.0)*	1.0 *(1.0)*	2.1 *(-0.1)*	5.8 *(-3.8)*	N.E	6.0 *(-4.0)*	13.5 *(-11.5)*
BH106	2.1[2]	0.0 *(2.1)*	0.9 *(1.2)*	1.9 *(0.2)*	6.3 *(-4.2)*	7.5 *(-5.4)*	8.0 *(-5.9)*	16.0 *(-13.9)*
BH107	2.1[2]	0.0 *(2.1)*	0.8 *(1.3)*	1.8 *(0.3)*	5.6 *(-3.5)*	7.7 *(-5.6)*	14.6 *(-12.5)*	N.E
BH109	2.0[2]	0.0 *(2.0)*	1.1 *(0.9)*	N.E	N.E	N.E	N.E	N.E
BH110	2.0[2]	0.0 *(2.0)*	1.1 *(0.9)*	N.E	N.E	N.E	N.E	N.E
BH111	1.8	0.0 *(1.8)*	0.8 *(1.0)*	1.5 *(0.3)*	N.E	N.E	N.E	N.E
BH112	2.0[2]	0.0 *(2.0)*	N.E	N.E	N.E	N.E	N.E	N.E

Notes: (1) N.E = Not Encountered.
(2) Approximated from Site Survey Plan due to poor satellite coverage at the test location
(3) Inferred from Auger Bit Refusal

9. Comments

9.1 Geotechnical Issues

Some of the key geotechnical issues that need to be considered and managed for development are:

- Presence of shallow groundwater/perched groundwater within the alluvial soil will require temporary or permanent shoring to allow for excavation;
- Dewatering of the alluvial soils may result in temporary drawdown of the groundwater table which may cause settlement of adjacent structures which needs to be controlled;

- Relatively impermeable shoring walls will need to be used and designed to reduce inflow volumes from the upper groundwater system and control drawdown of groundwater levels by extending into bedrock;
- Groundwater seepage within the sandstone bedrock will require some dewatering to allow for deep excavations. Inflow assessment will be required to inform drained basement options;
- Trafficability on fill and clayey alluvial soils during excavation works and piling activities is likely to be poor and the use of a rockfill working platform will more than likely be required, particularly for heavy plant such as piling rigs and concrete trucks;
- There are numerous Sydney Water assets present below and adjacent to the site boundary, with the largest asset being the sewer running below William Street. Sydney Water will likely request that 'specialist engineering assessments' be completed by a geotechnical engineer with G4 competency (or greater) for all their assets below and near the site to demonstrate that the proposed development will not adversely affect their assets; and
- The results of the acid sulfate soil assessment completed by Douglas (ref.: 224583.01.R.002.Rev0) indicated the natural alluvial and residual soils to comprise potential acid sulfate soils (PASS) or acidic soils. Excavation works will need to be carefully planned to minimise cross contamination of contaminated soils and minimise exposing PASS or acidic soils where possible.

9.2 Earthworks

9.2.1 Excavation

Excavation for the basement levels will be required through fill, natural soils and predominantly sandstone bedrock of up to high strength. Excavation of the fill, natural soils and low strength rock should be readily achievable using conventional earthmoving equipment such as hydraulic excavators with bucket attachments. Bulk excavation in medium strength or better rock (i.e. Class III or better) is likely to require the use of heavy ripping, rock hammers etc. for effective removal. Rock sawing along the excavation boundaries, depending on the shoring solution, and for detailed excavation is also likely to be required.

The excavation rate that can be achieved, particularly within high strength rock, varies considerably and is dependent upon the degree of jointing in the rock, the rock strength, the type of machinery being used and the skill of the operator. It is suggested that bulk excavation tenderers be required to make their own assessment of the equipment required to carry out the work.

Excavation works conducted within the saturated alluvial soils will need to be undertaken in conjunction with a dewatering programme to reduce the moisture content of the soils and allow machinery to work on the site. This may entail the use of a large pump connected to spear-points within the excavation, sumps within the excavation, or a combination of the two. An appropriate dewatering methodology will need to be developed by the earthworks contractor.

9.2.2 Vibration

During excavation, it will be necessary to use appropriate methods and equipment to keep ground vibrations at neighbouring buildings and structures within acceptable limits. The level of

acceptable vibration is dependent on various factors including the type of building structure (e.g. reinforced concrete, brick, etc.), its structural condition, founding conditions, the frequency range of vibrations produced by the construction equipment, the natural frequency of the building and the vibration transmitting medium.

Ground vibration can be strongly perceptible to humans at levels above 2.5 mm/s peak particle velocity (PPV). This is generally much lower than the vibration levels required to cause structural damage to most buildings. The Standard AS/ISO 2631.2 – 2014 "Mechanical vibration and shock – Evaluation of human exposure to whole-body vibration – Vibration in buildings (1 Hz to 80 Hz)" suggests an acceptable daytime limit of 8 mm/s PPV for human comfort. If any surrounding buildings are founded on shallow footings on the loose/weak soils, or if sensitive buildings are identified, then a lower vibration limit of about 3 mm/s may be needed.

Vibration trials should be undertaken for various plant used at the commencement of demolition works and during excavation to minimise the risk of causing adverse impacts to neighbouring buildings or infrastructure and utilities. It should be noted that Sydney Water typically has relatively low vibration limits to protect their assets.

9.2.3 Dilapidation Surveys

Dilapidation surveys should be carried out on adjacent buildings, pavements and infrastructure that may be affected by the excavation works or excessive settlement due to dewatering. The dilapidation surveys should be undertaken before the commencement of any excavation work in order to document any existing defects so that claims for damage due to construction related activities can be accurately assessed.

9.2.4 Disposal of Excavated Material

All excavated materials will need to be disposed of in accordance with the provisions of the current legislation and guidelines including the *Waste Classification Guidelines* (EPA, 2014). This includes fill and natural materials that may be removed from the site. Accordingly, environmental testing will need to be carried out to classify spoil prior to transport from the site. Reference to Douglas's contamination report should be made for further information.

9.3 Excavation Support

9.3.1 Excavation Support and Vertical Rock Faces

Battering of the sides of excavation will not be feasible where the proposed excavation is expected to be extended close to the boundaries of the site. Battering the excavation is not recommended due to the presence of shallow groundwater levels and soft/loose alluvial soils. Both temporary and permanent lateral support will therefore be required for all excavation faces in the overlying fill, soils and weathered rock.

Relatively impermeable shoring walls will need to be installed around the perimeter of the basement footprint prior to bulk excavation to reduce groundwater inflows into the basement excavation and provide support. Preferably shoring should be installed to below the bulk excavation level to cut off horizontal groundwater flows through the upper soils and within the rock, with relatively minor inflow through the base of the excavation only. However, this would require penetration of high strength Class II and Class I sandstone which may be difficult. As a

minimum, shoring should be socketed at least 1 m into competent medium strength or stronger Class III sandstone. Groundwater inflow assessment will be required to inform shoring and basement design.

Secant piles are a suitable shoring system comprising concrete or grout injected continuous flight auger (CFA) piles installed prior to the commencement of excavation so that adjacent piles overlap to provide a relatively impermeable seal. Drilling of deeper piles and particularly piles into rock, if required, can result in decompression of the surrounding soil which can result in damage to adjacent buildings, infrastructure, or utilities and must be controlled to avoid this issue. The secant piles may also be able to be used as the permanent water-tight basement walls if their water-tightness can be warranted by the piling contractor.

Cutter soil mixed wall are sometimes used but these are less effective in clayey soils and may not be suitable. Driven sheet piles are not recommended due to issues with vibrations and they will not be able to penetrate rock to create an effective seal.

The piling/shoring wall contractor should make an assessment of the subsurface conditions on the site to ensure an appropriate methodology and suitable plant are used for the works. Only contractors experienced in similar conditions should be engaged.

The use of temporary ground anchors/bracing to provide lateral support during construction will be required, and permanent lateral support would need to be provided by floor slabs.

It would be technically possible to terminate the shoring piles in self-supporting medium strength or stronger sandstone (Class III or better) above the bulk excavation level and continue excavation below the walls in the sandstone bedrock without shoring support. In this case it will be important for a geotechnical engineer to assess the stability of the rock directly beneath each pile. The toe of the piles which terminate above bulk excavation level will need to be restrained with toe bolts. To reduce the risk of adverse joints undermining piles a lower risk option could be to take every third or fourth pile to below excavation level to maintain some vertical support. Termination of the pile in medium strength sandstone, however, would result in higher volumes of groundwater inflow during construction and in the long term (if a drained basement is adopted).

Vertical excavation within medium strength or stronger sandstone (Unit 4 or better) is considered feasible where the rock face is not adversely affected by joints and other discontinuities. Steeply dipping joints were encountered in the boreholes and so should be expected in the excavation sidewalls. Adversely oriented joints can form unstable rock slivers, blocks and wedges which will require additional support. Bedding planes, crushed zones and weak seams are also common in the Hawkesbury Sandstone and were encountered in the medium strength or stronger rock in the boreholes. These seams may require shotcrete and rockbolt support to prevent long term regression and potential stability issues. Excavated faces in medium strength or stronger sandstone can only be considered self-supporting once mapping has confirmed that they are no adversely oriented joints or other discontinuities or weak seams.

Rock mass support can only be finalised during excavation once the actual defect location, dip and dip direction have been determined. It is therefore recommended that all rock faces be inspected/mapped by a suitably experienced geotechnical engineer/engineering geologist at 1.5 m drops in excavation level to confirm that the site conditions are consistent with the

geotechnical model and to ensure that suitable support is designed and installed in a timely manner (prior to proceeding with the next drop in excavation).

During construction it is recommended that monitoring of the lateral movement of the shoring walls and ground is undertaken using survey and also in-ground inclinometers.

9.3.2 Earth Pressures for Shoring Design

Design pressures for retaining walls should take into account the requirement to limit movement of the surrounding ground and adjacent structures/services and to ensure an adequate factor of safety is maintained against failure (for both temporary and permanent retaining walls).

It is suggested that the design of cantilevered shoring systems (or shoring with one row of anchors) be based on a triangular earth pressure distribution using the earth pressure coefficients provided in Table 7. 'Active' earth pressure coefficient (K_a) values may be used where some wall movement is acceptable. 'At Rest' earth pressure coefficients (K_o) values should be used where the wall movement needs to be limited.

Table 7 – Recommended Design Parameters for Shoring Systems

Unit/Material	Unit Weight	Earth Pressure Coefficient		Ultimate Passive Earth Pressure (kPa)
		Active (Ka)	At Rest (Ko)	
Unit 1 – Fill	19	0.4	0.6	-
Unit 2 – Alluvial Soil	18	0.4	0.6	-
Unit 3 – Residual Soil	20	0.35	0.5	-
Unit 4 – Medium strength shale and siltstone (Class IV)	22	0.25	0.1	3,000
Unit 5 – Medium strength Sandstone (Class III)	22	0*	0*	6,000
Unit 6 – Medium to high strength sandstone (Class II)	22	0*	0*	6,000
Unit 7 – High Strength Sandstone (Class I)	22	0*	0*	6,000

Notes: The values above assume a level surface behind the wall.
*It is assumed that the rock mass is free of adverse dipping joints and seams.
It should also be noted that the K_a and the K_o designs will not prevent stress relief movement.

If more than one row of anchors is required, then a trapezoidal earth pressure distribution should be used. In this case, the pressure distribution should increase from zero at the surface to the maximum value at a depth of 0.25 H and decrease from the maximum value at a depth of 0.75 H back to zero at the base of the excavation.

For a multi-anchored or propped design, where there are no movement-sensitive structures within the influence zone behind retaining walls, an earth pressure distribution equal to 4H kPa (where H, in metres, equals the depth to the top of self-supporting medium strength or stronger rock) can be used. Where the wall movement is to be minimised (i.e., close to adjacent buildings or services) the lateral earth pressure can be calculated using 6H kPa. For movement sensitive structures or service tunnels where it is critical that deformation is controlled, it may be necessary to calculate the maximum pressure using 8H kPa. These pressures can be applied as either rectangular or trapezoidal earth pressure distributions. Note these earth pressure distributions are “pressure envelopes”, selected to ensure that no row of anchors is overloaded during the temporary support phase. The actual magnitude and distribution of lateral earth pressures for the building in its final (long term) condition may differ from the uniform distributions given above. The final condition earth pressures can be assessed using numerical methods.

In all cases, additional surcharge loads such as new and existing footings, construction loads, etc., must be allowed for in the design, applied as a rectangular earth pressure distribution over the depth of influence.

The earth pressure loading described above does not include either earthquake loads or hydrostatic pressures. Unless positive drainage measures are incorporated to prevent water pressure build-up behind the walls, full hydrostatic head should be allowed for in design, while at the same time reducing the unit weight to account for the buoyant condition.

A factor of safety must be applied to the ultimate passive value above, while considering the displacement that is required to mobilise the passive resistance. Additional support will be required if allowable displacements are exceeded or if the rock is adversely affected by faults, bedding or jointing.

The first 0.5 m of rock socket below the bulk excavation level should not be taken into account for the purpose of passive restraint. The minimum socket depth should be equal to the greater of one pile diameter or 1.0 m below the lowest level of any nearby excavation (including any detailed excavations), but subject to analysis. This is also relevant where anchors are installed (or toe anchors, just prior to fully exposing the toe of the pile).

Detailed design of the shoring should be undertaken using PLAXIS software or similar to take into account soil-structure interaction and assess ground movements.

Consideration should be given to the existing footings of the neighbouring buildings at 83 Queens Road and 10-16 Spencer Street, as they are likely to be within the zone of influence of the proposed excavation. An assessment of the bearing capacity beneath these neighbouring footings should be undertaken to ensure the foundation remains within their serviceability design limits. Progressive inspections of the excavated face below the neighbouring footings will be necessary in 1.0 m drops to check whether there are defects or adversely dipping joints that may affect the neighbouring foundation performance.

9.3.3 Ground Movement and Stress Relief

Horizontal movements due to stress relief of the rock mass will occur during the excavation works. Based on published literature and DP's experience, the lateral deflections associated with stress relief in rock may be in the order of 0.05% to 0.2% of the excavation height in rock, depending on the various factors such as rock strength, orientation of the face and degree of fracturing. So for say 8 m of excavation in rock this may result in 4-16 mm of displacement. The predicted deflections would generally be greatest at the centre of the excavated faces and would reduce with distance from the excavation face/boundary.

It is unlikely to be practicable to provide restraint (i.e., anchoring) for the relatively high in-situ horizontal stresses associated with stress relief movements. Therefore, it is recommended that appropriate allowance be made for movements of this order in construction and planning.

9.3.4 Anchor Design

Post-stressed ground anchors, rock bolts and dowels (support elements) can be used to laterally support shoring walls or unstable rock blocks and wedges. Anchors could also be used vertically as hold down anchors. Support elements used for lateral support should be bonded in the stronger rock, inclined as required, but preferably not steeper than 30° below the horizontal. Table 8 provides ultimate and allowable bond stresses for preliminary design and estimating purposes.

Table 8 – Allowable Bond Stresses (Grout-Rock Interface)

Material	Allowable Bond Stress (kPa)	Ultimate Bond Stress (kPa)
Unit 4 – Medium strength shale and siltstone and low strength sandstone (Class IV)	100	300
Unit 5 – Medium strength Sandstone (Class III)	350	800
Unit 6 – Medium to high strength sandstone (Class II)	600	1,500
Unit 7 – High Strength Sandstone (Class I)	1,200	3,000

These values should be confirmed by pull-out tests prior to full scale installation of support elements. Ultimately, it is the contractor's responsibility to ensure that the correct design values (specific to the support system and method of installation) are used and that the support element holes are carefully cleaned prior to grouting.

The cone pull-out failure mechanism should also be considered for vertical anchors. A 90° cone could be assumed for the Class III or better Hawkesbury Sandstone.

After temporary support elements have been installed, it is recommended that they are tested to 125% of their nominal working load. Where stress relief or further unavoidable movement of the

shoring is expected, it is recommended that the support elements are locked-off between 60% and 80% of their working loads to accommodate the additional movement and subsequent increase in stress in the support elements. Checks should be carried out to confirm that the load in the support elements has been maintained and that losses due to creep effects or other causes have not occurred.

Shorter support elements (i.e. rock bolts, dowels and pins) may be required to support any unstable rock wedges, slivers or blocks. Shotcrete with mesh (or fibrecrete) may be required where beds/seams of extremely weathered and very low strength rock are encountered within higher strength sandstone, secured with anchors, rock bolts, dowels or pins, as required. Care should be exercised to ensure that anchors are installed progressively during excavation and stressed prior to excavation of the next drop to ensure that stability is maintained at all times.

It is anticipated that the new structure will support the shoring walls over the long term and therefore the support elements are expected to be temporary only. The use of permanent rockbolts and ground anchors, if required, will need careful attention to corrosion protection.

It should be noted that permission will be required from authorities and adjacent property owners prior to installing rockbolts/ground anchors below their land. Due consideration should also be given to below-ground excavations, services, etc.

9.4 **Foundations**

Based on the results of the investigation, it is anticipated that medium to high strength and high strength sandstone will be exposed at the base of excavation and pad footings may be suitable. Typical parameters for the design of foundations on sandstone, based on the classification methods of Pells et al. (2019) are shown in Table 9, and are subject to spoon testing/proof coring, where required. Shaft adhesion values for uplift (tension) in piles may be taken as being equal to 70% of the values for compression, provided that adequate socket roughness is achieved.

Table 9 – Recommended Parameters for Foundation Design

Foundation Stratum	Allowable Bearing Pressure (Serviceability)		Ultimate Bearing Pressure		Design Young's Modulus – E (MPa)
	End Bearing (MPa)	Shaft Adhesion (Compression) (kPa)	End Bearing (MPa)	Shaft Adhesion (Compression) (kPa)	
Unit 6 – Medium to High Strength Sandstone (Class II)	6.0	600	40	1,500	900

Foundation Stratum	Allowable Bearing Pressure (Serviceability)		Ultimate Bearing Pressure		Design Young's Modulus – E (MPa)
	End Bearing (MPa)	Shaft Adhesion (Compression) (kPa)	End Bearing (MPa)	Shaft Adhesion (Compression) (kPa)	
Unit 7 – High Strength Sandstone (Class I)	8.0	1,200	120	3,000	2,000

Note: Shaft adhesion applicable to the design of bored piles, uncased over the rock socket length, where adequate sidewall cleanliness and roughness are achieved, below bulk excavation level.

To use a design bearing pressure value of greater than 3.5 MPa, spoon testing is required to be carried out in one third of footings across the site during construction. If bearing pressures greater than 6 MPa are used in design, then additional cored bores and spoon testing will be required. For spoon testing, a 50 mm diameter hole is drilled below the base of the footing to a depth of 1.5 times the footing width, followed by testing to check for the presence of weak layers or clay bands.

Foundations proportioned on the basis of the allowable bearing pressures in Table 9 would be expected to experience total settlements of less than 1% of the pile diameter or footing width under the applied working load, with differential settlements between adjacent columns expected to be less than half of this value.

For design using the ultimate values provided in Table 9, a geotechnical strength reduction factor (ϕ_g) should be determined by the designer once the information for the site, design and installation risk factors and foundation testing regime are known. The serviceability assessment should be based on using geotechnical parameters that are appropriately selected and to which no reduction factor is applied.

All shallow foundations should be inspected and drilling of all pile foundation sockets witnessed by a geotechnical engineer to confirm that foundation conditions are suitable for the design parameters and proof-drilled or spoon tested as appropriate. If weak seams, defects or rock socket requirements are not encountered/achieved, footings/piles may need to be deepened until suitable foundation material is reached. Alternatively, footings can be enlarged (although differential settlement should be taken into account by the designer), or redesigned for a lower bearing pressure.

Suitably powered piling rigs will be required to penetrate the medium and high strength sandstone if required and this should be considered by the piling contractor. Consideration should also be given to the potential for water seepage into the piles. This may require the use of cleaning buckets and possibly tremie pouring methods.

9.5 **Groundwater**

Groundwater levels were measured in the wells on site between RL 0.8 m AHD and RL -1.4 m AHD within the shallow monitoring wells screened in the silty sand soil, and RL -7.7 m AHD and

RL - 8.2 m AHD within the deeper monitoring wells screened within bedrock above the anticipated bulk excavation level.

A shallow groundwater table exists within the upper alluvial soils and it is likely that the residual clayey soil acts as an aquitard between the alluvial soil and deeper groundwater table within the underlying bedrock. These measured groundwater levels are expected to vary with rainfall events and may be influenced to a lesser extent by the tide due to the proximity of the site to the nearby Kings Bay.

Due to the presence of a shallow and deep groundwater table 6 m higher than the anticipated bulk excavation level, groundwater inflow will occur and the quantity of inflow will inform whether a drained or tanked basement is adopted. Numerical modelling will be required to assess inflows and impacts to surrounding areas.

A tanked basement requires a considerable extra cost and materials but is lower risk in the long term. The walls and floor slabs need to be designed to resist hydrostatic pressures both globally (i.e. uplift of the entire building) and locally (i.e. pressure between column/slab supports).

A drained basement is technically feasible and will require permanent subfloor drainage below the basement floor slab to direct groundwater to the stormwater drainage system. However, a drained basement and pumping to the stormwater system will be subject to approval from Council and relevant authorities. The groundwater quality and ongoing treatment requirements must be considered for drained basements, and some ongoing treatment for iron is typical in shale/sandstone. Results from the separately prepared contamination report (224583.02.R.001.Rev1) indicate higher than normal levels of copper, zinc, and Polyfluoroalkyl substances within the groundwater and will need to be considered for treatment.

During construction, a dewatering programme will be required entailing the use of a large pump connected to spear-points within the excavation, sumps within the excavation, or a combination of the two.

A groundwater inflow assessment will be undertaken to assess inflows to inform basement design and for approval and discharge requirements during construction. Monitoring results from the installed dataloggers will be provided separately via monthly reports for three consecutive months.

Approval for long-term pumping will not be required should the basement be designed as a tanked basement.

9.6 **Trafficability**

The majority of the site is covered with buildings or concrete pavements. During the initial phase of construction (i.e., during installation of the shoring system), it may be preferable to leave the slabs in place for operation of piling rigs on the site. The suitability of the concrete slab to support heavy plant should be assessed through concrete strength testing and input from a structural engineer.

Removal of the concrete pavements during the initial phase would expose uncontrolled fill and loose/soft alluvial soil unsuitable for tracked plant and heavy machinery. Trafficability with heavy plant on the uncontrolled fill and soft to loose soils would be poor. Construction of internal haul

roads using rockfill would improve the trafficability for rubber-tyred trucks and various plant. If trafficking over the soft to loose alluvial soils is required then a more robust, engineered working platform is required.

A working platform is required for piling rigs, concrete pump trucks and mobile cranes should the uncontrolled fill and soft alluvial soils be exposed (or at shallow depth). A working platform in the order of 0.5 m to 1.0 m in thickness is common for large piling rigs on the aforementioned material. The platform should be constructed from good quality granular material with low fines, such as recycled concrete, 'blue metal' or high strength ripped sandstone, possibly over a strong geofabric or geogrid material.

The platform design will depend on the strength of the soils exposed and size of the plant proposed. The thickness of the platform can be accurately assessed once specific details of the heavy plant that will operate on the site are known. Further advice should be sought once more information is available regarding the selected plant size and sequencing of construction works.

9.7 Earthquake Design

A Hazard Factor (*Z*) of 0.08 would be appropriate for preliminary design in accordance with Australian Standard AS 1170.4 – 2007 *Structural design actions – Part 4: Earthquake actions in Australia*. The site sub-soil class is considered to be Class D_e (Soft Soil site) due to the presence of subsurface soil layers with an undrained shear strength of < 12.5 kPa. Further investigation using CPTs and/or analysis of the average profile could possibly be used to justify a Ce, subject to results.

9.8 Soil Aggressivity

Based on the results of the chemical analysis and reference to Tables 6.4.2(C) and 6.4.3(C) of AS 2159 – 2009, the site soils may be assumed to have an exposure classification of 'non-aggressive to moderate' with respect to buried reinforced concrete and steel structural elements. The PASS/acidic soils should also be considered and may warrant a more severe classification.

9.9 Impacts on Sydney Metro Infrastructure

The proposed Sydney Metro tunnel is located approximately 50 m to the north of the site and is understood to run east-west under the Charles Heath Reserve.

Given the distance to Sydney Metro tunnel, it is considered that the impacts due to excavation and the proposed construction of the development will be negligible on the Sydney Metro infrastructure and the requirement for a geotechnical impact assessment is not likely.

Nevertheless, further advice should be sought from Sydney Metro of the tunnel and reserve boundaries and their requirements for this development, if any. For example, it may be necessary to check and confirm that anchors do not extend into the second reserve, for which approval is required.

9.10 Impacts on Sydney Water Assets

It is anticipated that Sydney Water will request that a 'specialist engineering assessment' be completed by a geotechnical engineer with G4 competency for all their assets near the site to

demonstrate that the proposed development (i.e., shoring, excavations, etc.) will not adversely affect their assets.

Once detailed design of the proposed development is available, Douglas can assist with the preparation of the specialist engineering assessment for submission to Sydney Water.

10. **Limitations**

Douglas Partners Pty Ltd (Douglas) has prepared this report for this project at 79-81 Queens Road & 2-8 Spencer Street, Five Dock NSW in accordance with Douglas' proposal 224583.01.P.001.Rev1 dated 5 April 2024 and acceptance received from Alexander Lekovski dated 16 April 2024. 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 geotechnical 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.

The scope of work for this investigation/report did not include the assessment of surface or sub-surface materials or groundwater for contaminants, within or adjacent to the site. Should evidence of fill of unknown origin be noted in the report, and in particular the presence of building

demolition materials, it should be recognised that there may be some risk that such fill may contain contaminants and hazardous building materials.

Appendix A

About this Report

Terminology, Symbols and Abbreviations

Soil Descriptions

Rock Descriptions

Sampling, Testing and Excavation Methodology

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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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
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November 2023

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".

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
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
Infilled seam	IS
Cleavage	CV
Crushed zone	CZ
Decomposed seam	DS
Fault	F
Joint	JT
Lamination	LAM
Parting	P
Shear zone	SZ
Vein	VN
Drilling/handling break	DB , HB
Fracture	FC

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

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Rock Defect Shape/Planarity

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

Rock Defect Roughness

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

Defect Orientation

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

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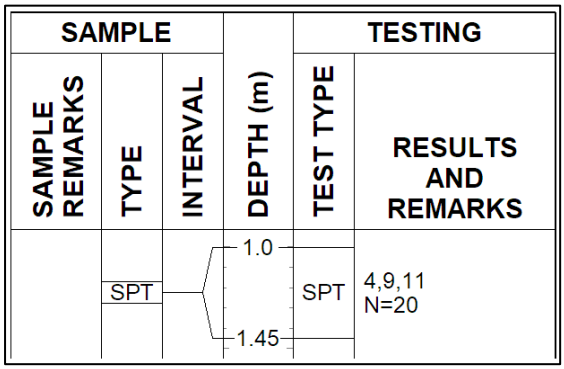
Sampling, Testing and Excavation Methodology

Terminology
Symbols
Abbreviations

November 2023

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
Bulk sample	B
Core sample	C
Disturbed sample	D
Sample from SPT test	SPT
Environmental sample	ES
Gas sample	G
Undisturbed tube sample	U[1]
Water sample	W
Piston sample	P
Core sample for unconfined compressive strength testing	UCS
Material Sample	MT

[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

Field and laboratory testing (continued)

Test Type	Code
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)	DCP/150
Perth sand penetrometer, followed by blow count penetration increment in mm (flat tip, generally in accordance with AS1289.6.3.3)	PSP/150

Groundwater Observations

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

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

Douglas PARTNERS

Appendix B

Drawings

REV	DESCRIPTION/COMMENT	DATE	DRAWN BY
0	INITIAL ISSUE	19.06.2024	EC
1	UPDATED SITE BOUNDARY	06.06.2025	EC

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 13.03.2025)

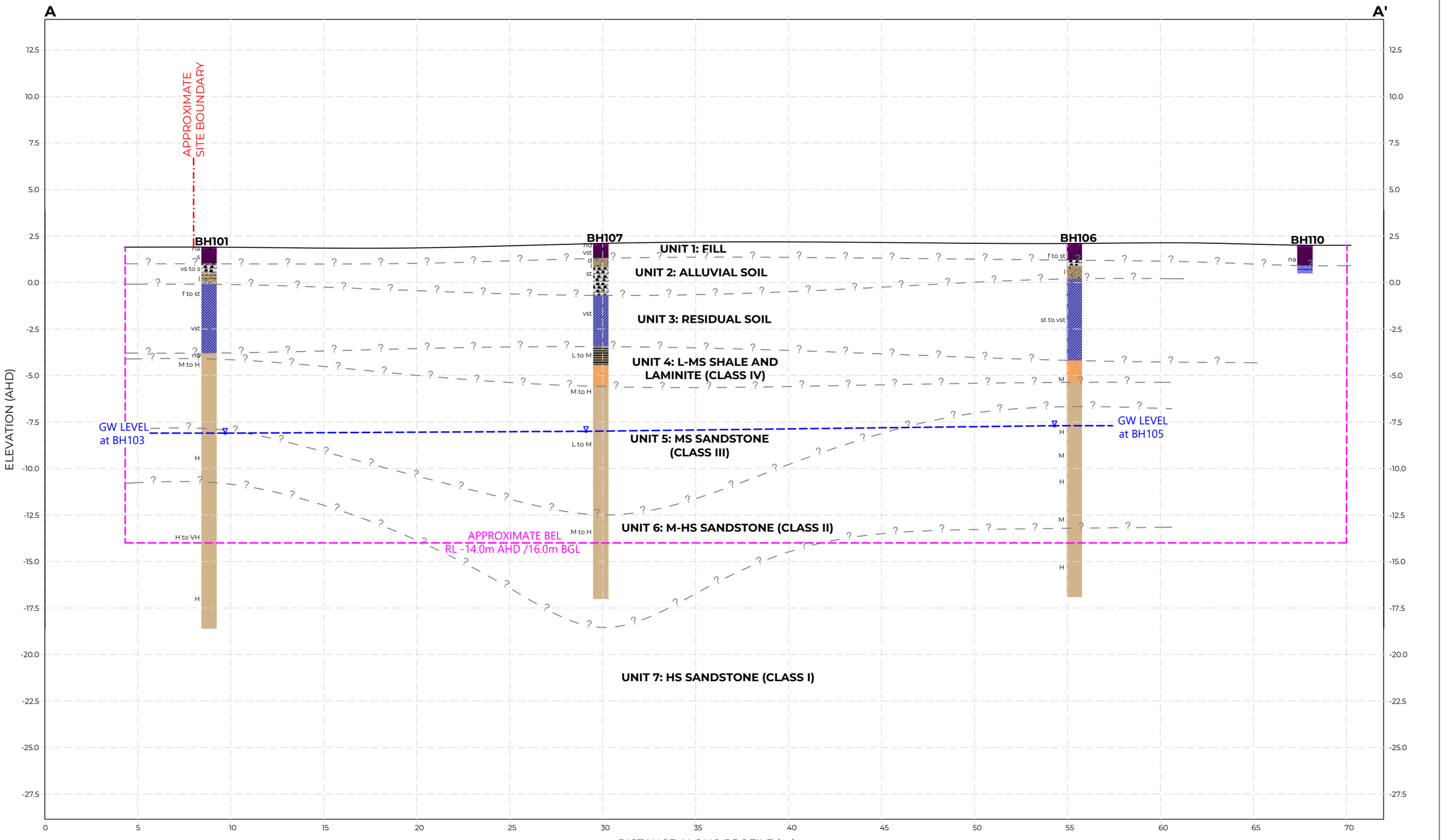
COORDINATE REFERENCE SYSTEM: GDA2020 / MGA zone 56

PROJECT NAME:
DPG Project 37 Pty Ltd

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

DRAWING TITLE:
TEST LOCATION PLAN

PROJECT NO: **224583.01**
DRAWING NO: **1**
REVISION: **1**



LEGEND

- ASPHALTIC CONCRETE
- CONCRETE
- Clayey PEAT
- SANDSTONE
- CI-CH - Medium to High Plasticity CLAY
- FILL
- Clayey SAND
- Shale
- Sandy CLAY
- Laminite
- Silty SAND

TESTS / OTHER

- N - Standard penetration test value
- — ? — — - Interpreted geotechnical boundary
- - Water level

ROCK STRENGTH

- VL- Very Low
- L - Low
- M - Medium
- H - High

SOIL CONSISTENCY

- vs - Very Soft
- s - Soft
- f - Firm
- st - Stiff
- vst - Very Stiff
- h - Hard

SOIL DENSITY

- vl - Very Loose
- l - Loose
- md - Medium Dense
- d - Dense
- vd - Very Dense

REV	DESCRIPTION/COMMENT	DATE	DRAWN BY
0	INITIAL ISSUE	12.06.2024	EC
1	UPDATED SITE BOUNDARY	06.06.2025	EC

SCALE: 0 1 2 3 4 6 8 10
1:200 @ A3
Vertical Exaggeration = 1.0

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

CLIENT:
DPG Project 37 Pty Ltd

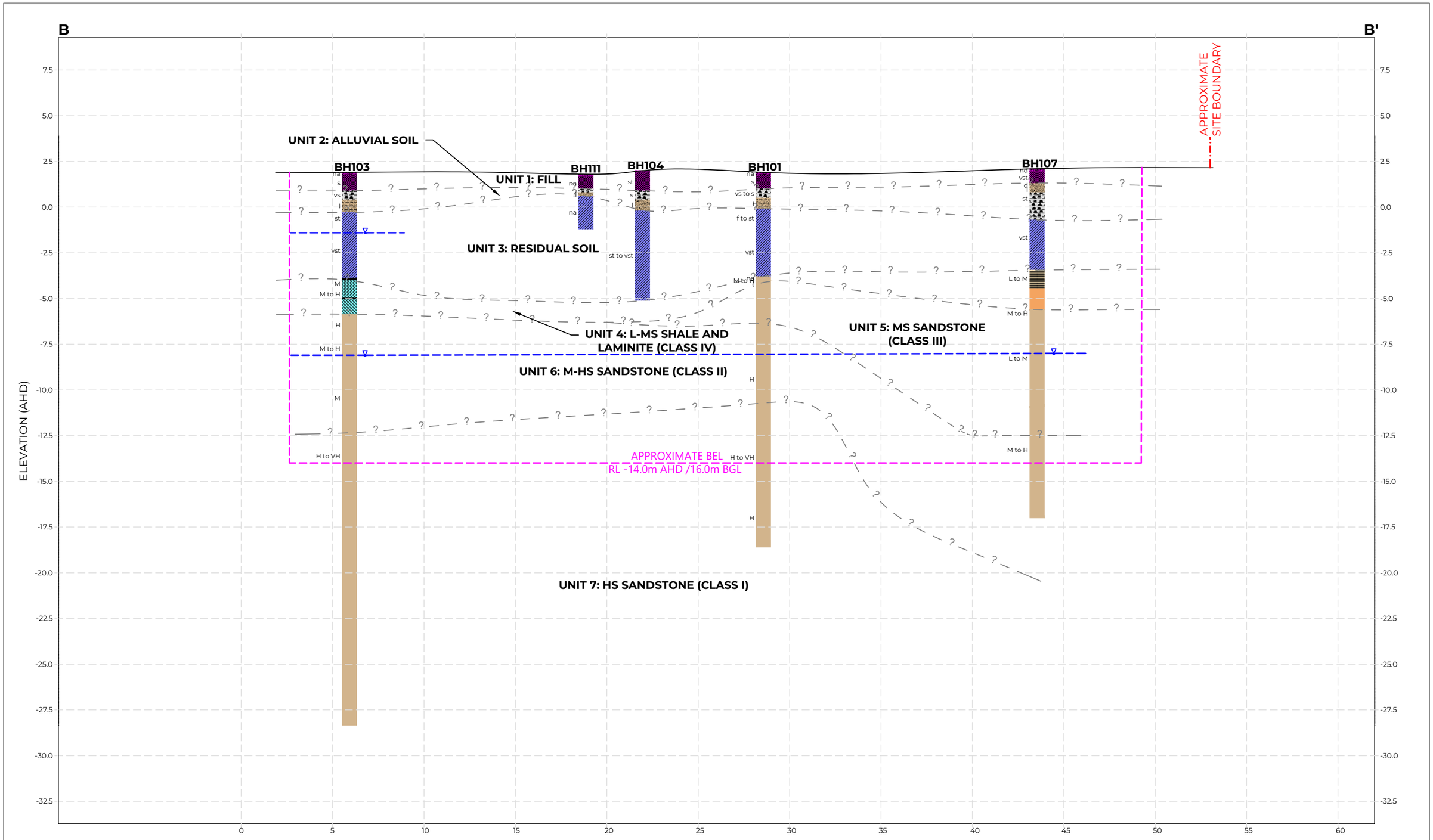
NOTES
1. Subsurface conditions are accurate at the borehole locations only. Variations in subsurface conditions may occur between borehole locations. Interpreted strata boundaries are approximate and should be used as a guide only.
2. Summary logs only and should be read in conjunction with detailed logs.
3. Horizontal and vertical scales are not equal.

PROJECT NAME:
DPG Project 37 Pty Ltd

PROJECT ADDRESS:
79-81 Queens Rd & 2-8 Spencer St, Five Dock

DRAWING TITLE:
INTERPRETED GEOTECHNICAL CROSS SECTION A-A'

PROJECT No: **224583.01**
DRAWING No: **2**
REVISION: **1**



LEGEND

- ASPHALTIC CONCRETE
- CONCRETE
- Laminite
- Silty SAND
- SILTSTONE
- Cl - Medium Plasticity CLAY
- NO CORE
- Clayey PEAT
- SANDSTONE
- Cl-CH - Medium to High Plasticity CLAY
- FILL
- Clayey SAND
- Shale

TESTS / OTHER
- N - Standard penetration test value
- — ? — — - Interpreted geotechnical boundary
- - Water level

ROCK STRENGTH
- VL- Very Low
- L - Low
- M - Medium
- H - High

SOIL CONSISTENCY
- vs - Very Soft
- s - Soft
- f - Firm
- st - Stiff
- vst - Very Stiff
- h - Hard

SOIL DENSITY
- vl - Very Loose
- l - Loose
- md - Medium Dense
- d - Dense
- vd - Very Dense

REV	DESCRIPTION/COMMENT	DATE	DRAWN BY
0	INITIAL ISSUE	12.06.2024	EC
1	UPDATED SITE BOUNDARY	06.06.2025	EC

SCALE: 0 1 2 3 4 6 8 10
1:200 @ A3
Vertical Exaggeration = 1.0

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

CLIENT: **DPG Project 37 Pty Ltd**

NOTES
1. Subsurface conditions are accurate at the borehole locations only. Variations in subsurface conditions may occur between borehole locations. Interpreted strata boundaries are approximate and should be used as a guide only.
2. Summary logs only and should be read in conjunction with detailed logs.
3. Horizontal and vertical scales are not equal.

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

PROJECT ADDRESS: **79-81 Queens Rd & 2-8 Spencer St, Five Dock**

DRAWING TITLE: **INTERPRETED GEOTECHNICAL CROSS SECTION B-B'**

PROJECT No: **224583.01**

DRAWING No: **3**

REVISION: **1**

Appendix C

Field Work Results

BOREHOLE LOG

CLIENT: DPG Project 37 Pty Ltd
PROJECT: Proposed Mixed Use Development
LOCATION: 79-81 Queens Road & 2-8 Spencer Street, Five Dock NS
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
		0.15	CONCRETE 150MM THICK			ND	ND						
seepage 01/05/24			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		
	1	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		1.40	Clayey SAND (SC): red orange brown; fine to medium.		ALV	L	M		ES		1.40 1.50		
	0	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	24,25/100
		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.

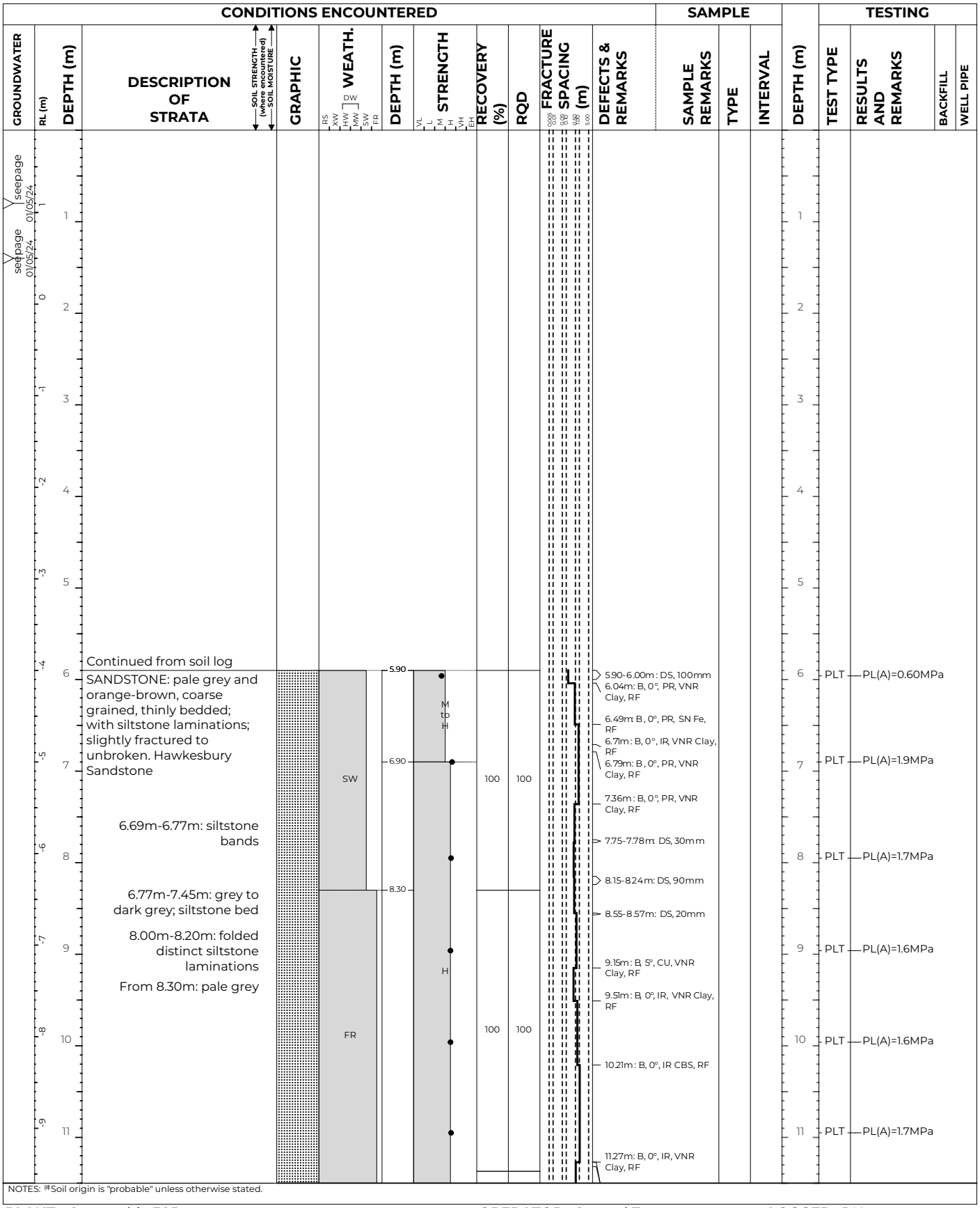
PLANT: Comacchio 305
OPERATOR: Ground Test
LOGGED: JAL
METHOD: AD/T to 2.5m, WB to 5.9m, NMLC to 20.5m
CASING: HW to 2.5m, then HQ to 6m
REMARKS:

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 NS
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 NS
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

CONDITIONS ENCOUNTERED | **SAMPLE** | **TESTING**

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 (m) (0.03, 0.06, 0.20, 0.60, 2.00)	DEFECTS & REMARKS	SAMPLE REMARKS	TYPE	INTERVAL	DEPTH (m)	TEST TYPE	RESULTS AND REMARKS	BACKFILL	WELL PIPE
	-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				12	PLT	PL(A)=2.0MPa		
	-11		11.71m-11.84m: siltstone bands									11.80m: B, 0°, PR, VNR Clay, RF								
		13						H	100	100		12.43m: B, 5°, IR, VNR Clay, RF				13	PLT	PL(A)=1.8MPa		
	-12	14										13.04m: B, 5°, IR, VNR Clay, RF				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					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	From 19.55m: 30% siltstone laminations									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: [a] 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

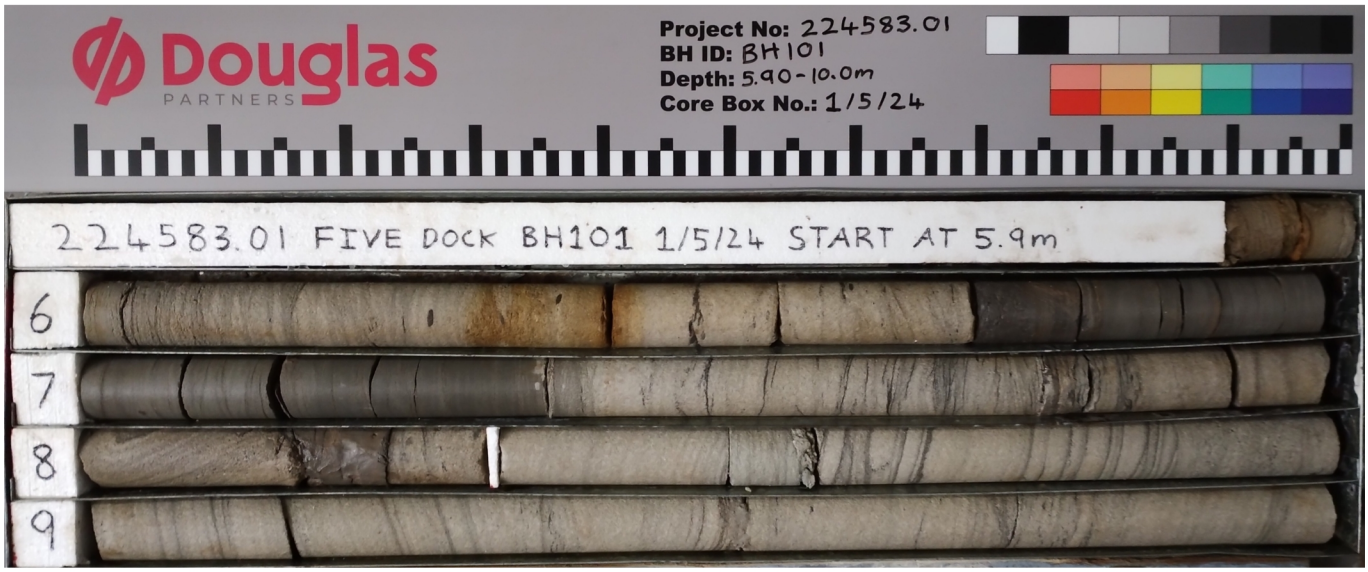
Generated with CORE-GS by Geroc - Split Soil-Rock Log

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 NS
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

Douglas PARTNERS

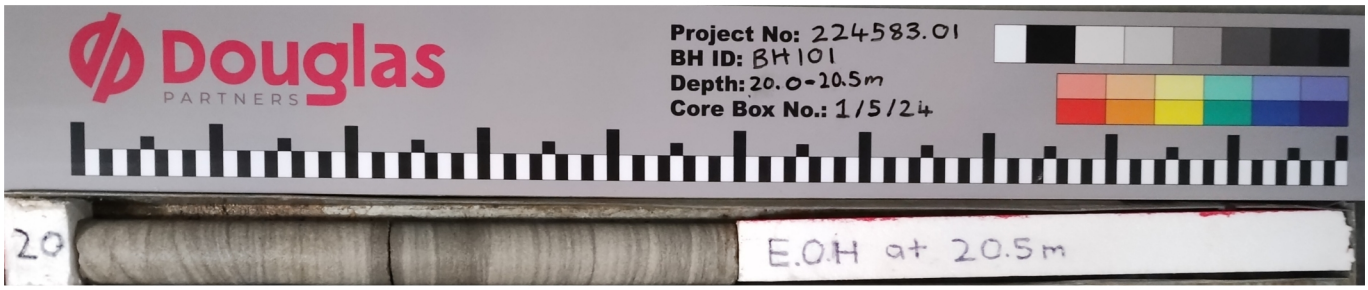
CORE PHOTO LOG

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

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 NS
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

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

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

BOREHOLE LOG

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

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	BACKFILL	WELL PIPE
		0.15	CONCRETE			ND	ND		A/ES	0.10 - 0.20	0.10 0.20				
seepage 29/04/24	1	1.00	FILL / Sandy CLAY: orange-brown; medium plasticity.		FILL	(S)	w>PL	PFAS	A/ES	0.50 - 0.60	0.50 0.60			Bentonite	
seepage	0	1.50	Sandy CLAY: orange-brown mottled red; medium plasticity.		ALV	VS			A/ES	1.00 - 1.10	1.00 1.10	SPT	0,0,0 N=0		
	2	2.20	Clayey SAND: grey-brown; fine to medium.		ALV	L	M		ES	1.50 - 1.60	1.50 1.60				
	-1	3	CLAY (CI): pale grey, orange and brown; medium plasticity.			St						SPT	3,6,7 N=13		
			From 2.80m: pale grey mottled red; with ironstone bands						ES	3.00 - 3.10	3.00 3.10			Gravel	
	-2	4	From 4.00m: yellow, orange-brown mottled red; extremely weathered		RS	VSt	w<PL					SPT	6,12,19 N=31		
	-3	5							ES	4.50 - 4.60	4.50 4.60				
	-4	5.78	Continued as rock log									SPT	12,30/130		
	-5	7												Bentonite	50mm
	-6	8												Gravel	
	-7	9													
	-8	10													
	-9	11												Bentonite	

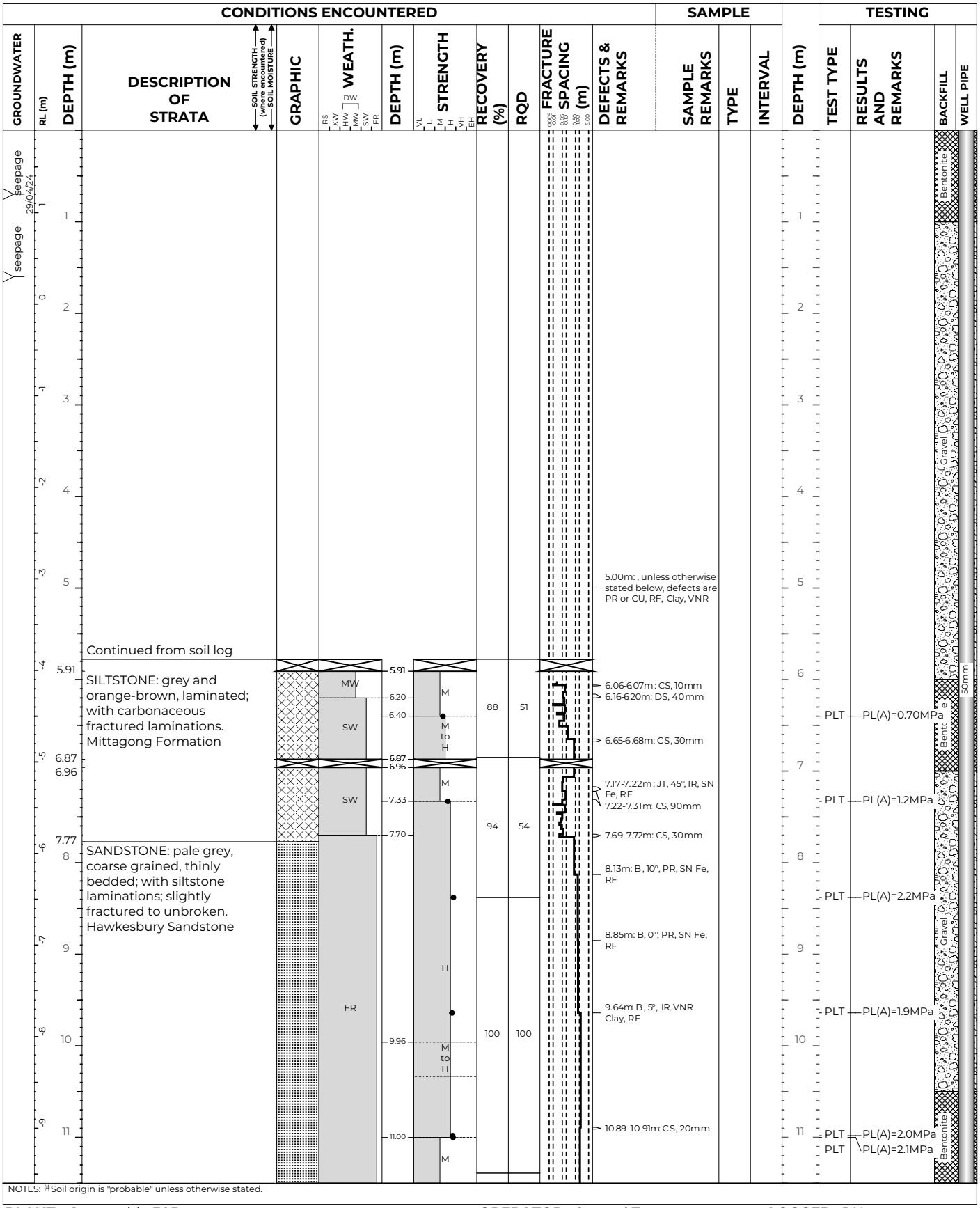
NOTES: (#) Soil origin is "probable" unless otherwise stated. (*) Consistency/Relative density shading is for visual reference only - no correlation between cohesive and granular materials is implied.

PLANT: Comacchio 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

BOREHOLE LOG

CLIENT: DPG Project 37 Pty Ltd
PROJECT: Proposed Mixed Use Development
LOCATION: 79-81 Queens Road & 2-8 Spencer Street, Five Dock NS
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
OPERATOR: Ground Test
LOGGED: JAL
METHOD: AD/T to 2.5m, WB to 5.9m, NMLC to 30.24M
CASING: HW to 4m, then HQ to 5.9m
REMARKS:

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 NS
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

CONDITIONS ENCOUNTERED | **SAMPLE** | **TESTING**

GROUNDWATER	RL (m)	DEPTH (m)	DESCRIPTION OF STRATA (SOIL STRENGTH (where encountered) / SOIL MOISTURE)	GRAPHIC	WEATH. (DW: PS, XW, HW, MW, SW, FR)	DEPTH (m)	STRENGTH (VL, L, M, H, VH, EH)	RECOVERY (%)	RQD	FRACTURE SPACING (m) (0.03, 0.06, 0.20, 0.60, 2.00)	DEFECTS & REMARKS	SAMPLE REMARKS	TYPE	INTERVAL	DEPTH (m)	TEST TYPE	RESULTS AND REMARKS	BACKFILL	WELL PIPE
	-10 to -22	12 to 22	[CONT] SANDSTONE: pale grey, coarse grained, thinly bedded; with siltstone laminations; slightly fractured to unbroken. Hawkesbury Sandstone 11.40m-12.00m: dark grey siltstone bed 12.55m-13.00m: dark grey siltstone bed		FR	13.07 18.00	M H to VH H	100 100 100 100	91 99 100 98		11.98m: B, 0°, PR, VNR Clay, RF 12.04m: B, 10°, IR, SN Fe, RF 12.22m: B, 5°, IR, SN Fe, RF 12.56-12.60m: DS, 40mm 12.64m: B, 0°, IR, VNR Clay, RF 12.73-12.78m: B x5, 0°, PR CBS, RF 13.10-13.82m: B x5, 5-10°, CU, SN Fe, RF 14.38m: JT, 80°, IR, CN, RF 15.15m: B, 10°, PR, SN Fe, RF 16.04-16.05m: B x2, 0°, PR, VNR Clay, RF 17.21m: B, 0°, PR, CN, RF 19.64m: B, 5°, PR, VNR Clay, RF 20.15m: B, 15°, PR, VNR Clay, RF 20.63-20.68m: B x2, 5°, IR, CBS, RF 21.70-21.86m: B x2, 5°, IR, VNR Clay, RF 22.80m: B, 15°, PR, SN Fe, RF				12 to 22	PLT	PL(A)=0.80MPa PL(A)=0.70MPa PL(A)=2.5MPa PL(A)=1.6MPa PL(A)=3.1MPa PL(A)=2.2MPa PL(A)=3.3MPa PL(A)=2.7MPa PL(A)=1.7MPa PL(A)=2.7MPa PL(A)=2.1MPa	Gravel	50mm

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

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

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 NS
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	GRAPHIC	WEATH.	DEPTH (m)	STRENGTH	RECOVERY (%)	RQD	FRACTURE SPACING (m)	DEFECTS & REMARKS	SAMPLE REMARKS	SAMPLE TYPE	SAMPLE 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	Gravel	
	-23	25						100	100		24.78m: B, 0°, PR, SN Fe, RF				25	PLT	PL(A)=2.1MPa		
	-24	26													26	PLT	PL(A)=2.4MPa		
	-25	27			FR		H								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: [a] Soil origin is "probable" unless otherwise stated.

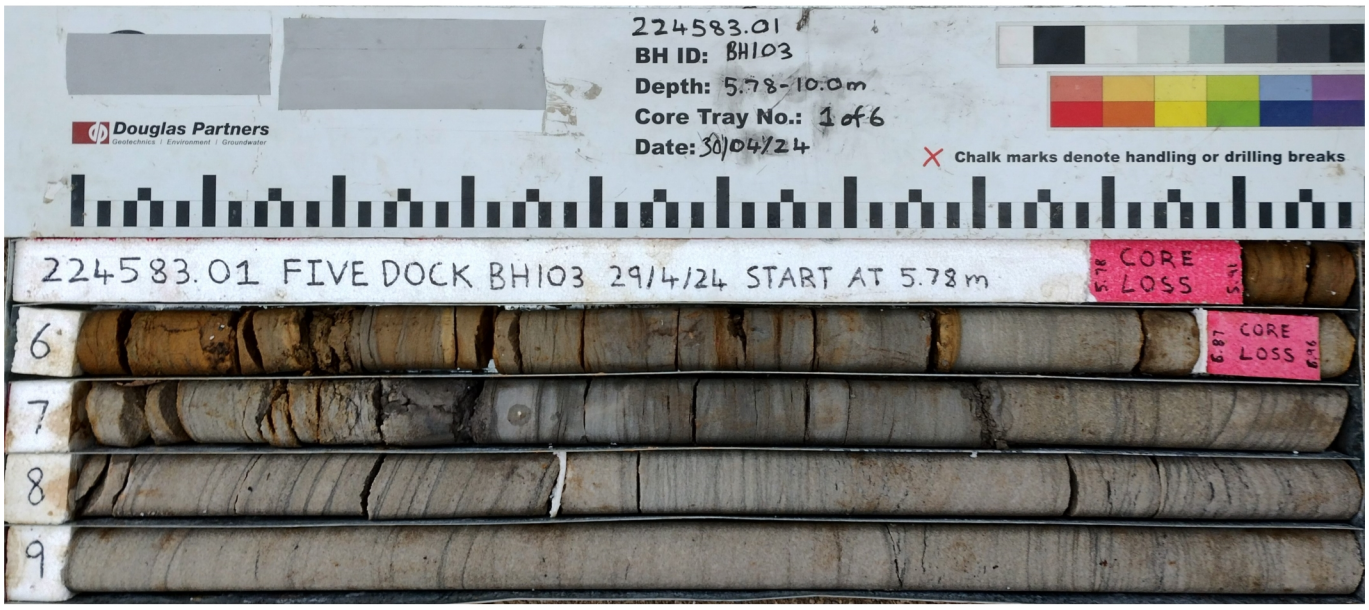
PLANT: Comacchio 305
METHOD: AD/T to 2.5m, WB to 5.9m, NMLC to 30.24M
REMARKS:
OPERATOR: Ground Test
LOGGED: JAL
CASING: HW to 4m, then HQ to 5.9m

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 NS
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 NS
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

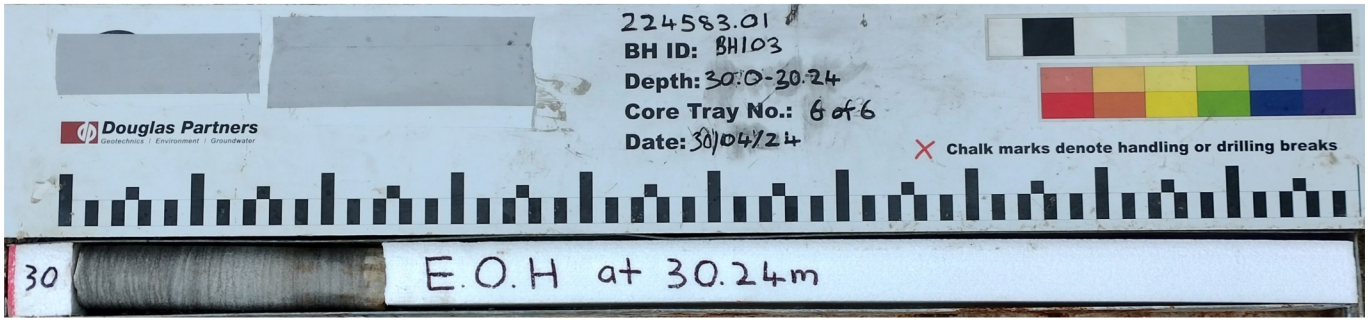
15.00-20.00 m depth

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 NS
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

BOREHOLE LOG

CLIENT: DPG Project 37 Pty Ltd
PROJECT: Proposed Mixed Use Development
LOCATION: 79-81 Queens Road & 2-8 Spencer Street, Five Dock NS
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								
Seepage 29/04/24	1		FILL / Sandy CLAY: orange-brown; medium plasticity.		FILL	(S)	w>PL				1			Bentonite	50mm
		1.00	Sandy CLAY (CI): orange-brown mottled red; medium plasticity; fine to medium sand.		ALV	VS									
	0	1.50	Clayey SAND (SC): grey-brown; fine to medium.		ALV	L	M				2				
		2.20	CLAY (CI): pale grey, orange and brown; medium plasticity.			St									
▼ 31/05/24 01:00	-1	3	From 2.80m: pale grey mottled red; with ironstone bands								3			Gravel	
	-2	4	From 4.00m: yellow, orange-brown mottled red; extremely weathered		RS	VSt	w<PL				4				50mm
	-3	5									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

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 NS
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	RESULTS AND REMARKS
	2.0	0.15	CONCRETE.			ND	ND						
Seepage 29/04/24			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	DCP9/150	23
									A/ES	0.50–0.60	0.30		
	1	1							A/ES	0.90–1.00	0.50		
Seepage 29/04/24		1.10	Silty CLAY (OH): orange, grey-brown; medium to high plasticity.		ALV	F	w>PL				0.60		
		1.60	Silty SAND (SC): grey brown; fine to medium.		ALV	L	M		A/ES	1.50–1.60	0.90		
	0	2									1.00		
		2.20	CLAY (CI-CH): orange, red, brown; medium to high plasticity.								1.50		
	-1	3							A/ES	2.90–3.00	1.60		
	-2	4	From 4.50m: orange yellow brown		RS	St to VSt	w>PL		A/ES	4.40–4.50	2.00		
	-3	5									2.50		
	-4	6	From 6.80m: extremely weathered sandstone						A/ES	5.90–6.00	3.00		
	-5	7									3.50		
									A/ES	7.00–7.10	4.00		
	-6	8	Borehole discontinued at 7.10m depth. TC bit refusal on inferred medium strength sandstone.								4.50		
	-7	9									5.00		
	-8	10									5.50		
	-9	11									6.00		
											6.50		
											7.00		
											7.50		

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

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 NS
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)
		0.15	CONCRETE			ND	ND				
Seepage 14/05/24			FILL / Sandy CLAY: grey, orange-brown; medium plasticity. From 0.60m: saturated		FILL	PC			A/ES		0.20 0.30
									A/ES		0.50 0.60
									* A/ES		0.90 1.00
		1.00	Sandy CLAY (CI): grey, orange-brown; medium plasticity.		ALV	F	w>LL		A/ES		1.50 1.60
		2.10	CLAY (CI-CH): grey mottled, orange-red; medium to high plasticity.		RS	VSt to St	w<PL	PFAS	A/ES		2.90 3.00
									A/ES		4.40 4.50
			From 5.50m: extremely weathered sandstone						A/ES		5.50 5.60
		5.75	Continued as rock log								
MW3 31/05/24											

TESTING AND REMARKS: TEST TYPE — DCP9/150; RESULTS AND REMARKS — 5, 10, 15

BACKFILL: Backfill; Bentonite
WELL PIPE: 50mm

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

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 NS
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

CONDITIONS ENCOUNTERED | **SAMPLE** | **TESTING**

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 (m)	DEFECTS & REMARKS	SAMPLE REMARKS	TYPE	INTERVAL	DEPTH (m)	TEST TYPE	RESULTS AND REMARKS	BACKFILL	WELL PIPE
Seepage 14/05/24	1	1														1				
	0	2														2				
	-1	3														3				
	-2	4														4				
	-3	5														5				
	-4	6	Continued from soil log			5.75										6	PLT	PL(A)=0.60MPa	Backfill	50mm
			LAMINITE: 70% dark grey siltstone and 30% grey fine grained sandstone; laminated, slightly fractured. Mittagong Formation			5.95	M	100	100		6.69m: JT x2, 70°, IR, CN, RF								
	-5	7					M to H	100	98		7.47m: JT x2, 85°, IR, CN, RF 7.50m: B, 0°, PR, CN, RF					7	PLT	PL(A)=1.2MPa		
		7.41	SANDSTONE: pale grey, fine to coarse grained; with siltstone laminations, slightly fractured to unbroken.. Hawkesbury Sandstone																	
	-6	8	From 7.41m-7.90m: fine grained													8	PLT	PL(A)=0.70MPa		
	-7	9			FR	9.00		100	94		8.72m: B, 5°, IR, CT Clay 5mm, RF 8.73m: B, 5°, IR, CT Clay 3mm, RF 8.74m: DS x2, 10mm 8.76m: DS, 20mm 8.82m: B, 5°, IR, CT Clay, RF					9	PLT	PL(A)=1.6MPa		
MW3 31/05/24	-8	10					H				10.28m: B x2, 5°, CU, SN Fe, RF					10	PLT	PL(A)=2.0MPa		
	-9	11	From 11.24m-12.75m: fine grained					100	100		10.86m: B, 5°, CU, VNR Clay, RF 11.04m: B, 5°, IR, CT Clay 2mm, RF					11	PLT	PL(A)=1.8MPa	Bentonite	

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

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

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

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 NS

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 (m)	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, 10 mm 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		
	-14	16													16	PLT	PL(A)=2.2MPa		
	-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																	

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

NOTES: [H] 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

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 NS

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 NS
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 NS
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

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

TESTING AND REMARKS

TEST TYPE	RESULTS AND REMARKS
DCP9/150	5 10 15

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.

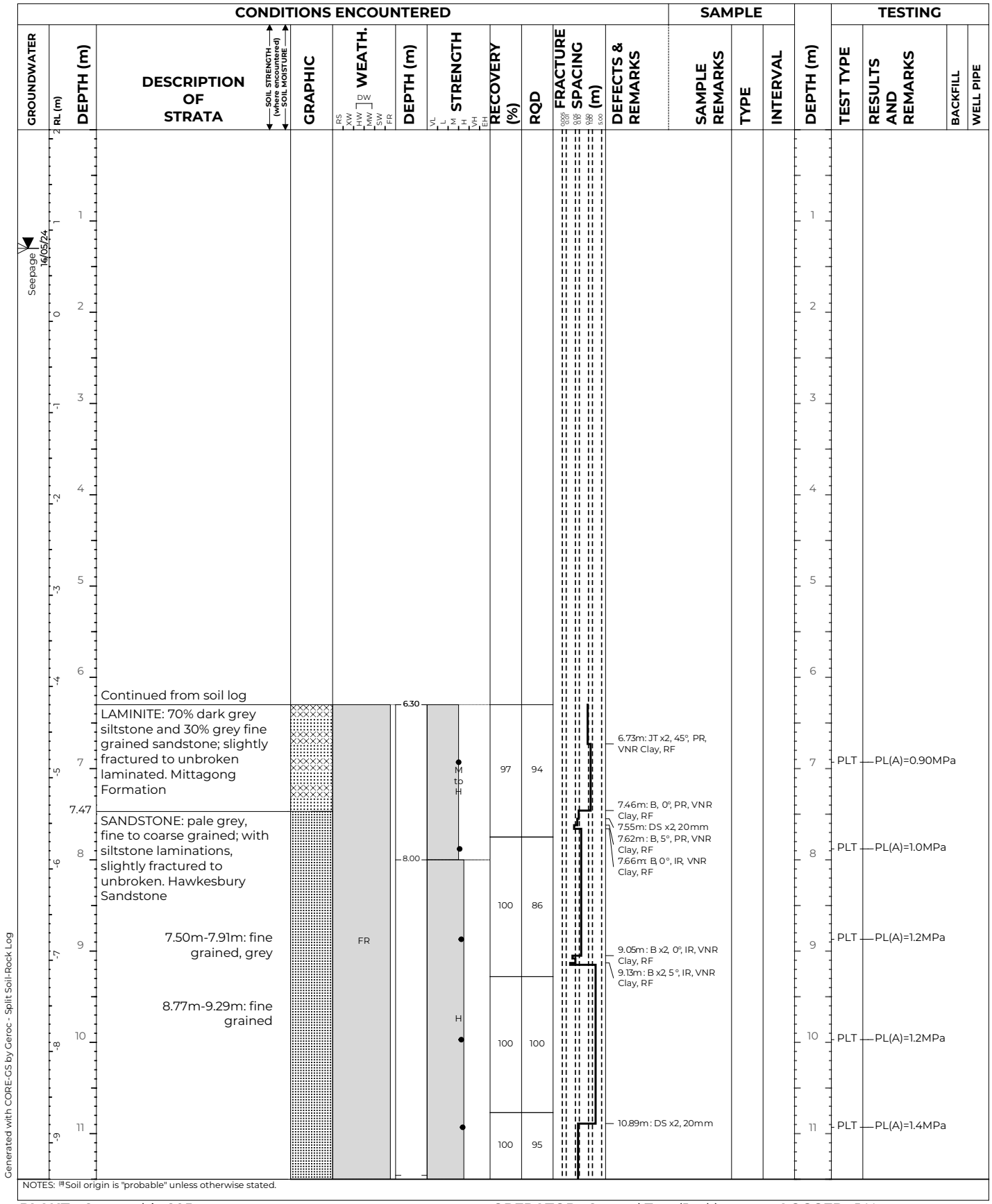
PLANT: Comacchio 205
OPERATOR: Ground Test (Jack)
LOGGED: JAL
METHOD: Diatube to 0.15m, AD/T to 2.5m, WB to 6.3m, NMLC to 19.0m
CASING: HW to 2.5m, then HQ to 6.3m
REMARKS: *Field replicate BD2/20240516 taken at 0.9-1.0m

Refer to explanatory notes for symbol and abbreviation definitions

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 NS
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.

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

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 NS
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	GRAPHIC	WEATH.	DEPTH (m)	STRENGTH	RECOVERY (%)	RQD	FRACTURE SPACING (m)	DEFECTS & REMARKS	SAMPLE REMARKS	TYPE	INTERVAL	DEPTH (m)	TEST TYPE	RESULTS AND REMARKS	BACKFILL	WELL PIPE
		12	[CONT] SANDSTONE: pale grey, fine to coarse grained; with siltstone laminations, slightly fractured to unbroken. Hawkesbury Sandstone		FR	11.50	M	100	95		11.97m: B, 0°, PR, SN Fe, RF				12	PLT	PL(A)=0.80MPa		
		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		
		14													14	PLT	PL(A)=1.7MPa		
		15				14.50	M	100	100		14.50m: B, 10°, CU, SN Fe, RF				15	PLT	PL(A)=0.50MPa		
		16				15.50	H	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		
		17													17	PLT	PL(A)=1.7MPa		
		18					H	100	100		18.16m: B, 10°, CU, VNR Clay, RF				18	PLT	PL(A)=1.6MPa		
		19						100	100		18.95m: B, 0°, PR, VNR Clay, RF					PLT	PL(A)=1.2MPa		
			Borehole discontinued at 19.00m depth.																
		20																	
		21																	
		22																	

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

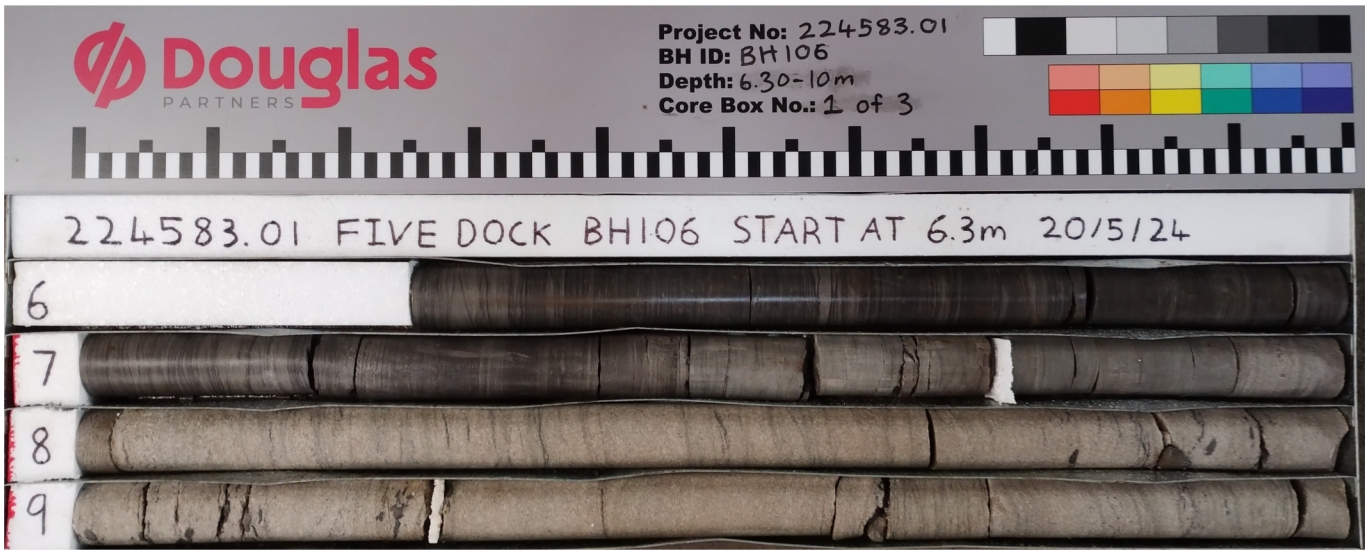
PLANT: Comacchio 205
OPERATOR: Ground Test (Jack)
LOGGED: JAL
METHOD: Diatube to 0.15m, AD/T to 2.5m, WB to 6.3m, NMLC to 19.0m
CASING: HW to 2.5m, then HQ to 6.3m
REMARKS: *Field replicate BD2/20240516 taken at 0.9-1.0m

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 NS
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 NS
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 NS
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

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								
	1	0.80	FILL / Sandy CLAY, trace gravel: grey-brown; medium plasticity; fine to coarse sand; fine to coarse gravel.		FILL	VSt	w<PL	PFAS	ES		0.50 0.60			Bentonite Gravel	
Seepage 14/05/24		1.30	Silty SAND (SC): orange-brown, grey; fine to medium.		ALV	D L	W		ES		0.90 1.00				
Seepage 31/05/24 01:00 31/05/24 01:00 14/05/24	0	2.80	Silty CLAY (OH): orange-brown; medium to high plasticity.		ALV	(St)	w>PL		ES		1.50 1.60			Bentonite	
	-1		CLAY (CI-CH): orange, red-brown, mottled pale grey; medium to high plasticity. From 3.50m: orange, red-yellow, pale grey with ironstone		RS	(VSt)	w<PL		ES		2.90 3.00				
		5.55	Continued as rock log						ES		4.40 4.50			Gravel Bentonite	50mm
31/05/24	-8														

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)

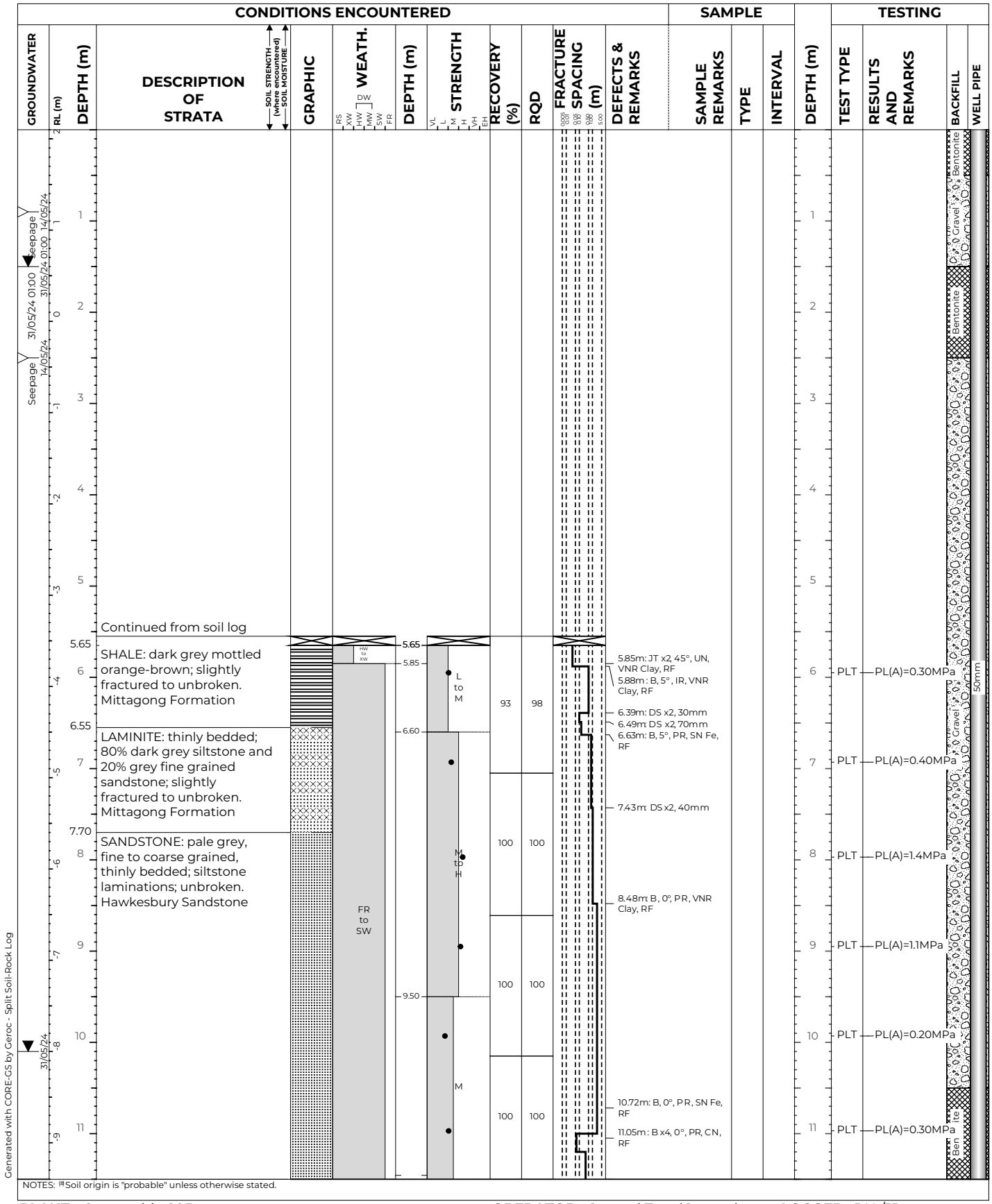
LOGGED: JAL/JJ
CASING: HW to 2.5m, then HQ to 5.5m

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 NS
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



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

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

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 NS
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 | **SAMPLE** | **TESTING**

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 (m) (0.03, 0.06, 0.20, 0.60, 2.00)	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, thinly bedded; siltstone laminations, unbroken. Hawkesbury Sandstone 12.05m: 1.22m siltstone band 12.50m-13.00m: siltstone inclusions		FR to SW	11.50		100	100		11.50m: DB 11.63m: DB 11.94m: B, 5°, PR, CN 12.15m: DB				12	PLT	PL(A)=1.4MPa		
	-11	13.00	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		96	87		12.51m: B, 0°, UN, CN, RF 12.62m: B x2, 5°, UN, CN, RF 12.92m: B, 15°, PR, CN, RF 12.95m: B, 15°, PR, INF, RF, sand infill 13.00m: B, 15°, PR, CN, RF				13	PLT	PL(A)=1.1MPa		
	-12	14					H	100	100		13.60m: B, 5°, UN, CN, RF 13.80m: B, 10°, UN, CN, RF 14.24m: B, 5°, UN, CN, RF				14	PLT	PL(A)=0.90MPa		
	-13	15						100	100		14.65m: DB 14.70m: HB 14.74m: HB 14.84m: HB 15.25m: HB				15	PLT	PL(A)=1.6MPa	Gravel 50mm	
	-14	16			FR			100	100		16.20m: DB				16	PLT	PL(A)=1.4MPa		
	-15	17						100	100		17.00m: HB				17	PLT	PL(A)=1.4MPa		
	-16	18				17.50	M to H	100	100		17.70m: HB 17.80m: DB 18.00m: HB				18	PLT	PL(A)=0.40MPa		
	-17	19	Borehole discontinued at 19.10m depth. Target depth reached.			18.50	H				19.00m: HB 19.10m: DB				19	PLT	PL(A)=1.0MPa		
	-18	20																		
	-19	21																		
	-20	22																		

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

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 NS
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

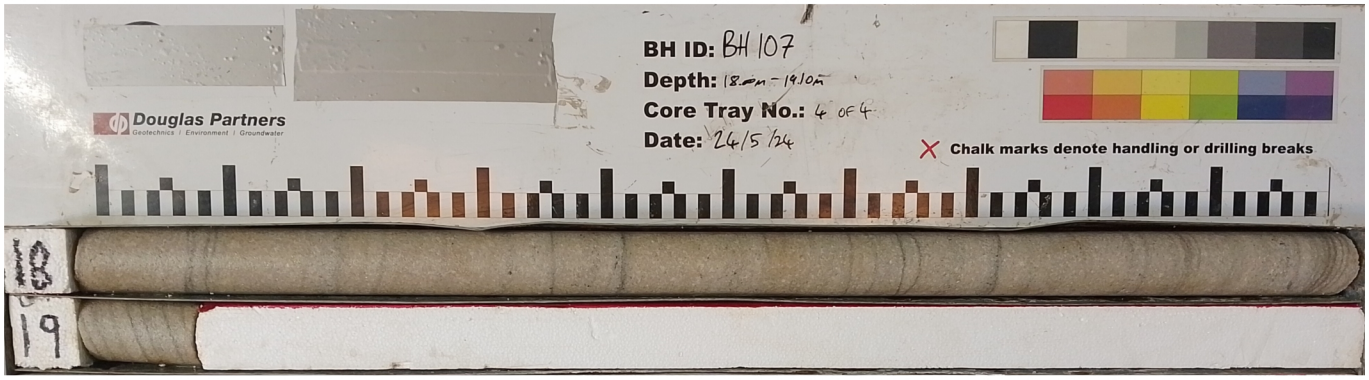
5.55-10.00 m depth

10.00-14.00 m depth

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 NS
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 NS
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

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	W				1			Gravel	50mm
						L									
MW5 31/05/24 01:00		1.30	Peaty CLAY (OH): orange-brown; medium to high plasticity.		ALV	(St)	w>PL								
MW5 31/05/24 01:00	0		Borehole discontinued at 1.50m depth. Target depth reached.												
	-1	2													
	-2	3													
		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

BOREHOLE LOG

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

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						W						
	1.00									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.										

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

BOREHOLE LOG

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

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		A/ES		0.10		
		FILL / Sandy CLAY: grey, orange and brown; medium to high plasticity; suspected perched water in fill.		FILL	ND	w>LL				0.20		
		0.40m-0.50m: layer of gravel (ash)						A/ES		0.40		
	1									0.50		
	1.10	Sandy CLAY (CI): grey, orange-brown mottled red; medium plasticity.		ALV				A/ES		0.90		
										1.00		
							PFAS	A/ES		1.40		
		Borehole discontinued at 1.50m depth. Target depth reached.								1.50		
	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 NS
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
seepage 29/04/24	1	0.15	CONCRETE						A/ES		0.10		
			FILL / Sandy CLAY: pale grey and orange-yellow; medium plasticity; fine to medium sand.		FILL	ND	ND		A/ES		0.20		
		0.80							A/ES		0.50		
			Peaty CLAY (CI): dark grey and pale grey; medium plasticity.		ALV		w>PL				0.60		
		1.00	Clayey SAND: red, orange and brown; fine to medium.		ALV	(L)	M		A/ES		1.00		
	0	1.20	CLAY (CI): brown-grey; medium plasticity.		RS		w>PL				1.10		
		1.50	CLAY (CI-CH): pale grey and brown; medium to high plasticity.						A/ES		1.50		
					RS	ND	w<PL				1.60		
	-1	2							A/ES		2.00		
											2.10		
								PFAS	A/ES		2.50		
		3	Borehole discontinued at 3.00m depth. Target depth reached.								2.60		
	-2	4							A/ES		2.90		
	-3										3.00		

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 NS

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	0.10	CONCRETE										
		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
										0.40	PID	<1ppm
	0.90	FILL / Sandy CLAY: grey; fine to medium sand; (possibly reworked natural).		FILL				A		1.00		
										1.10	PID	<1ppm
		Borehole discontinued at 1.50m 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: Hand Tools
METHOD: HA to 1.5m
REMARKS:

OPERATOR: Ground Test

LOGGED: JAL
CASING: Uncased

Refer to explanatory notes for symbol and abbreviation definitions

Appendix D

Permeability Test Results

Douglas Partners Pty Ltd
ABN 75 053 980 117
www.douglaspartners.com.au

Permeability Testing - Rising or Falling Head Test Report

Client:	DPG Project 37 Pty Ltd	Project No:	224583.01
Project:	Mixed Use Development	Test date:	7-Jun-24
Location:	79-85 Queens Road, Five Dock, NSW	Tested by:	AG

Test Location

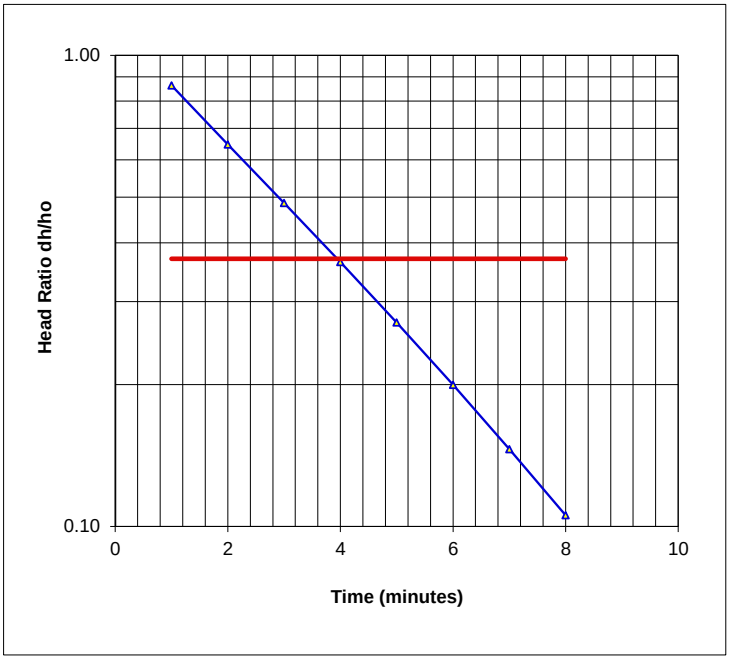
Description:	Standpipe in borehole	**Test No.**	BH103	
Material type:	Sandstone	Easting:	325956	m
Slotted Pipe From 12.0-30.0, Gravel 11.5-30.0		Northing	6250755.5	m
		Surface Level:	1.9	m AHD

Details of Well Installation

Well casing diameter (2r)	50	mm	Depth to water before test	10.21	m
Well screen diameter (2R)	76	mm	Depth to water at start of test	1.5	m
Length of well screen (Le)	18	m			

Test Results

Time (min)	Depth (m)	Change in Head: dH (m)	dH/Ho
0	1.50	8.71	1.000
1	2.69	7.52	0.863
2	4.58	5.63	0.646
3	5.98	4.23	0.486
4	7.04	3.17	0.364
5	7.85	2.36	0.271
6	8.47	1.74	0.200
7	8.94	1.27	0.146
8	9.29	0.92	0.106



To = 4 mins
240 secs

Theory: Falling Head Permeability calculated using equation by Hvorslev

$k = [r^2 \ln(Le/R)]/2Le\ To$

where r = radius of casing
R = radius of well screen
Le = length of well screen
To = time taken to rise or fall to 37% of initial change

Hydraulic Conductivity	**k =**	**4.5E-07**	m/sec
	=	**0.160**	cm/hour

Douglas Partners Pty Ltd
ABN 75 053 980 117
www.douglaspartners.com.au

Permeability Testing - Rising or Falling Head Test Report

Client:	DPG Project 37 Pty Ltd	Project No:	224583.01
Project:	Mixed Use Development	Test date:	7-Jun-24
Location:	79-85 Queens Road, Five Dock, NSW	Tested by:	AG

Test Location

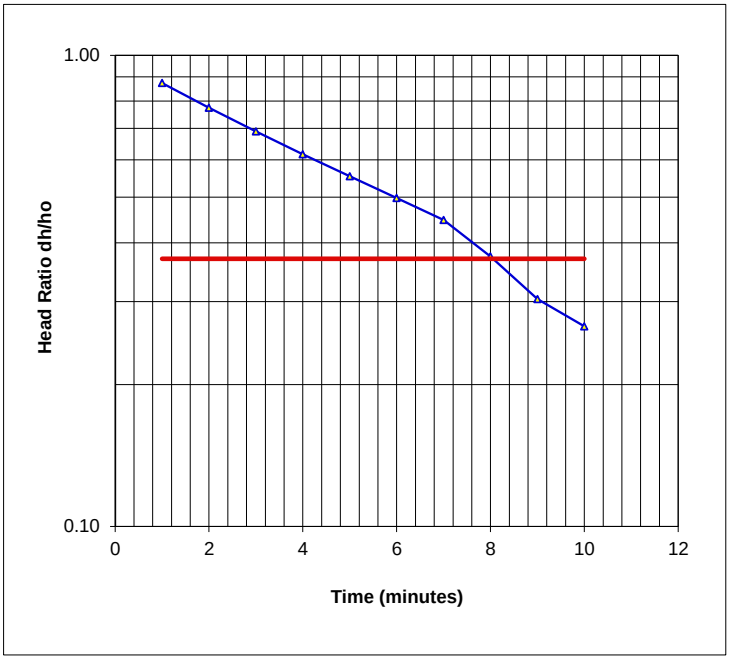
Description:	Standpipe in borehole	**Test No.**	BH105	
Material type:	Sandstone	Easting:	325961.7	m
Slotted Pipe From 12.0-19.0, Gravel 11.5-19.0		Northing	6250700.0	m
		Surface Level:	2	m AHD

Details of Well Installation

Well casing diameter (2r)	50	mm	Depth to water before test	10.16	m
Well screen diameter (2R)	76	mm	Depth to water at start of test	1.4	m
Length of well screen (Le)	7	m			

Test Results

Time (min)	Depth (m)	Change in Head: dH (m)	dH/Ho
0	1.40	8.76	1.000
1	2.51	7.65	0.873
2	3.38	6.78	0.774
3	4.12	6.04	0.689
4	4.76	5.40	0.616
5	5.31	4.85	0.554
6	5.80	4.36	0.498
7	6.24	3.92	0.447
8	6.88	3.28	0.374
9	7.50	2.66	0.304
10	7.83	2.33	0.266



To = 8 mins
480 secs

Theory: Falling Head Permeability calculated using equation by Hvorslev

$k = [r^2 \ln(Le/R)]/2Le\ To$

where r = radius of casing
R = radius of well screen
Le = length of well screen
To = time taken to rise or fall to 37% of initial change

Hydraulic Conductivity	**k =**	**4.9E-07**	m/sec
	=	**0.175**	cm/hour

Douglas Partners Pty Ltd
ABN 75 053 980 117
www.douglaspartners.com.au

Permeability Testing - Rising or Falling Head Test Report

Client:	DPG Project 37 Pty Ltd	Project No:	224583.01
Project:	Mixed Use Development	Test date:	7-Jun-24
Location:	79-85 Queens Road, Five Dock, NSW	Tested by:	AG

Test Location

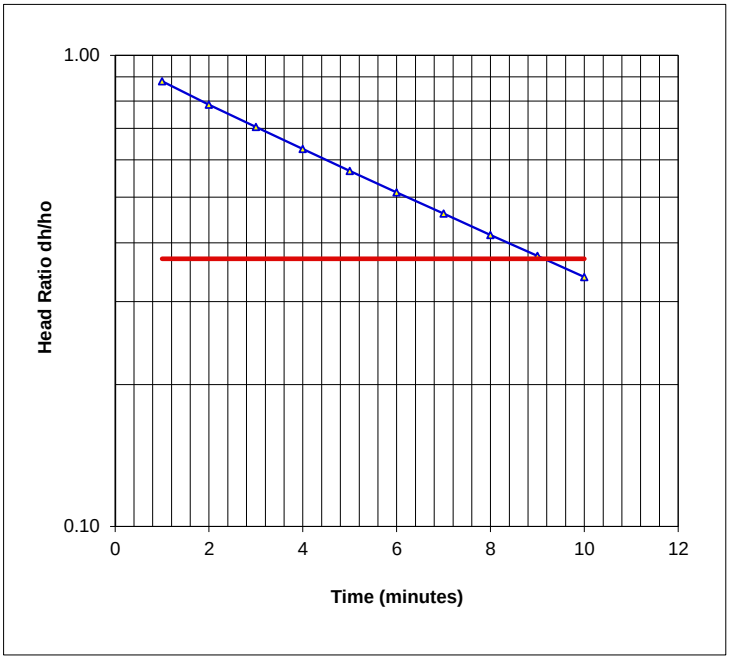
Description:	Standpipe in borehole	**Test No.**	BH107	
Material type:	Sandstone	Easting:	325989.6	m
Slotted Pipe From 12.0-19.0, Gravel 11.5-19.0		Northing	6250729.5	m
		Surface Level:	2.1	m AHD

Details of Well Installation

Well casing diameter (2r)	50	mm	Depth to water before test	10.1	m
Well screen diameter (2R)	76	mm	Depth to water at start of test	0.35	m
Length of well screen (Le)	7	m			

Test Results

Time (min)	Depth (m)	Change in Head: dH (m)	dH/Ho
0	0.35	9.75	1.000
1	1.51	8.59	0.881
2	2.44	7.66	0.786
3	3.23	6.87	0.705
4	3.93	6.17	0.633
5	4.56	5.54	0.568
6	5.11	4.99	0.512
7	5.60	4.50	0.462
8	6.05	4.05	0.415
9	6.44	3.66	0.375
10	6.80	3.30	0.338



To = 9 mins
540 secs

Theory: Falling Head Permeability calculated using equation by Hvorslev

$k = [r^2 \ln(Le/R)]/2Le\ To$

where r = radius of casing
R = radius of well screen
Le = length of well screen
To = time taken to rise or fall to 37% of initial change

Hydraulic Conductivity	**k =**	**4.3E-07**	m/sec
	=	**0.155**	cm/hour

Douglas Partners Pty Ltd
ABN 75 053 980 117
www.douglaspartners.com.au

Permeability Testing - Rising or Falling Head Test Report

Client:	DPG Project 37 Pty Ltd	Project No:	224583.01
Project:	Mixed Use Development	Test date:	4-Jul-24
Location:	79-85 Queens Road, Five Dock, NSW	Tested by:	AG

Test Location

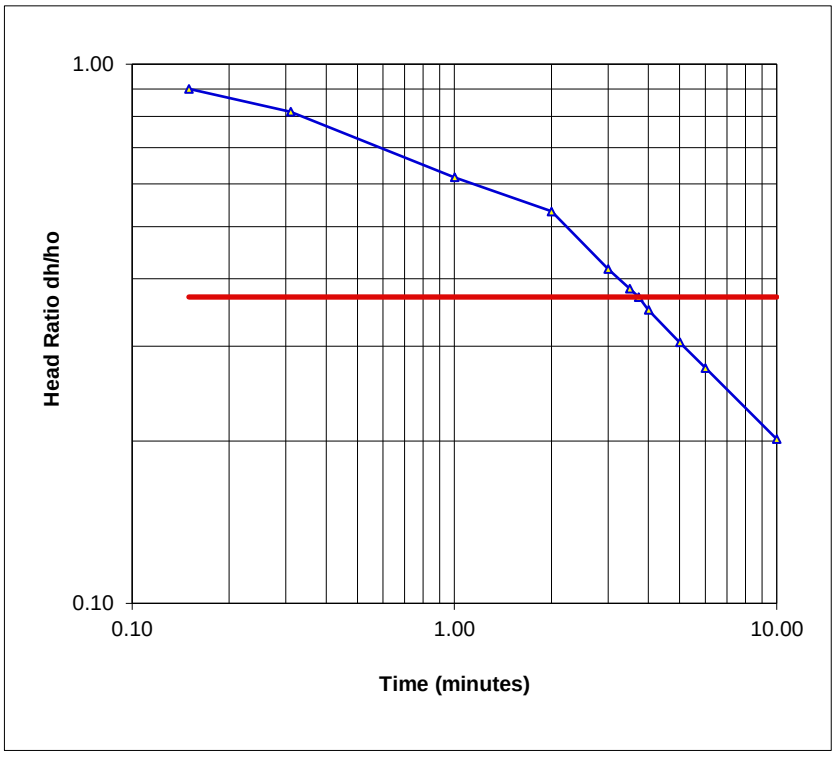
Description:	Standpipe in borehole	**Test No.**	BH103S	
Material type:	Clay, Clayey Sand	Easting:	325956	m
Slotted Pipe From 1.5-6.0, Gravel 1.0-6.0		Northing	6250755.5	m
		Surface Level:	1.9	m AHD

Details of Well Installation

Well casing diameter (2r)	50	mm	Depth to water before test	0.74	m
Well screen diameter (2R)	76	mm	Depth to water at start of test	0.14	m
Length of well screen (Le)	5	m			

Test Results

Time (min)	Depth (m)	Change in Head: dH (m)	dH/Ho
0	0.14	0.60	1.000
0.15	0.20	0.54	0.900
0.31	0.25	0.49	0.817
1.00	0.37	0.37	0.617
2.00	0.42	0.32	0.533
3.00	0.49	0.25	0.417
3.50	0.51	0.23	0.383
3.73	0.518	0.22	0.370
4.00	0.53	0.21	0.350
5.00	0.56	0.18	0.305
6.00	0.58	0.16	0.273
10.00	0.62	0.12	0.202



To = 3.73 mins
223.8 secs

Theory: Falling Head Permeability calculated using equation by Hvorslev

$k = [r^2 \ln(Le/R)]/2Le\ To$

where r = radius of casing
R = radius of well screen
Le = length of well screen
To = time taken to rise or fall to 37% of initial change

Hydraulic Conductivity	**k =**	**1.4E-06**	m/sec
	=	**0.491**	cm/hour

Douglas Partners Pty Ltd
ABN 75 053 980 117
www.douglaspartners.com.au

Permeability Testing - Rising or Falling Head Test Report

Client:	DPG Project 37 Pty Ltd	Project No:	224583.01
Project:	Mixed Use Development	Test date:	7-Jun-24
Location:	79-85 Queens Road, Five Dock, NSW	Tested by:	AG

Test Location

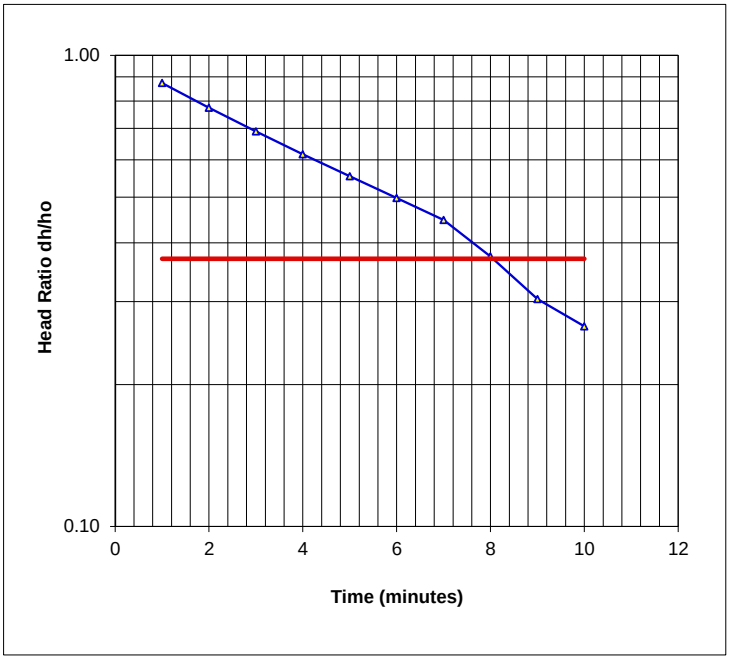
Description:	Standpipe in borehole	**Test No.**	BH105	
Material type:	Sandstone	Easting:	325961.7	m
Slotted Pipe From 12.0-19.0, Gravel 11.5-19.0		Northing	6250700.0	m
		Surface Level:	2	m AHD

Details of Well Installation

Well casing diameter (2r)	50	mm	Depth to water before test	10.16	m
Well screen diameter (2R)	76	mm	Depth to water at start of test	1.4	m
Length of well screen (Le)	7	m			

Test Results

Time (min)	Depth (m)	Change in Head: dH (m)	dH/Ho
0	1.40	8.76	1.000
1	2.51	7.65	0.873
2	3.38	6.78	0.774
3	4.12	6.04	0.689
4	4.76	5.40	0.616
5	5.31	4.85	0.554
6	5.80	4.36	0.498
7	6.24	3.92	0.447
8	6.88	3.28	0.374
9	7.50	2.66	0.304
10	7.83	2.33	0.266



To = 8 mins
480 secs

Theory: Falling Head Permeability calculated using equation by Hvorslev

$k = [r^2 \ln(Le/R)]/2Le\ To$

where r = radius of casing
R = radius of well screen
Le = length of well screen
To = time taken to rise or fall to 37% of initial change

Hydraulic Conductivity	**k =**	**4.9E-07**	m/sec
	=	**0.175**	cm/hour

Douglas Partners Pty Ltd
ABN 75 053 980 117
www.douglaspartners.com.au

Permeability Testing - Rising or Falling Head Test Report

Client:	DPG Project 37 Pty Ltd	Project No:	224583.01
Project:	Mixed Use Development	Test date:	7-Jun-24
Location:	79-85 Queens Road, Five Dock, NSW	Tested by:	AG

Test Location

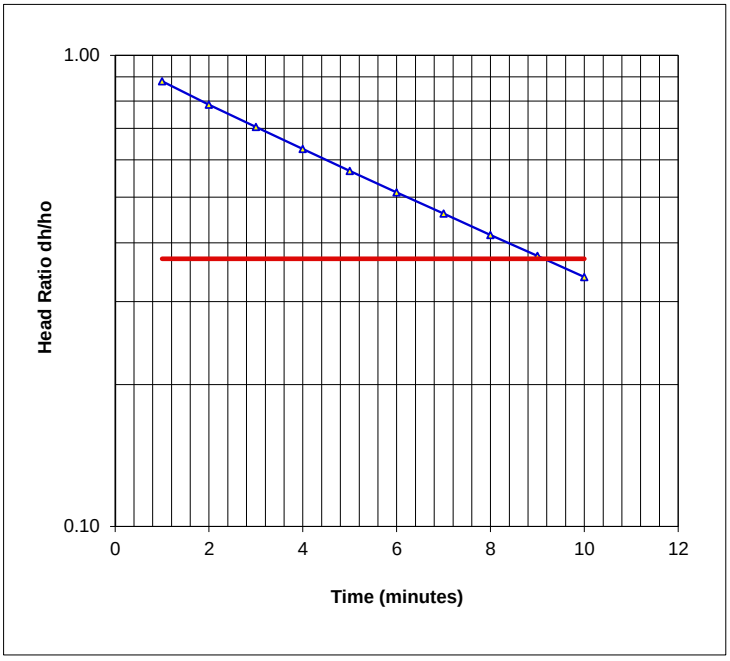
Description:	Standpipe in borehole	**Test No.**	BH107	
Material type:	Sandstone	Easting:	325989.6	m
Slotted Pipe From 12.0-19.0, Gravel 11.5-19.0		Northing	6250729.5	m
		Surface Level:	2.1	m AHD

Details of Well Installation

Well casing diameter (2r)	50	mm	Depth to water before test	10.1	m
Well screen diameter (2R)	76	mm	Depth to water at start of test	0.35	m
Length of well screen (Le)	7	m			

Test Results

Time (min)	Depth (m)	Change in Head: dH (m)	dH/Ho
0	0.35	9.75	1.000
1	1.51	8.59	0.881
2	2.44	7.66	0.786
3	3.23	6.87	0.705
4	3.93	6.17	0.633
5	4.56	5.54	0.568
6	5.11	4.99	0.512
7	5.60	4.50	0.462
8	6.05	4.05	0.415
9	6.44	3.66	0.375
10	6.80	3.30	0.338



To = 9 mins
540 secs

Theory: Falling Head Permeability calculated using equation by Hvorslev

$k = [r^2 \ln(Le/R)]/2Le\ To$

where r = radius of casing
R = radius of well screen
Le = length of well screen
To = time taken to rise or fall to 37% of initial change

Hydraulic Conductivity	**k =**	**4.3E-07**	m/sec
	=	**0.155**	cm/hour

Appendix E

Laboratory Results

Material Test Report

Douglas Partners Pty Ltd
Sydney Laboratory
96 Hermitage Road West Ryde NSW 2114
Phone: (02) 9809 0666
Email: mick.gref@douglaspartners.com.au

Accredited for compliance with ISO/IEC 17025 - Testing

Approved Signatory: Mick Gref
Assistant Laboratory Manager
Laboratory Accreditation Number: 828

Report Number:	**224583.01-1**
Issue Number:	1
Date Issued:	06/06/2024
Client:	DPG Project 37 Pty Ltd
	PO Box Q294 QVB, Sydney NSW
Contact:	Alexander Lekovski
Project Number:	224583.01
Project Name:	Proposed Mixed Use Development
Project Location:	79-85 Queens Road & 2-16 Spencer Street, Five Dock NSW
Work Request:	11450
Sample Number:	SY-11450A
Date Sampled:	01/05/2024
Dates Tested:	24/05/2024 - 30/05/2024
Sampling Method:	Sampled by Engineering Department
	The results apply to the sample as received
Sample Location:	**BH103 (2.5-2.95m)**
Material:	CLAY: pale grey, orange and brown, with ironstone bands

Atterberg Limit (AS1289 3.1.2 & 3.2.1 & 3.3.1)		Min	Max
Sample History	Oven Dried		
Preparation Method	Dry Sieve		
Liquid Limit (%)	81		
Plastic Limit (%)	24		
Plasticity Index (%)	**57**		

Linear Shrinkage (AS1289 3.4.1)		Min	Max
Moisture Condition Determined By	AS 1289.3.1.2		
Linear Shrinkage (%)	**21.5**		
Cracking Crumbling Curling	Cracking & Curling		

Material Test Report

Douglas Partners Pty Ltd
Sydney Laboratory
96 Hermitage Road West Ryde NSW 2114
Phone: (02) 9809 0666
Email: mick.gref@douglaspartners.com.au

Accredited for compliance with ISO/IEC 17025 - Testing

Approved Signatory: Mick Gref
Assistant Laboratory Manager
Laboratory Accreditation Number: 828

Report Number:	**224583.01-1**
Issue Number:	1
Date Issued:	06/06/2024
Client:	DPG Project 37 Pty Ltd
	PO Box Q294 QVB, Sydney NSW
Contact:	Alexander Lekovski
Project Number:	224583.01
Project Name:	Proposed Mixed Use Development
Project Location:	79-85 Queens Road & 2-16 Spencer Street, Five Dock NSW
Work Request:	11450
Sample Number:	SY-11450B
Date Sampled:	01/05/2024
Dates Tested:	24/05/2024 - 30/05/2024
Sampling Method:	Sampled by Engineering Department
	The results apply to the sample as received
Sample Location:	**BH105 (1.5-1.6m)**
Material:	Sandy CLAY: grey, orange-brown

Atterberg Limit (AS1289 3.1.2 & 3.2.1 & 3.3.1)		Min	Max
Sample History	Oven Dried		
Preparation Method	Dry Sieve		
Liquid Limit (%)	24		
Plastic Limit (%)	15		
Plasticity Index (%)	**9**		

Linear Shrinkage (AS1289 3.4.1)		Min	Max
Moisture Condition Determined By	AS 1289.3.1.2		
Linear Shrinkage (%)	**6.5**		
Cracking Crumbling Curling	None		

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

CERTIFICATE OF ANALYSIS 350634

Client Details

Client	Douglas Partners Pty Ltd
Attention	Alex Gibson
Address	96 Hermitage Rd, West Ryde, NSW, 2114

Sample Details

Your Reference	**224583.01 Five Dock**
Number of Samples	10 Soil
Date samples received	07/05/2024
Date completed instructions received	07/05/2024

Analysis Details

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

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

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

Report Details

Date results requested by	14/05/2024
Date of Issue	14/05/2024

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

Results Approved By
Diego Bigolin, Inorganics Supervisor
Nick Sarlamis, Assistant Operation Manager

Authorised By
Nancy Zhang, Laboratory Manager

Misc Inorg - Soil			
Our Reference		350634-9	350634-10
Your Reference	UNITS	BH102	BH101
Depth		1-1.45	4-4.45
Date Sampled		29/04/2024	01/05/2024
Type of sample		Soil	Soil
Date prepared	-	07/05/2024	07/05/2024
Date analysed	-	09/05/2024	09/05/2024
pH 1:5 soil:water	pH Units	6.6	7.3
Electrical Conductivity 1:5 soil:water	µS/cm	210	1,800
Chloride, Cl 1:5 soil:water	mg/kg	26	2,200
Sulphate, SO4 1:5 soil:water	mg/kg	140	670

sPOCAS field test						
Our Reference		350634-1	350634-2	350634-3	350634-4	350634-5
Your Reference	UNITS	BH101	BH101	BH102	BH102	BH103
Depth		0.9-1	2.9-3	0.5-0.6	3-3.1	0.5-0.6
Date Sampled		01/05/2024	01/05/2024	29/04/2024	29/04/2024	29/04/2024
Type of sample		Soil	Soil	Soil	Soil	Soil
Date prepared	-	07/05/2024	07/05/2024	07/05/2024	07/05/2024	07/05/2024
Date analysed	-	08/05/2024	08/05/2024	08/05/2024	08/05/2024	08/05/2024
pH_F (field pH test)	pH Units	7.8	8.0	8.2	5.2	7.8
pH_{FOX} (field peroxide test)	pH Units	3.3	3.5	6.8	3.3	5.6
Reaction Rate*	-	Extreme reaction	Medium reaction	Medium reaction	High reaction	High reaction

sPOCAS field test				
Our Reference		350634-6	350634-7	350634-8
Your Reference	UNITS	BH103	BH111	BH111
Depth		1.5-1.6	1-1.1	2.5-2.6
Date Sampled		29/04/2024	29/04/2024	29/04/2024
Type of sample		Soil	Soil	Soil
Date prepared	-	07/05/2024	07/05/2024	07/05/2024
Date analysed	-	08/05/2024	08/05/2024	08/05/2024
pH_F (field pH test)	pH Units	6.5	7.3	8.1
pH_{FOX} (field peroxide test)	pH Units	2.5	4.0	5.1
Reaction Rate*	-	Medium reaction	High reaction	Medium reaction

Method ID	Methodology Summary
Inorg-001	pH - Measured using pH meter and electrode. Please note that the results for water analyses are indicative only, as analysis outside of the APHA storage times.
Inorg-002	Conductivity and Salinity - measured using a conductivity cell.
Inorg-063	pH- measured using pH meter and electrode. Soil is oxidised with Hydrogen Peroxide or extracted with water. To ensure accurate results these tests are recommended to be done in the field as pH may change with time thus these results may not be representative of true field conditions.
Inorg-081	Anions - a range of Anions are determined by Ion Chromatography, in accordance with APHA latest edition, 4110-B. Waters samples are filtered on receipt prior to analysis. Alternatively determined by colourimetry/turbidity using Discrete Analyser.

QUALITY CONTROL: Misc Inorg - Soil						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-1	[NT]
Date prepared	-			07/05/2024	[NT]	[NT]	[NT]	[NT]	07/05/2024	[NT]
Date analysed	-			09/05/2024	[NT]	[NT]	[NT]	[NT]	09/05/2024	[NT]
pH 1:5 soil:water	pH Units		Inorg-001	[NT]	[NT]	[NT]	[NT]	[NT]	100	[NT]
Electrical Conductivity 1:5 soil:water	µS/cm	1	Inorg-002	<1	[NT]	[NT]	[NT]	[NT]	103	[NT]
Chloride, Cl 1:5 soil:water	mg/kg	10	Inorg-081	<10	[NT]	[NT]	[NT]	[NT]	100	[NT]
Sulphate, SO4 1:5 soil:water	mg/kg	10	Inorg-081	<10	[NT]	[NT]	[NT]	[NT]	82	[NT]

QUALITY CONTROL: sPOCAS field test						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-1	[NT]
Date prepared	-			07/05/2024	[NT]	[NT]	[NT]	[NT]	07/05/2024	[NT]
Date analysed	-			08/05/2024	[NT]	[NT]	[NT]	[NT]	08/05/2024	[NT]
pH_F (field pH test)	pH Units		Inorg-063	[NT]	[NT]	[NT]	[NT]	[NT]	100	[NT]
pH_{FOX} (field peroxide test)	pH Units		Inorg-063	[NT]	[NT]	[NT]	[NT]	[NT]	100	[NT]

Result Definitions

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

Quality Control Definitions

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

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

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

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

Laboratory Acceptance Criteria

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

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

Spikes for Physical and Aggregate Tests are not applicable.

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

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

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

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

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

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

Where matrix spike recoveries fall below the lower limit of the acceptance criteria (e.g. for non-labile or standard Organics <60%), positive result(s) in the parent sample will subsequently have a higher than typical estimated uncertainty (MU estimates supplied on request) and in these circumstances the sample result is likely biased significantly low.

Measurement Uncertainty estimates are available for most tests upon request.

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

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

Douglas PARTNERS

CHAIN OF CUSTODY DESPATCH SHEET

Project No:	224583.01	**Suburb:**	Five Dock	**To:**	Envirolab Services
Project Manager:	Alex Gibson	**Order Number:**		**Sampler:** JL	12 Ashley St, Chatswood NSW 2067
Email:	Alex.Gibson@douglaspartners.com.au			**Attn:**	Sample Receipt
Turnaround time	☑ Standard ☐ 72 hour ☐ 48 hour ☐ 24 hour ☐ Same day				(02) 9910 6200 samplereceipt@envirolab.com
Prior Storage	☐ Fridge ☑ Freezer ☑ Esky ☐ Shelf	**Do samples contain 'potential' HBM?**		☑ No	☐ (Yes, handle, transport, store in accordance with FPM HAZID)

Lab ID	Sample ID: Location / Other ID	Depth From	Depth To	Date Sampled	Sample Type: S - soil W - water M - Material	Container Type: G - glass P - plastic	Analytes: ASS Screening	sPOCAS	Aggresivity Suite (EC, pH, SO4, Cl)								Notes/ Preservation/ Additional Requirements
1	BH101	0.9	1	1/05/24	S	P	X										Chromium reduceable sulfur testing to be confirmed on results of screening tests
2	BH101	2.9	3	1/05/24	S	P	X										
3	BH102	0.5	0.6	29/04/24	S	P	X										
4	BH102	3	3.1	29/04/24	S	P	X										
5	BH103	0.5	0.6	29/04/24	S	P	X										
6	BH103	1.5	1.6	29/04/24	S	P	X										
7	BH111	1	1.1	29/04/24	S	P	X										
8	BH111	2.5	2.6	29/04/24	S	P	X										
9	BH102	1	1.45	29/04/24	S	P			X								Soil:Water 1:5
10	BH101	4	4.45	1/05/24	S	P			X								Soil:Water 1:5

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

Job No: 350634

Date Received: 7/5/24

Time Received: 1445

Received By: EW

Temp: Cool/Ambient

Cooling: Ice/Icepack 2.0

Security: Intact/Broken/None

Metals to analyse:		**LAB RECEIPT**	
Number of samples in container:	**Transported to laboratory by:**	**Lab Ref. No:**	
Send results to:	Douglas Partners Pty Ltd	**Received by:**	
Address:	96 Hermitage Road, West Ryde NSW 2114 **Phone:** (02) 9809 0666	**Date & Time:**	
Relinquished by:	**Date:** **Signed:**	**Signed:**	

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www.envirolab.com.au

CERTIFICATE OF ANALYSIS 352229

Client Details

Client	Douglas Partners Pty Ltd
Attention	Alex Gibson
Address	96 Hermitage Rd, West Ryde, NSW, 2114

Sample Details

Your Reference	**224583.01, Five Dock**
Number of Samples	11 Soil
Date samples received	24/05/2024
Date completed instructions received	24/05/2024

Analysis Details

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

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

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

Report Details

Date results requested by	31/05/2024
Date of Issue	31/05/2024

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

Results Approved By
Jenny He, Senior Chemist

Authorised By
Nancy Zhang, Laboratory Manager

Misc Inorg - Soil				
Our Reference		352229-1	352229-2	352229-3
Your Reference	UNITS	BH104	BH105	BH106
Depth		2.9-3	0.5-0.6	1.5-1.6
Date Sampled		13/05/2024	14/05/2024	16/05/2024
Type of sample		Soil	Soil	Soil
Date prepared	-	24/05/2024	24/05/2024	24/05/2024
Date analysed	-	28/05/2024	28/05/2024	28/05/2024
pH 1:5 soil:water	pH Units	6.5	7.5	7.4
Electrical Conductivity 1:5 soil:water	µS/cm	310	160	54
Chloride, Cl 1:5 soil:water	mg/kg	190	34	<10
Sulphate, SO4 1:5 soil:water	mg/kg	350	59	27

sPOCAS field test						
Our Reference		352229-4	352229-5	352229-6	352229-7	352229-8
Your Reference	UNITS	BH104	BH105	BH105	BH106	BH106
Depth		1.5-1.6	0.9-1	4.4-4.5	0.9-1	2.9-3
Date Sampled		13/05/2024	14/05/2024	14/05/2024	16/05/2024	16/05/2024
Type of sample		Soil	Soil	Soil	Soil	Soil
Date prepared	-	27/05/2024	27/05/2024	27/05/2024	27/05/2024	27/05/2024
Date analysed	-	28/05/2024	28/05/2024	28/05/2024	28/05/2024	28/05/2024
pH_F (field pH test)	pH Units	6.3	7.3	7.6	7.2	6.8
pH_{FOX} (field peroxide test)	pH Units	3.2	3.7	8.3	4.0	4.5
Reaction Rate*	-	Medium reaction	Medium reaction	Volcanic reaction	Medium reaction	Medium reaction

sPOCAS field test				
Our Reference		352229-9	352229-10	352229-11
Your Reference	UNITS	BH107	BH107	BH104
Depth		1.5-1.6	4.4-4.5	2.9-3
Date Sampled		22/05/2024	22/05/2024	13/05/2024
Type of sample		Soil	Soil	Soil
Date prepared	-	27/05/2024	27/05/2024	27/05/2024
Date analysed	-	28/05/2024	28/05/2024	28/05/2024
pH_F (field pH test)	pH Units	7.3	7.0	6.0
pH_{FOX} (field peroxide test)	pH Units	3.3	5.0	4.5
Reaction Rate*	-	Medium reaction	Medium reaction	Medium reaction

Method ID	Methodology Summary
Inorg-001	pH - Measured using pH meter and electrode. Please note that the results for water analyses are indicative only, as analysis outside of the APHA storage times.
Inorg-002	Conductivity and Salinity - measured using a conductivity cell.
Inorg-063	pH- measured using pH meter and electrode. Soil is oxidised with Hydrogen Peroxide or extracted with water. To ensure accurate results these tests are recommended to be done in the field as pH may change with time thus these results may not be representative of true field conditions.
Inorg-081	Anions - a range of Anions are determined by Ion Chromatography, in accordance with APHA latest edition, 4110-B. Waters samples are filtered on receipt prior to analysis. Alternatively determined by colourimetry/turbidity using Discrete Analyser.

QUALITY CONTROL: Misc Inorg - Soil						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-1	[NT]
Date prepared	-			24/05/2024	[NT]	[NT]	[NT]	[NT]	24/05/2024	[NT]
Date analysed	-			28/05/2024	[NT]	[NT]	[NT]	[NT]	28/05/2024	[NT]
pH 1:5 soil:water	pH Units		Inorg-001	[NT]	[NT]	[NT]	[NT]	[NT]	99	[NT]
Electrical Conductivity 1:5 soil:water	µS/cm	1	Inorg-002	<1	[NT]	[NT]	[NT]	[NT]	104	[NT]
Chloride, Cl 1:5 soil:water	mg/kg	10	Inorg-081	<10	[NT]	[NT]	[NT]	[NT]	87	[NT]
Sulphate, SO4 1:5 soil:water	mg/kg	10	Inorg-081	<10	[NT]	[NT]	[NT]	[NT]	89	[NT]

QUALITY CONTROL: sPOCAS field test						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-1	[NT]
Date prepared	-			27/05/2024	[NT]	[NT]	[NT]	[NT]	27/05/2024	[NT]
Date analysed	-			28/05/2024	[NT]	[NT]	[NT]	[NT]	28/05/2024	[NT]
pH_F (field pH test)	pH Units		Inorg-063	[NT]	[NT]	[NT]	[NT]	[NT]	100	[NT]
pH_{FOX} (field peroxide test)	pH Units		Inorg-063	[NT]	[NT]	[NT]	[NT]	[NT]	100	[NT]

Result Definitions

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

Quality Control Definitions

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

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

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

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

Laboratory Acceptance Criteria

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

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

Spikes for Physical and Aggregate Tests are not applicable.

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

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

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

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

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

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

Where matrix spike recoveries fall below the lower limit of the acceptance criteria (e.g. for non-labile or standard Organics <60%), positive result(s) in the parent sample will subsequently have a higher than typical estimated uncertainty (MU estimates supplied on request) and in these circumstances the sample result is likely biased significantly low.

Measurement Uncertainty estimates are available for most tests upon request.

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

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

Douglas PARTNERS

CHAIN OF CUSTODY DESPATCH SHEET

Project No: 224583.01	**Suburb:** Five Dock		**To:** Envirolab Services
Project Manager: Alex Gibson	**Order Number:**	**Sampler:** JL	12 Ashley St, Chatswood NSW 2067
Email: Alex.Gibson@douglaspartners.com.au			**Attn:** Sample Receipt
Turnaround time ☑ Standard ☐ 72 hour ☐ 48 hour ☐ 24 hour ☐ Same day			(02) 9910 6200 samplereceipt@envirolab.com
Prior Storage ☐ Fridge ☑ Freezer ☑ Esky ☐ Shelf	**Do samples contain 'potential' HBM?** ☑ No ☐ Yes (If YES, handle, transport, store in accordance with FPM HAZID)		

	Lab ID	Sample ID: Location / Other ID	Depth From	Depth To	Date Sampled	Sample Type: S - soil W - water M - Material	Container Type: G - glass P - plastic	Analytes: Aggressivity Suite (EC, pH, SO4, Cl)	ASS Screening	sPOCAS	sCr						Notes/ Preservation/ Additional Requirements
✓	1	BH104	2.9	3	13/05/24	S	P	x									Soil:water 1:5
✓	2	BH105	0.5	0.6	14/05/24	S	P	x									Soil:water 1:5
	3	BH106	1.5	1.6	16/05/24	S	P	x									Soil:water 1:5
✓	4	BH104	1.5	1.6	13/05/24	S	P		x								Chromium Reducable sulfur and sPOCAS testing to be confirmed on results of screening
11 ✓	~~AR~~ AG	BH104	2.9	3	13/05/24	S	P		x								
✓	5	BH105	0.9	1	14/05/24	S	P		x								
✓	6	BH105	4.4	4.5	14/05/24	S	P		x								
✓	7	BH106	0.9	1	16/05/24	S	P		x								
✓	8	BH106	2.9	3	16/05/24	S	P		x								
✓	9	BH107	1.5	1.6	22/05/24	S	P		x								
✓	10	BH107	4.4	4.5	22/05/24	S	P		x								

ENVIROLAB — Envirolab Services, 12 Ashley St, Ph: (02) 9910 6200
Job No: 355220
Date Received: 24/5/24
Time Received: 1450
Temp: Ambient
Cooling: Ice
Security: Intact / Broken / None

Metals to analyse:			**LAB RECEIPT**
Number of samples in container:	**Transported to laboratory by:**		**Lab Ref. No:**
Send results to: Douglas Partners Pty Ltd			**Received by:**
Address: 96 Hermitage Road, West Ryde NSW 2114	**Phone:** (02) 9809 0666		**Date & Tim**
Relinquished by: Alex Gibson	**Date:** 24/05/2024	**Signed:**	**Signed:**