Principal Healthcare Finance Pty Limited

Opal Residential Aged Care Facility, Bayview

Geotechnical Investigation Report

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Opal Residential Aged Care Facility, Bayview
Geotechnical Investigation Report

Principal Healthcare Finance Pty Limited

WSP
Level 27, 680 George Street
Sydney NSW 2000
GPO Box 5394
Sydney NSW 2001

Tel: +61 2 9272 5100
Fax: +61 2 9272 5101
wsp.com

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Prepared by:	Callum Fisher	11/09/2025	
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WSP acknowledges that every project we work on takes place on First Peoples lands.
We recognise Aboriginal and Torres Strait Islander Peoples as the first scientists and engineers and pay our respects to Elders past and present.

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Executive summary

WSP Australia Pty Ltd was engaged by Bloompark Consulting Pty Ltd, on behalf of Principal Healthcare Finance Pty Limited (Opal Healthcare), to undertake a geotechnical interpretative investigation for the proposed 177-bed Residential Aged Care Facility at 36–42 Cabbage Tree Road, Bayview. The report supports the State Significant Development Application (SSD-77240466) and addresses SEARs Items 12 and 13, focusing on ground and groundwater conditions and acid sulphate soil potential.

The site, approximately 6,000 sqm in area, is located within the Aveo Bayview Gardens Retirement Living precinct and features moderately sloping topographic relief, with a 9m cross fall from west to east. It is underlain by Hawkesbury Sandstone with a typical subsurface profile comprising fill, residual silty clay, and interbedded sandstone and siltstone.

Nine boreholes were drilled, including three cored holes with groundwater wells, to assess geotechnical, contamination, and hydrogeological conditions. Laboratory testing included Atterberg limits, linear shrinkage, moisture content, particle size distribution, soil aggressivity, California Bearing Ratio (CBR), and Maximum Dry Density (MDD).

Findings indicate stiff to hard residual clay with moderate to high shrink-swell potential and generally non-aggressive soil chemistry. The site is classified as H1 under AS2870-2011 due to deep clay layers, with potential reclassification to Class A following basement excavation. Exposure classification for buried infrastructure is “Non-Aggressive” to “Mild” per AS2159-2009. Groundwater was encountered in two out of three monitoring wells at a depth of about 3m.

Recommendations include the use of soldier pile walls with shotcrete infill panels for basement retention and pad footings founded in low to medium strength rock. Ground anchors or internal props are advised for lateral support during excavation. Excavation of fill and clay is feasible with conventional equipment, while rock excavation will require heavy ripping. Vibration mitigation strategies are outlined with a recommendation to implement vibration monitoring during construction to address potential impacts on neighbouring properties.

Separate reports will address contamination and groundwater monitoring. This geotechnical report provides essential design parameters and construction guidance to support early-stage planning and regulatory compliance.

1 Introduction

1.1 Background

This Geotechnical Interpretative Report is submitted to the Department of Planning, Housing and Infrastructure (**DPHI**) on behalf of Principal Healthcare Finance Pty Limited (**Opal Healthcare**) in support of a State Significant Development Application (**SSDA**) (SSD-77240466) for a 177-bed residential aged care facility (**RACF**) at 36-42 Cabbage Tree Road, Bayview (**the site**).

The proposed development will comprise the following:

- Demolition of the existing aged care building and driveway on the site;
- Construction of a three-storey residential aged care facility, accommodating:
  - 177 beds,
  - Basement parking,
  - Ground floor ancillary facilities;
- Construction of a community room, to be located on the Aveo Bayview Gardens Retirement Living (**Aveo BGRL**) site;
- Construction of a new driveway, to be located on the Aveo BGRL site;
- Torrens Title subdivision of the Opal Healthcare Bayview site from Aveo BGRL;
- Associated amenities and landscaping works;
- Augmentation of, and connection to, existing utilities as required.

For a detailed project description, refer to the Environmental Impact Statement prepared by Beam Planning.

1.2 Relevant SEARs

This Geotechnical Interpretative Report addresses the following relevant Secretary's Environmental Assessment Requirements (SEARs) set out in Table 1-1 below.

Table 1-1 SEARs Compliance table

Environmental Factor	Response / Location in report
No. 12 – Ground and Groundwater Conditions *Assess potential impacts on soil resources and related infrastructure and riparian lands on and near the site and including soil erosion.* *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 sulphate soil potential in an EPI provide a Salinity Management Plan or Acid Sulphate Management Plan that includes appropriate management measures and strategies.*	Section 5. Groundwater is addressed in separate report (PS223670-HYD-REP-Opal Bayview. WSP)

1.3 The site

The Opal HealthCare Bayview site comprises a ~6,000sqm portion of the current Aveo BGRL site at 36-42 Cabbage Tree Road, legally described at Lot 121 in DP 789400. The site in irregular is shape, bound by Annam Road to the east, and the Aveo BGRL site to the north, west, and south. A site aerial is provided below.

Figure 1.1 Context of site within the broader Aveo site

Figure 1.2 Development site

2 Desktop study

The Sydney 1:100,000 Geological Map indicates that the development site is underlain by Hawkesbury Sandstone “Rh”. The typical ground profile encountered is anticipated to comprise of relatively shallow residual soil overlying the weathered sandstone, with the strength of the sandstone improving with depth. As this site has been developed previously, there will be a variable thickness of fill material over the site.

The site has a crossfall of approximately 9 m across the building envelope, sloping downwards from west to east. The site is currently occupied by Aveo Bayview Retirement Village, consisting of single and double-storey residential buildings. The site features several interior sealed roads, landscaped areas of grass and mature gum trees, paperbark and various exotic species.

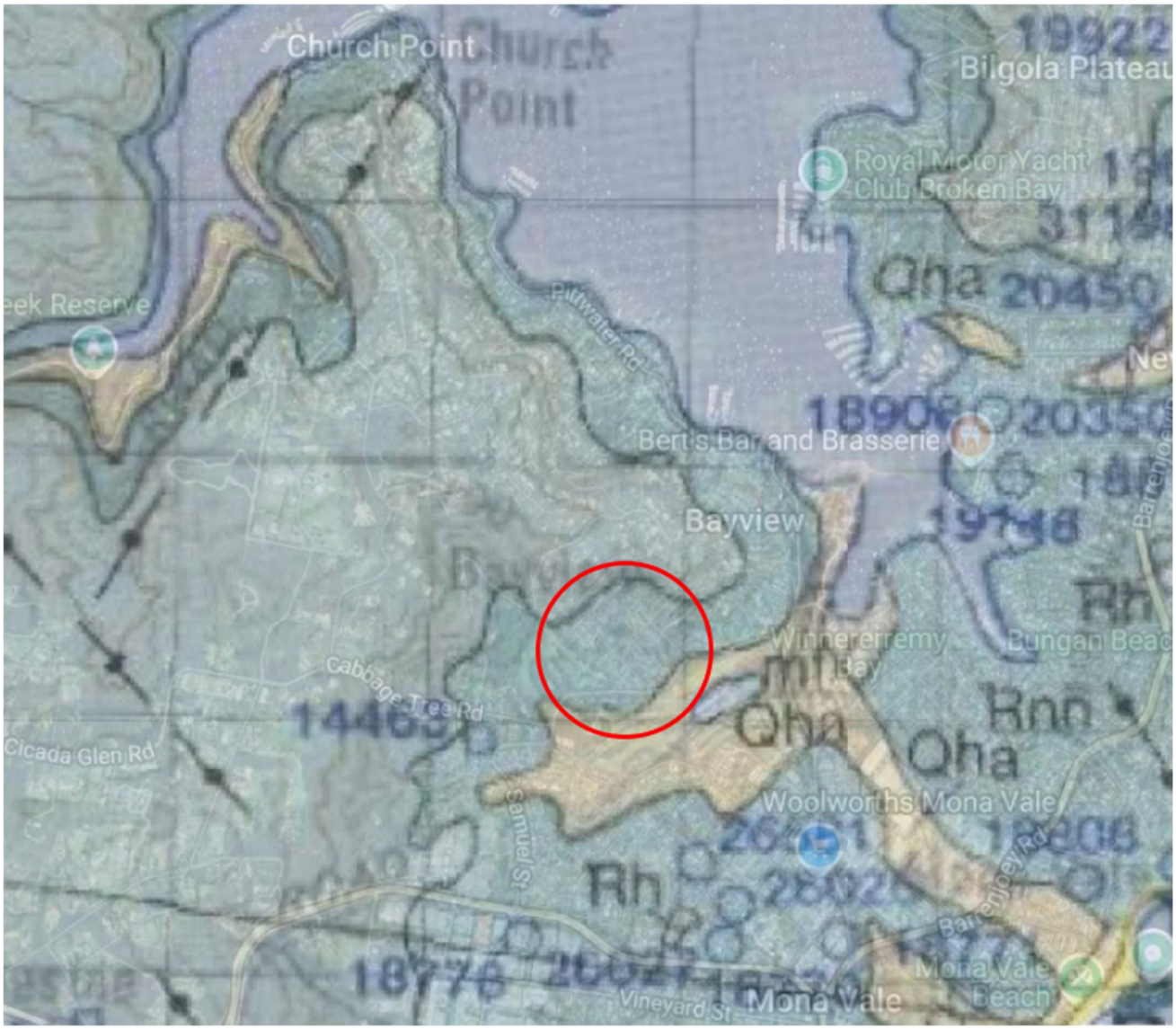


Figure 2.1 Sydney 1:100,000 Geological Map showing the Opal Bayview RACF Project site

3 Geotechnical investigation

3.1 Sitework overview

The aim of the geotechnical investigation is to assess the subsurface conditions to assist with lodgement of a SSDA for a proposed new residential aged care facility. We understand from architectural plans that the new facility will comprise three to four storey buildings with partial basement car park. The indicative maximum depth of excavation is 6m as indicated in Figure 3.1. The sitework has been designed to provide a general coverage of boreholes across the footprint of the proposed development to depths sufficient to provide geotechnical advice to support design for retaining walls, foundations and groundwater.

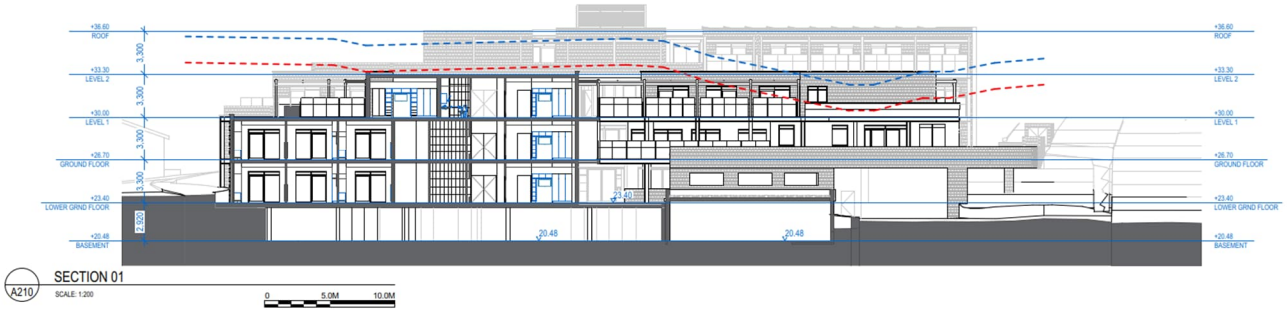


Figure 3.1 Section showing the proposed Opal Bayview development

3.1.1 Health and safety

Prior to mobilisation, the following health and safety documentation was completed:

- Before You Dig Australia (BYDA) searches completed and documented
- Drafting of safety documentation:
  - Ground Penetration Permit (GPP)
  - Health, Environment and Safety Plan (HESP)
  - Safe Work Method Statements (SWMS) specific to each task performed
- Desktop study of existing site
- Police Checks completed for all site personnel
- Verification of Competencies (VOCs) for all subcontractors and WSP personnel
- Subcontractor liaison and stakeholder management with site owner (Aveo)
- Pre-mobilisation meeting to discuss access and to prepare for works

3.1.2 Services locating

Several weeks prior to the commencement of the intrusive investigation, service clearance was completed separately at each test location using the following methods:

- Ground Penetrating Radar (GPR)
- Radio Detection and Passive Scan

- Induction Direct Clamp
- Observation of BYDA drawings
- Visual identification of service markers from surface

All cleared locations were visually marked and labelled with white spray paint.

3.1.3 Boreholes

The proposed scope of the geotechnical and contamination fieldwork is set out in our proposal (PS223670-GEO-SYD-PRP-001 RevB on 04 April 2025) and comprised the following:

- Desktop study of existing information relevant to the site and surrounds
- 9 x boreholes to address groundwater, geotechnical and contamination requirements:
  - 1x cored borehole to 10 m depth with groundwater well installed
  - 2x cored boreholes to 6 m depth with groundwater wells installed
  - 6x augered boreholes to 7 m depth or prior refusal
- Samples retrieved for geotechnical, hydrogeological contamination testing at an accredited laboratory, in accordance with *AS1289 Methods of testing soils for engineering purposes*, for both geotechnical and contamination testing
- Contamination reporting to be delivered in a separate report
- Groundwater monitoring to be delivered in a separate report at conclusion of the monitoring program

3.1.4 Laboratory testing

Laboratory testing has been completed on selected geotechnical soil and contamination samples as follows:

Geotechnical Scope:

- 5 x Atterberg Limits – Required to assess the engineering characteristics of the soil material
- 5 x Linear Shrinkage – to assess susceptibility to shrink and swell with changing moisture content
- 9 x moisture content
- 2 x soil grading (particle size distribution test) – to confirm engineering description
- 5 x soil aggressivity test (ph, chloride, sulphate, resistivity) – to assess aggressivity of the soil on buried concrete and steel
- 2 x California Bearing Ratio (4 Day Soaked) – to assess subgrade strength to inform pavement design
- 2 x Maximum Dry Density (modified compaction effort) – to assess the compacted density of the soil under varying moisture content.

3.2 Intrusive fieldwork

The field investigation was managed by an experienced geotechnical engineer who was responsible for supervising drilling, soil logging, sample collection and engineering logs. A contamination scientist also attended site for the purpose of contamination sampling and observations. Groundwater observations were taken by a hydrogeologist during the well installations.

The site investigation was completed as follows:

- Drill rig mobilised to each test location, work area established and delineated. Note that BH04 was abandoned before commencement due to access constraints for existing residents
- Pavement coring conducted at each borehole to penetrate through the pavement/bitumen layer from surface
- Proceeded with augering of each borehole until either the rock interface or termination depth
- Soil samples collected in accordance with AS1726-2017 *Geotechnical Site Investigations*
- Contamination scientist retrieved soil samples every 0.5 m of soil profile up to 3 m depth
- Contamination scientist investigated the presence of surface samples of suspected Asbestos Containing Material (ACM) within the grounds, although none was found
- Preliminary Waste Classification determined by contamination scientist based on the test locations
- Standard Penetration Tests (SPTs) were conducted at 1.5 m intervals from 1m throughout the soil profile to allow assessment of soil strength/ consistency
- Pocket Penetrometer (PP) tests were completed in all cohesive soil material to assess strength characteristics
- Once the rock interface was reached, core drilling commenced until reaching the termination criteria for each borehole
- Core samples were boxed, photographed, logged and retained at our WSP warehouse facility
- Groundwater well installed at three locations in the cored boreholes
- Each borehole was backfilled with spoil material, then grouted to below the base of pavement with a gatic cover concreted in place to ensure the borehole is flush with the surface and allow future access to the monitoring well
- All site waste was pumped into a container on-site and then disposed of at an accredited waste facility
- Coordinates for each test location was surveyed using phone GPS with an accuracy of ± 5m in plan
- Elevations for each test location was obtained using ELVIS LiDAR (open source government data source) with an accuracy of ± 0.3m vertically
- Observations and photos were taken throughout the investigation

Figure 3.2 Test location plan at Opal Bayview RACF site

3.3 Groundwater

An experienced hydrogeologist attended site to inspect the installation of groundwater monitoring wells in BH01, BH02 and BH03 between the 1 and 4th of July 2025. The wells were developed on 10 July 2025 and were recorded approximately one month after installation on 04 August 2025.

Well	Depth (m)	Depth to water (mbtoc)*
BH01	4.81	Dry
BH02	4.78	3.10
BH03	5.09	3.12

* metres below top of casing

Groundwater monitoring is detailed in a separate report (refer PS223670-WSP-NSW-HYD-REP-001 Rev0) which will be available following a 3 month period of monitoring ending in early November 2025.

4 Investigation results

4.1 Subsurface conditions

The ground conditions encountered throughout the investigation were largely consistent with those assessed from the desktop study. The stratigraphic layers identified across the site are summarised in Table 4-1 below.

Table 4-1 Stratigraphic layers identified at Opal RACF site

Unit	Layer	Depth Range (m BGL)	Description
1a	Asphalt and Concrete (Road)	0 – 0.15	Dark grey, angular aggregate
1b	Gravelly Sand and Silty Sand (Fill)	0.15 – 0.50	Fine to coarse grained, grey to brown, well graded, and fine to medium grained, sub-angular gravels
2	Silty Clay (Residual Soil)	0.40 – 3.00	Pale grey to brown, mottled red-orange high plasticity, very stiff to hard
3	Interbedded Sandstone and Siltstone (Class 3)[1]	1.70 +	Pale grey and brown, stained red-orange, low to medium strength with localised very low strength bands

(1) Rock unit classified in accordance with classification of sandstones and shales in the Sydney region (Pells, Mostyn, Bertuzzi & Wong, 2019).

4.2 Geotechnical field testing

4.2.1 Standard penetration tests (SPTs)

SPTs were conducted in the field at 1.5 m spacing from approximately 1.0 m depth below ground level. The tests were typically carried out in the clay material but also in highly weathered sandstone. The results are provided in Figure 4.1 which show SPT ‘N’ values ranging between 22 and 50 in the clay, which indicates a range in consistency from very stiff to hard. All tests in the highly weathered sandstone encountered refusal which indicates the highly weathered rock in excess of hard.

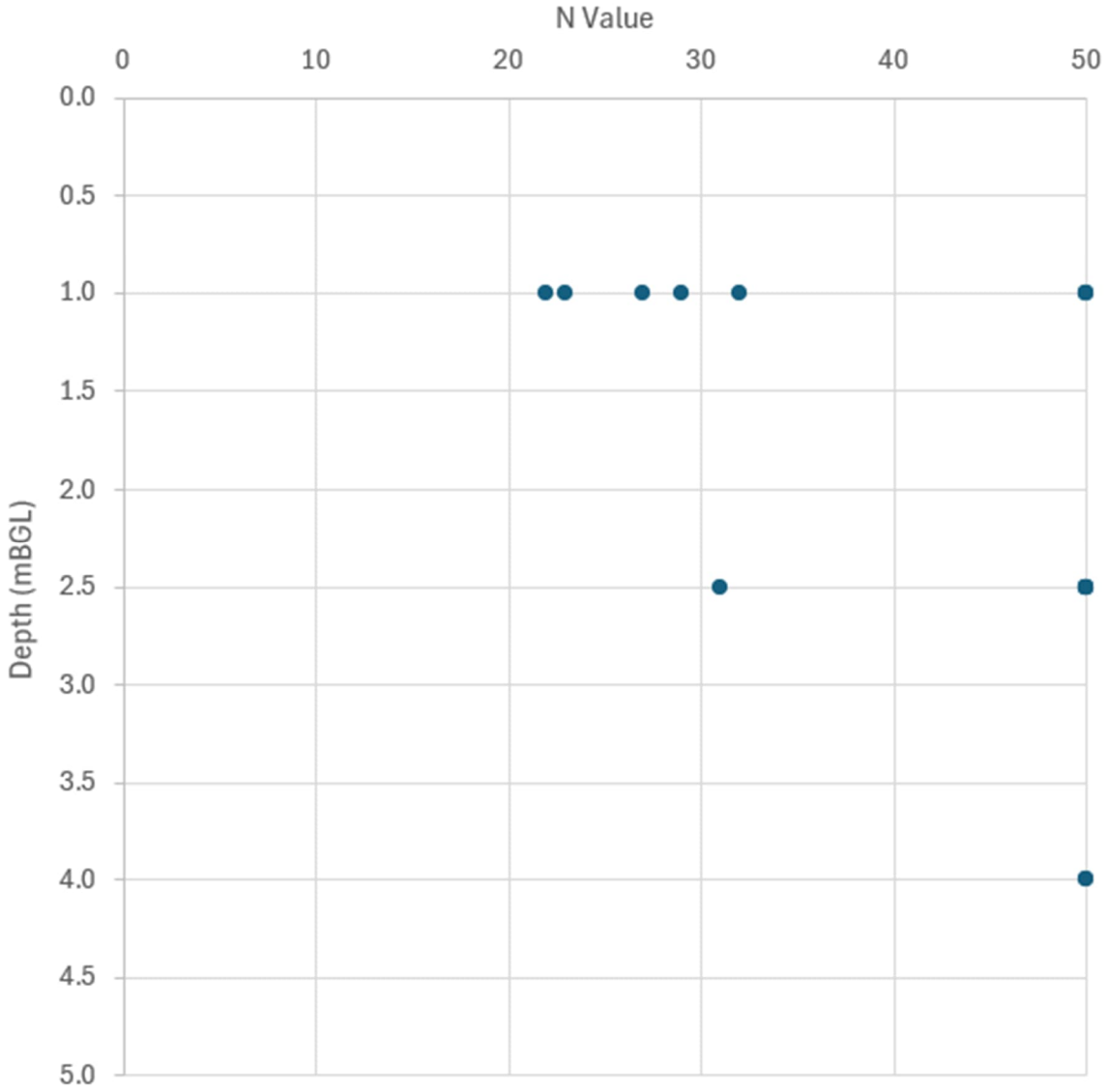


Figure 4.1 Graph displaying SPT values from all boreholes

4.2.2 Point load tests (PLTs)

PLTs were conducted in the field on samples of cores recovered from the boreholes. The tests were either axial or diametral, to investigate heterogenous behaviour of the bedrock. The results of the field PLTs are presented as $Is_{(50)}$ values against depth in Figure 4.3 for axial and diametral tests. It is noted that diametral results are typically lower in shale or siltstone as the force is applied parallel to the bedding planes and failure generally occurs along these planes of weakness.

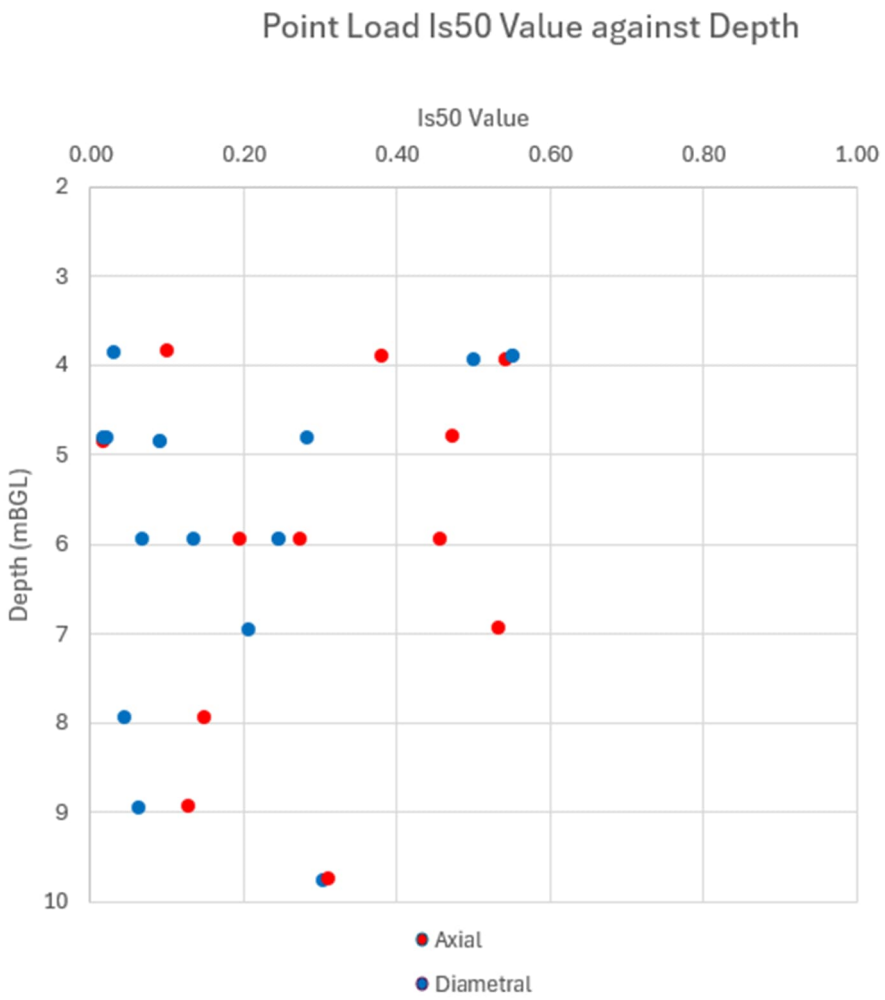


Figure 4.2 Point Load testing (PLT) results

The results tend to show a high amount of scatter compared with the axial tests where the force is applied perpendicular to the bedding.

Inferred unconfined compressive strength can be determined by applying a correlation factor of 20 to the $Is_{(50)}$ values based on published correlations. Using this factor provides an inferred strength range for the rock between low and medium strength with the majority of tests indicating a Class III sandstone (Pells, 1998).

4.3 Laboratory test results

Atterberg limits and Linear Shrinkage testing was carried out on five (5) selected soil samples to assess the plasticity of subsurface materials. The test results are contained in Appendix B. Results from these tests are summarised below.

Table 4-2 Atterberg limits and Linear Shrinkage test results

Auger Hole	Sample Depth (m BGL)	Material	Liquid Limit (%)	Plastic Limit (%)	Plasticity Index (%)	Linear Shrinkage (%)
BH02	1.0 – 1.45	Silty Clay	51	18	33	12.5
BH02	2.0 – 2.5	Silty Clay	31	14	16	8.0
BH03	2.5 – 2.9	Silty Clay	44	15	29	11.0

Auger Hole	Sample Depth (m BGL)	Material	Liquid Limit (%)	Plastic Limit (%)	Plasticity Index (%)	Linear Shrinkage (%)
BH05	2.5 – 2.95	Sandy Gravelly Clay	43	20	23	10.0
BH08	1.0 – 1.45	Silty Clay	38	16	22	10.0

The Atterberg limits results confirm the soils tested consist of clay of low to intermediate plasticity. The linear shrinkage results indicate the clay has a moderate to high shrinkage potential.

Moisture content tests were conducted on nine (9) selected soil samples to assess the moisture content by mass of the residual clay. Results from these tests are summarised below.

Table 4-3 Moisture content test results

Auger Hole	Sample Depth (m BGL)	Material	Moisture Content (%)
BH01	1.0 – 1.45	Silty Clay	14.3
BH01	2.0 – 2.5	Silty Clay	9.7
BH02	1.0 – 1.45	Silty Clay	20.5
BH03	1.0 – 1.45	Silty Sandy Clay	11.7
BH05	1.0 – 1.05	Sandy Gravelly Clay	7.1
BH06	1.0 – 1.25	Silty Clay	9.6
BH07	1.0 – 1.45	Silty Clay	17.5
BH07	4.0 – 4.05	Silty Clay	6.8
BH08	1.0 – 1.45	Silty Clay	14.8

The moisture content was found to be generally at or below the range of Plastic Limit values in Table 4-2. This confirms the field SPT tests and observations which indicates the residual clay is stiff or hard in consistency.

Aggressivity testing was conducted on five (5) soil samples to assess the chemical composition, pH and electrical conductivity of the subsurface. Results from these tests are summarised below.

Table 4-4 Soil aggressivity test results

Auger Hole	Sample Depth (m BGL)	Material	SO4 (mg/kg)	Cl (mg/kg)	pH	EC (µS/m)
BH01	2.0 – 2.5	Silty Clay	130	22	7.3	310
BH03	2.5 – 2.9	Silty Clay	38	<10	6.0	360
BH05	2.5 – 2.95	Sandy Gravelly Clay	140	57	5.4	280
BH06	2.5 – 2.7	Silty Clay	75	<10	5.5	250
BH07	4.0 – 4.05	Silty Clay	80	59	5.3	230

The test results are discussed in Section 5.2.

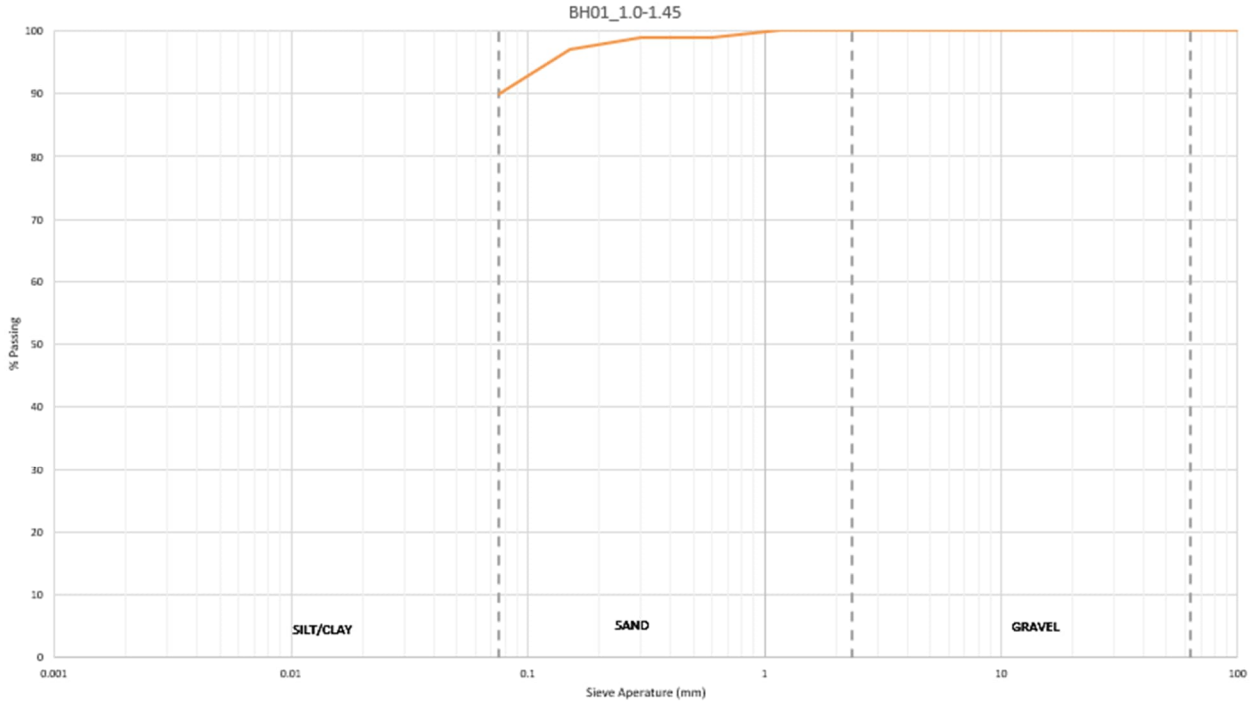
California Bearing Ratio (CBR) and Maximum Dry density (MDD) testing was carried out on two (2) soil samples to assess the density and compacted strength. Results from these tests are summarised below.

Table 4-5 California Bearing Ratio (CBR) test results

Auger Hole	Sample Depth (m BGL)	Material	California Bearing Ratio (%)	Maximum Dry Density (t/m^3)
BH03	0.2 – 0.7	Gravelly Sand Fill	4.5	1.86
BH08	0.2 – 0.6	Gravelly Sand Fill	1.5	1.79

The CBR values indicate the tested material (which is a mix of fill and residual soil) would provide a very poor to poor quality subgrade.

Particle Size Distribution (PSD) testing was conducted on two (2) soil samples to confirm the soil description. The tests undertaken on samples of residual clay confirm it consists of predominantly of silty clay and some sand and gravel. Refer to Figure 4.3.



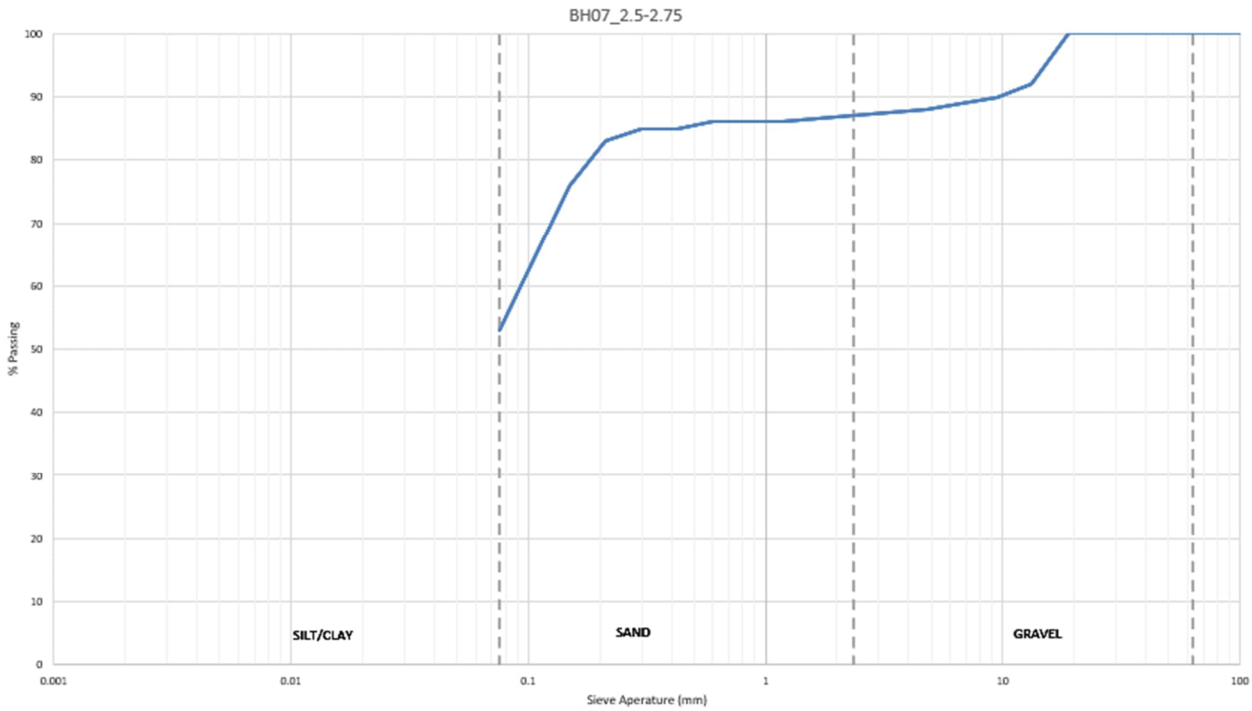


Figure 4.3 Particle size distribution results

5 Discussion and recommendations

5.1 Geotechnical site classification

Site classification in accordance with AS2870-2011 – Residential slabs and footings has considered the soil profile method using Table D2. Based on this method the site would be classed as H1 due to the depth of clay soil being >1.8m, noting the range identified in the boreholes varies from 2.0m to 3.0m. If the surface soils are removed due to basement excavation the site could be reclassified as Class A – for sand and rock sites.

Class H1 (highly reactive) soils typically experience characteristic surface movements in the range of 40 – 60 mm (horizontal and vertical), which is due to seasonal moisture variation..

5.2 Exposure classification

Australian Standard AS2159 - 2009, Table 6.4.2(C), provides criteria for exposure classification for concrete piles based on sulphates in the soil and groundwater, pH and chlorides in groundwater. Based on the testing carried out (refer Appendix B) the exposure classification is assessed as “Non-Aggressive” to “Mild” for both steel and concrete structures.

Table 5-1 Extract from AS2159 of Table 6.4.2(C)

TABLE 6.4.2(C)

EXPOSURE CLASSIFICATION FOR CONCRETE PILES—PILES IN SOIL

Exposure conditions				Exposure classification	
Sulfates (expressed as SO_4*)		pH	Chlorides in groundwater	Soil conditions A†	Soil conditions B‡
In soil ppm	In groundwater ppm		ppm		
<5000	<1000	>5.5	<6000	Mild	Non-aggressive
5000–10 000	1000–3000	4.5–5.5	6000–12 000	Moderate	Mild
10 000–20 000	3000–10 000	4–4.5	12 000–30 000	Severe	Moderate
>20 000	>10 000	<4	>30 000	Very severe	Severe

* Approximately 100 ppm SO_4 = 80 ppm SO_3

† Soil conditions A—high permeability soils (e.g., sands and gravels) which are in groundwater

‡ Soil conditions B—low permeability soils (e.g., silts and clays) or all soils above groundwater

5.3 Geotechnical model

The borehole logs are provided in Appendix A. The typical model for the site consists of about 0.5 m of Fill over very stiff to hard residual clay to a depth of about 2.5 m over highly weathered interbedded sandstone and siltstone rock. The rock is typically low or medium strength with occasional bands (100 mm to 200 mm) of very low strength rock found to the limit of investigation of 10 m. Groundwater is likely to be at a depth of about 3 m (~RL 23 m AHD) which coincides with the top of rock.

5.4 Retaining structures and foundations

5.4.1 Soldier pile wall

Based on the preliminary architectural section (Figure 3.1), a single basement level is proposed which will vary in depth due to the sloping topography, being about 6 m at the northwest side and 3 m at the southeast.

Groundwater is not expected to be a significant issue due to the depth it was encountered on site (about 3 m deep) so a water-tight structure is not warranted.

For preliminary design purposes, a soldier pile wall consisting of 600mm diameter bored concrete piles at 2m centres with shotcrete infill panels is recommended to retain the surface soils and highly weathered rock. The piles should be taken below the bulk excavation level (BEL) by about 2-3 pile diameters. The detailed pile design including founding depth will need to consider the vertical load to be supported. Strip drains should be provided between the piles with outlets at basement level to prevent build-up of water pressures.

During excavation, the piles will need to be supported laterally by temporary anchors or struts where anchors are not permitted. Once basement excavation is completed it is assumed that lateral loads will be resisted via internal propping through the permanent basement floor slabs.

Finite element modelling should be used to assess ground movements and resulting structural forces during bulk excavation. This work should be undertaken collaboratively with the project structural engineers to ensure compatibility is achieved between geotechnical and structural models.

The estimated movement of the retaining structure can be assessed from the finite element model and used to inform the monitoring plan. This would include survey targets mounted on the face of piles during excavation and behind the walls.

Design parameters are provided in Table 5-2.

5.4.2 Pad footings

Based on the geotechnical model, it is likely that the base of the excavation will expose highly to moderately weathered sandstone and siltstone varying from low to medium strength. Pad footings would be founded about 1m below the BEL can be used to support vertical loads. Preliminary ultimate bearing pressure of 10MPa can be assumed based on the PLTs and rock description.

All pad footings should be inspected by a geotechnical engineer to confirm that a suitable founding stratum has been reached. Because of the very low strength bands identified in the deeper boreholes, we also recommend carrying out rotary jack-hammer holes and spoon testing or cored boreholes at approximately 50% of footings to confirm assumed ground conditions are present and test for persistence of adverse seams (e.g., core loss and or weak layers identified in the core) below the founding level to 1.5 times the minimum width of the footings. If the founding stratum is weaker than assumed the pad dimension should be increased to reduce the bearing pressure to an appropriate value, or the weaker material excavated out and replaced with mass concrete.

Geotechnical parameters have been developed for the adopted geotechnical units across the Opal RACF site. The design parameters have been based on interpretation of available investigation results, consideration of published correlations and engineering judgement. The suggested geotechnical parameters for soils on the site are summarised below in Table 5-2. During the construction phase, all materials encountered should be verified with the parameters adopted during the design process by an experienced geotechnical engineer or engineering geologist.

The design parameters presented in Table 5-2 are intended for use with Ultimate Limit State (ULS) and Serviceability Limit State (SLS) design approaches, using appropriate design standards with associated strength reduction and load factors applied accordingly.

A geotechnical strength reduction factor Φ_{gb} of 0.52 is recommended based on AS2159-2009 with an assessed risk rating (IRR) value of 2.66.

Table 5-2 Geotechnical design parameters for soil and rock

Unit	Unit Name	Unit Weight (kN/m3)	Undrained Shear Strength (kPa)	Effective Cohesion (kPa)	Effective Friction Angle (deg)	Coefficient of Active Pressure, K_a	Coefficient of Earth Pressure at rest, K_0	Coefficient of Passive Earth Pressure K_p	Drained Poisson's Ratio	Elastic Modulus (vertical loading), E' (MPa)	Ultimate Shaft Adhesion (kPa)	Ultimate Bearing Pressure under vertical loading (kPa)
1	Uncontrolled Fill – below asphalt	19	-	0	30	-	-	-	0.3	10	-	-
2	Residual Clay	20	200	5	28	0.4	0.5	2.8	0.3	20	-	-
3	Low to medium strength Interbedded Sandstone and Siltstone (Class 3)	24	-	150	35	0.2	1.0	6.0	0.2	750	800	10,000

Notes:

(1) For bored piles under compression only. Shaft adhesion values for uplift/tension may be taken as being equal to 70% of the values for compression, provided cone pull-out criteria are met.

(2) Settlement of less than 1% of the footing width is expected at the factored bearing pressure

(3) An unloading modulus for retaining wall design can be estimated by applying a factor of 2 to the provided loading modulus values.

(4) Values based on site investigation information, published literature and engineering judgement with similar materials.

5.5 Acid sulphate soil and rock

Research on the NSW Spatial Planner indicates that the site is unrated on the Acid Sulphate Soil map. Acid sulphate soils are typically associated with low lying, waterlogged estuarine or coastal areas. As such there is a low likelihood of encountering Acid Sulphate soils at the Opal site.

5.6 Earthquake site classification

Earthquake design actions have been assessed in accordance with AS 1170-2007 Structural Design Actions – Part 4: Earthquake actions in Australia. AS 1170-2007 Section 3 indicates that the site has a hazard factor (Z) of 0.08 and a probability factor (kp) of 1.0 based on an annual probability of exceedance of 1/500. The value of the product kpZ is 0.08 and should be applied to gravitational force to assess the design peak ground acceleration.

Based on AS 1170.4-2007 Section 4, the sub soil class for the site is Class Be – Rock site as there is less than 3m depth of soil.

5.7 Batter slopes

All excavations shall be battered or fully supported to reduce the risk to personnel safety and adjacent infrastructure and shall comply with the requirements of the Excavation Work Code of Practice (Safe Work Australia, January 2020).

Table 5-3 sets out safe batter slopes for temporary and permanent conditions.

Table 5-3 Recommended slope /excavation batters

Geotechnical Unit	**Consistency / Strength**	**Cut Slope Batters**	
		Permanent	**Temporary[1, 2]**
Unit 1b (Fill)	Variable	-	1V:2.5H
Unit 2 (Residual Soil)	Stiff to hard	1V: 1.2H	1V: 1.5H
Unit 3 (Sandstone and Siltstone)	Low to medium strength	1V: 1H	1V: 0.5H[3]

[1] Temporary slopes to be protected during heavy rain using polythene sheeting or geotextile

[2] No surcharge loads to be placed within a distance equal to the depth of excavation from the slope or excavation crest

[3] Temporary trench excavations up to about 1m depth can be cut vertically. Stability is controlled by joints, fractures, local weathering. Geotechnical Engineer to assess

[4] For temporary excavations greater than 3 m depth then provision of benches or shoring/ retaining walls will be required

For areas where soil cover is shallow or is benched and battered to the top of rock, the low to medium strength sandstone/ siltstone can be cut vertically. The exposed rock should be assessed by a geotechnical engineer to advise on appropriate support measures, which are likely to comprise either spot or pattern rock bolts, steel mesh and shotcrete. The spacing of rock bolts would depend on the fracture spacing in the specific cut face.

5.8 Ground anchors

Temporary ground anchors will be required for lateral support of the perimeter piled walls higher than about 3.5m to 4m, unless obstructions exist adjacent such as site boundary or structures, in which case internal props could be used.

A recommended ultimate bond stress for anchor design is 800 kPa, and a geotechnical strength reduction factor Φ_{gb} of 0.52 is recommended to be applied based on AS2159-2009 with an assessed risk rating (IRR) value of 2.66.

Suitability tests should be conducted on selected anchors to verify the design and performance requirements are met. All rock anchors should have a minimum bond length of 3m and be proof tested to 1.25 times the design load before locking off at a load <75% of the design load.

The design value provided assumes the holes are flushed clean and carefully constructed. Higher bond stresses may be adopted subject to testing.

5.9 In situ stress

The existence of horizontal in-situ stresses at shallow depths, exceeding the vertical stress due to gravity, is a well-established phenomenon in the Sydney Basin (McQueen, 2004). Based on the sloping topography, the relatively shallow depth of excavation in rock and the weathered and fractured nature of the rock it is considered that in situ rock stresses would have dissipated and are not considered necessary to allow for in the design of retaining walls at this site.

5.10 Excavatability

Excavatability of the fill and natural soil layers will be readily achieved using conventional excavators. Heavy ripping and rock hammers will be required to excavate the low to medium strength rock in combination with rock saws close to boundaries. Rock hammers are likely to be required for detailed excavation of footings, service trenches and the like.

Rock hammers and heavy ripping may cause unacceptable vibration levels to nearby residents and structures. The following measures can be used to reduce the impacts of vibration:

- Limit the hammer size and or use grinders
- Introduce a saw cut between the potential receptor and the vibration source
- Work along joint or fracture planes to exploit weak planes within the rock
- Use vibration monitoring to ensure vibration levels are within acceptable limits to avoid damage to structures.

5.11 Pavement Design Parameters

Two soil samples were tested for California Bearing Ratio (CBR) (Table 4-5). The samples consisted of a mix of fill material and residual soil to represent the likely mix on site. CBR values of 4.5% and 1.5% were determined by the laboratory testing, which indicates the likely variability to be expected on site. Based on these results a design value of 1.5% is recommended.

5.12 Utility trenches

The following recommendations are made for utilities trenches:

- Trench details must follow standard utility backfilling specifications including the use of clean sand or gravels, rather than clayey spoil material from site.
- For utility trenches in rock (Class A) no additional special precautions are necessary
- For utility trenches in soil (Class H) ensure water infiltration is minimised by providing a hard cover and appropriate drainage falls where possible or consider the use of cement stabilised fill where there is no hard cover such as landscaped areas.

- Provisions for differential movement is not required for pipe connections in rock

5.12.1 General recommendations

Design considerations for pipework in Class H soils would include:

- Use of flexible couplings or expansion joints to allow for movement without damaging utilities.
- Sleeve pipes passing through footings or slabs to allow movement to occur independent of the structure.
- Moisture change in the soil is greater near the surface therefore pipes buried at a depth of 1 m or more would experience less differential movement.
- Avoid rigid connections between structures and external services i.e. water, sewer and stormwater.
- Isolate pipework from structural elements using compressible materials or void formers.
- Ensure adequate fall and support in pipework to prevent sagging or uplift due to soil movement.

5.13 Drainage

To prevent surface water affecting building foundations, good practice design and management practices should be implemented. These include:

- Sloping ground away from the building for a distance of 1m to 1.5m
- Provide spoon drains or sloped surfaces to channel water to the stormwater system
- Roof guttering and downpipes to direct water to the stormwater system
- Provide agg drains around the building perimeter if there is a risk of ponding
- Ensure drainage pipes are graded appropriately with maintenance access to allow periodic cleaning
- Avoid planting trees near the building and install root barriers where existing trees are to be retained

6 References

1 Department of Planning and Environment, Sydney. (2017). Soil Landscapes of Sydney 1:100,000 Scale Sheet. The Central Resource for Sharing and Enabling Environmental Data in NSW.

2 McQueen, L. (2004). In situ rock stress and its effect in tunnels and deep excavations in Sydney. Australian Geomechanics, Vol 39, 43-57.

3 New South Wales Office of Water. (2012). NSW Aquifer Interference Policy.

4 Oliveira, D.A.F. & Wong, P.K. (2012). Selection of rock mass design parameters for assessing excavation induced movements in the Sydney CBD. ANZ 2012 Conference, (pp. 15-18). Melbourne.

5 Pells et al. (2019). Classification of Sandstones and Shales in the Sydney Region - A 40 Year Review.

6 Pettifer, G.S. & Fookes, P.G. (1994). A revision to the graphical method for assessing the excavatability of rock. Quarterly Journal of Engineering Geology, 145-164.

7 Bertuzzi & Pells (2015), Sydney Sandstone and Shale Parameters for Tunnel Design, Australian Geomechanics

7 Limitations

Scope of services

This geotechnical site assessment report (the report) has been prepared in accordance with the scope of services set out in the contract, or as otherwise agreed, between the client and WSP (scope of services). In some circumstances the scope of services may have been limited by a range of factors such as time, budget, access and/or site disturbance constraints.

Reliance on data

In preparing the report, WSP has relied upon data, surveys, analyses, designs, plans and other information provided by the client and other individuals and organisations, most of which are referred to in the report (the data). Except as otherwise stated in the report, WSP has not verified the accuracy or completeness of the data. To the extent that the statements, opinions, facts, information, conclusions and/or recommendations in the report (conclusions) are based in whole or part on the data, those conclusions are contingent upon the accuracy and completeness of the data. WSP will not be liable in relation to incorrect conclusions should any data, information or condition be incorrect or have been concealed, withheld, misrepresented or otherwise not fully disclosed to WSP.

Geotechnical investigation

Geotechnical engineering is based extensively on judgment and opinion. It is far less exact than other engineering disciplines. Geotechnical engineering reports are prepared to meet the specific needs of individuals. A report prepared for a consulting civil engineer may not be adequate for a construction contractor or even some other consulting civil engineer. This report was prepared expressly for the client and expressly for purposes indicated by the client or his representative. Use by any other persons for any purpose, or by the client for a different purpose, might result in problems. The client should not use this report for other than its intended purpose without seeking additional geotechnical advice.

This geotechnical report is based on project-specific factors

This geotechnical engineering report is based on a subsurface investigation which was designed for project-specification factors, including the nature of any development, its size and configuration, the location of any development on the site and its orientation, and the location of access roads and parking areas. Unless further geotechnical advice is obtained this geotechnical engineering report cannot be used:

- when the nature of any proposed development is changed
- when the size, configuration location or orientation of any proposed development is modified.

This geotechnical engineering report cannot be applied to an adjacent site.

The limitations of site investigation

In making an assessment of a site from a limited number of boreholes or test pits there is the possibility that variations may occur between test locations. Site exploration identifies specific subsurface conditions only at those points from which samples have been taken. The risk that variations will not be detected can be reduced by increasing the frequency of test locations; however this often does not result in any overall cost savings for the project. The investigation program undertaken is a professional estimate of the scope of investigation required to provide a general profile of the subsurface conditions. The data derived from the site investigation program and subsequent laboratory testing are extrapolated across the site to form an inferred geological model and an engineering opinion is rendered about overall subsurface conditions and their likely behaviour with regard to the proposed development. Despite investigation the actual conditions at the site might differ from those inferred to exist, since no subsurface exploration program, no matter how comprehensive, can reveal all subsurface details and anomalies.

The borehole logs are the subjective interpretation of subsurface conditions at a particular location, made by trained personnel. The interpretation may be limited by the method of investigation, and cannot always be definitive. For example, inspection of an excavation or test pit allows a greater area of the subsurface profile to be inspected than

borehole investigation, however, such methods are limited by depth and site disturbance restrictions. In borehole investigation, the actual interface between materials may be more gradual or abrupt than a report indicates.

Subsurface conditions are time dependent

Subsurface conditions may be modified by changing natural forces or man-made influences. A geotechnical engineering report is based on conditions which existed at the time of subsurface exploration.

Construction operations at or adjacent to the site, and natural events such as floods, or groundwater fluctuations, may also affect subsurface conditions, and thus the continuing adequacy of a geotechnical report. The geotechnical engineer should be kept appraised of any such events, and should be consulted to determine if additional tests are necessary.

Avoid misinterpretation

A geotechnical engineer should be retained to work with other appropriate design professionals explaining relevant geotechnical findings and in reviewing the adequacy of their plans and specifications relative to geotechnical issues.

Bore/Profile logs should not be separated from the engineering report

Final bore/profile logs are developed by geotechnical engineers based upon their interpretation of field logs and laboratory evaluation of field samples. Customarily, only the final bore/profile logs are included in geotechnical engineering reports. These logs should not under any circumstances be redrawn for inclusion in architectural or other design drawings. To minimise the likelihood of bore/profile log misinterpretation, contractors should be given access to the complete geotechnical engineering report prepared or authorised for their use. Providing the best available information to contractors helps prevent costly construction problems. For further information on this matter reference should be made to ‘Guidelines for the Provision of Geotechnical Information in Construction Contracts’ published by the Institution of Engineers Australia, National Headquarters, Canberra 1987.

Geotechnical involvement during construction

During construction, excavation is frequently undertaken which exposes the actual subsurface conditions. For this reason geotechnical consultants should be retained through the construction stage, to identify variations if they are exposed and to conduct additional tests which may be required and to deal quickly with geotechnical problems if they arise.

Report for benefit of client

The report has been prepared for the benefit of the client and no other party. WSP assumes no responsibility and will not be liable to any other person or organisation for or in relation to any matter dealt with or conclusions expressed in the report, or for any loss or damage suffered by any other person or organisation arising from matters dealt with or conclusions expressed in the report (including without limitation matters arising from any negligent act or omission of WSP or for any loss or damage suffered by any other party relying upon the matters dealt with or conclusions expressed in the report). Other parties should not rely upon the report or the accuracy or completeness of any conclusions and should make their own enquiries and obtain independent advice in relation to such matters.

Other limitations

WSP will not be liable to update or revise the report to take into account any events or emergent circumstances or facts occurring or becoming apparent after the date of the report.

Appendix A

Borehole logs

NON-CORE DRILL HOLE - GEOLOGICAL LOG

HOLE NO : BH01

FILE / JOB NO : PS223670
SHEET : 1 OF 3

CLIENT : Bloompark
LOCATION : Bayview 5 Main Drive
PROJECT : Opal Bayview SI

POSITION : E: 341927, N: 6273574 (MGA2020-56) | SURFACE ELEVATION : 28.00 (AHD) | ANGLE FROM HORIZONTAL : 90°

RIG TYPE : GEO205 | MOUNTING : Track | CONTRACTOR : Terratest | DRILLER : KM

DATE STARTED : 30/6/2025 | DATE COMPLETED : 1/7/2025 | DATE LOGGED : 1/7/2025 | LOGGED BY : HW | CHECKED BY : BMS

DRILLING					MATERIAL					
PROGRESS: DRILLING & CASING	PROGRESS: WATER	DRILLING PENETRATION	GROUND WATER LEVELS	SAMPLES & FIELD TESTS	DEPTH (m) RL (m AHD)	GRAPHIC LOG	GROUP SYMBOL	MATERIAL DESCRIPTION Soil Type, Colour, Plasticity or Particle Characteristic Secondary and Minor Components	MOISTURE CONDITION	CONSISTENCY RELATIVE DENSITY	STRUCTURE & Other Observations
AD/T		F-H	Not Encountered	0.10m ES	0.0 28.0			0.10m FILL: Brick paver, brown grey	D		ROAD SURFACE
								0.15m FILL SAND: Fine to coarse grained, grey to brown, well graded			FILL 0.10: PID = 0.1 ppm
				0.30m ES				FILL: CONCRETE, pale grey 0.30m			0.15-0.30: Aggregate is angular, 5-20mm
								FILL Silty SAND: fine to medium grained, grey to dark brown, poorly graded, low plasticity silt			FILL 0.30: PID = 0.1 ppm
				0.50m ES	0.5 27.5			0.50m Silty CLAY: high plasticity, orange-brown to red-brown, with fine grained sand, trace fine grained gravel			RESIDUAL SOIL 0.50: PID = 0.1 ppm
				0.80m ES							
				SPT 15,17,15 N=32	1.0 27.0			1.00m: becoming pale grey, slightly mottled red			1.00: PID = 0.1 ppm; 1.00: PP >600 kPa
				1.0-1.45m D						VSt - H	
				1.45m	1.5 26.5		CH		w<PL		
					2.0 26.0			2.00m: with fine to medium grained ironstone gravel, sub-angular to sub-rounded			2.00: PID = 0.1 ppm
				2.5-2.70m D						H	
		VH		SPT 30,30/50mm HB N=R 2.70m	2.5 25.5			2.50m SANDSTONE: fine grained, pale grey to pale brown, heavily stained red to orange-red, inferred highly weathered, very low to low strength			HIGHLY WEATHERED MATERIAL
					3.0 25.0			3.07m Continued as Cored Drill Hole			
					3.5 24.5						
					4.0 24.0						
					4.5 23.5						
					5.0 23.0						

See Explanatory Notes for details of abbreviations & basis of descriptions.

CORED DRILL HOLE LOG

HOLE NO : BH01

FILE / JOB NO : PS223670

SHEET : 2 OF 3

CLIENT : Bloompark
LOCATION : Bayview 5 Main Drive

PROJECT : Opal Bayview SI

POSITION : E: 341927, N: 6273574 (MGA2020-56) SURFACE ELEVATION : 28.00 (AHD) ANGLE FROM HORIZONTAL : 90°

RIG TYPE : GEO205 MOUNTING : Track CONTRACTOR : Terratest DRILLER : KM

DATE STARTED : 30/6/2025 DATE COMPLETED : 1/7/2025 DATE LOGGED : 1/7/2025 LOGGED BY : HW CHECKED BY : BMS

CASING DIAMETER : 65 mm BARREL (Length) : 1.50 m BIT : 8-step BIT CONDITION : good

DRILLING					MATERIAL			FRACTURES		
PROGRESS: DRILLING & CASING	PROGRESS: WATER	(CORE LOSS RUN %) / DRILL DEPTH	RQD (%)	SAMPLES & FIELD TESTS	DEPTH (m)	GRAPHIC LOG	DESCRIPTION ROCK TYPE : Colour, Grain size, Structure (texture, fabric, mineral composition, hardness alteration, cementation, etc as applicable)	WEATHERING	ESTIMATED STRENGTH UCS=20·$I_{s(50)}$ ● - Axial ○ - Diametral ■ - UCS VL -2 L -6 M -20 H -60 VH -200 EH	NATURAL FRACTURE (mm) 20 40 100 300 1000	VISUAL	ADDITIONAL DATA (joints, partings, seams, zones, etc) Description, orientation, infilling or coating, shape, roughness, thickness, other
					0.0							
					0.5							
					1.0							
					1.5							
					2.0							
					2.5							
					3.0		3.07m START CORING AT 3.07m					
HQ3	100% RETURN	0% LOSS 3.45	100		3.5		INTERBEDDED SANDSTONE (80%) AND SILTSTONE (20%): fine grained, brown to pale grey, thinly to medium bedded at 0°-10°	HW to MW				J, 75°, Fe SN, PR, RF
	100% RETURN	0% LOSS 4.15	23	Is(50) D=0.0300 MPa Is(50) A=0.100 MPa	4.0							P, 5°, Fe SN, PR, RF P, 5°, CN, PR, RF P, 5°, CN, PR, RF J, 90°, CN, PR, RF P, 5°, CN, PR, RF FZ, clay infill P, 10°, Fe SN, PR, RF
	100% RETURN	0% LOSS 5.00	100		4.5							IS, CR infill P, 10°, Fe SN, PR, RF, sand infill J, 70°, healed
					5.0							

See Explanatory Notes for details of abbreviations & basis of descriptions.

CORED DRILL HOLE LOG

HOLE NO : BH01

FILE / JOB NO : PS223670
SHEET : 3 OF 3

CLIENT : Bloompark
LOCATION : Bayview 5 Main Drive
PROJECT : Opal Bayview SI

POSITION : E: 341927, N: 6273574 (MGA2020-56) SURFACE ELEVATION : 28.00 (AHD) ANGLE FROM HORIZONTAL : 90°

RIG TYPE : GEO205 MOUNTING : Track CONTRACTOR : Terratest DRILLER : KM

DATE STARTED : 30/6/2025 DATE COMPLETED : 1/7/2025 DATE LOGGED : 1/7/2025 LOGGED BY : HW CHECKED BY : BMS

CASING DIAMETER : 65 mm BARREL (Length) : 1.50 m BIT : 8-step BIT CONDITION : good

DRILLING						MATERIAL			FRACTURES		
PROGRESS: DRILLING & CASING	PROGRESS: WATER	(CORE LOSS RUN %) / DRILL DEPTH	RQD (%)	SAMPLES & FIELD TESTS	DEPTH (m)	GRAPHIC LOG	DESCRIPTION ROCK TYPE : Colour, Grain size, Structure (texture, fabric, mineral composition, hardness alteration, cementation, etc as applicable)	WEATHERING / ESTIMATED STRENGTH (UCS=20·$I_{s(50)}$ ● - Axial ○ - Diametral ■ - UCS)	NATURAL FRACTURE (mm)	VISUAL	ADDITIONAL DATA (joints, partings, seams, zones, etc) Description, orientation, infilling or coating, shape, roughness, thickness, other
HQ3	100% RETURN	0% LOSS 6.50	100	Is(50) D=0.0700 MPa Is(50) A=0.200 MPa	5.0 5.5 6.0		INTERBEDDED SANDSTONE (80%) AND SILTSTONE (20%): fine grained, brown to pale grey, thinly to medium bedded at 0°-10° *(continued)* 5.00m: becoming dark brown to grey-brown	HW to MW			P, 5°, Fe SN, PR, RF J, 75°, Fe SN, PR, RF
	100% RETURN	0% LOSS 8.00	87	Is(50) D=0.210 MPa Is(50) A=0.530 MPa	6.5 7.0 7.5			HW			FZ, Fe SN, CR infill
	100% RETURN	0% LOSS 9.50	93	Is(50) D=0.0400 MPa Is(50) A=0.150 MPa	8.0 8.5		7.90m INTERBEDDED SILTSTONE (80%) AND SANDSTONE (20%): pale grey to pale red-brown, medium bedded at 0°-5°, sandstone is fine grained 8.47m INTERBEDDED SANDSTONE (80%) AND SILTSTONE (20%): medium to coarse grained, pale grey to brown-grey, thinly to medium bedded at 5°-10°	MW HW MW to SW			P, 5°, PR, RF, CR infill J, 80°, Fe SN, CU, RF FZ, clay infill, CR infill
	100% RETURN	0% LOSS 10.00	20	Is(50) D=0.0600 MPa Is(50) A=0.130 MPa Is(50) D=0.300 MPa Is(50) A=0.310 MPa	9.0 9.5 10.0		10.00m Hole Terminated at 10.00 m Target depth Groundwater monitoring well installed	HW MW HW			P, 5°, PR, RF, sand infill P, 5°, PR, RF, sand infill FZ, CR infill, sand infill FZ, clay infill

See Explanatory Notes for details of abbreviations & basis of descriptions.

HOLE NO : BH01

FILE / JOB NO : PS223670
SHEET : 1 OF 2

CLIENT : Bloompark
LOCATION : Bayview 5 Main Drive

PROJECT : Opal Bayview SI

POSITION : E: 341927, N: 6273574 (MGA2020-56) SURFACE ELEVATION : 28.00 (AHD) ANGLE FROM HORIZONTAL : 90°

RIG TYPE : GEO205 MOUNTING : Track CONTRACTOR : Terratest

DATE STARTED : 30/6/2025 DATE COMPLETED : 1/7/2025 DATE LOGGED : 1/7/2025 LOGGED BY : HW CHECKED BY : BMS

DRILLING				MATERIAL			PIEZOMETER CONSTRUCTION DETAILS					
PROGRESS: DRILLING & CASING	PROGRESS: WATER	GROUND WATER LEVELS	DEPTH (m)	GRAPHIC LOG	GROUP SYMBOL	MATERIAL DESCRIPTION Soil Type, Colour, Plasticity or Particle Characteristic Secondary and Minor Components	ID	Type	Stick Up & RL	Tip Depth & RL	Installation Date	Static Water Level
							BH01	Standpipe		5.00 m 23.00 m AHD	1/7/2025	
AD/T			0.0			0.10m FILL: Brick paver, brown grey 0.15m 0.30m FILL SAND: Fine to coarse grained, grey to brown, well graded 0.50m						
			1.0		CH	FILL: CONCRETE, pale grey 0.15-0.30: Aggregate is angular, 5-20mm FILL Silty SAND: fine to medium grained, grey to dark brown, poorly graded, low plasticity silt						
			2.0			CLAY: high plasticity, orange-brown to red-brown, with fine grained sand, trace fine grained gravel 2.50m						
			3.0			1.00m: becoming pale grey, slightly mottled red 2.00m: with fine to medium grained ironstone gravel, sub-angular to sub-rounded 3.07m						
	100% RETURN					SANDSTONE: fine grained, pale grey to pale brown, heavily stained red to orange-red, inferred highly weathered, very low to low strength						
	100% RETURN		4.0			INTERBEDDED SANDSTONE (80%) AND SILTSTONE (20%): fine grained, brown to pale grey, thinly to medium bedded at 0°-10°						
	100% RETURN	Not Encountered										
	100% RETURN		5.0			5.00m: becoming dark brown to grey-brown						
HQ3	100% RETURN		6.0									
	100% RETURN		7.0									
	100% RETURN		8.0			7.90m INTERBEDDED SILTSTONE (80%) AND SANDSTONE (20%): pale grey to pale red-brown, medium bedded at 0°-5°, sandstone is fine grained 8.47m						
	100% RETURN		9.0			INTERBEDDED SANDSTONE (80%) AND SILTSTONE (20%): medium to coarse grained, pale grey to brown-grey, thinly to medium bedded at 5°-10°						
			10.0			Hole Terminated at 10.00 m Target depth 10.00m Groundwater monitoring well installed						
			11.0									

3.00 m

5.00 m

BH01

Gatic Cover

Bentonite

Gravel 5-10mm

End Cap

Bentonite

Sand backfill

See Explanatory Notes for details of abbreviations & basis of descriptions.

FINAL REPORT OF CORE PHOTOGRAPHS: BH01

CLIENT:	Bloompark	COORDS: 341927 m E 6273574 m N MGA2020-56	SHEET: 1 OF 2
PROJECT:	Opal Bayview SI	SURFACE RL: 28.00 m DATUM: AHD	DRILL RIG: GEO205
LOCATION:	Bayview - 5 Main Drive	INCLINATION: -90°	CONTRACTOR: Terratest
JOB NO:	PS223670	HOLE DIA: 110 mm HOLE DEPTH: 10.00 m	LOGGED: HW DATE: 1/7/25
			CHECKED: BMS DATE: 24/7/25

PointID : BH01 Depth Range: 3.07 - 7.00 m

FINAL REPORT OF CORE PHOTOGRAPHS: BH01

CLIENT:	Bloompark	COORDS: 341927 m E 6273574 m N MGA2020-56	SHEET: 2 OF 2
PROJECT:	Opal Bayview SI	SURFACE RL: 28.00 m DATUM: AHD	DRILL RIG: GEO205
LOCATION:	Bayview - 5 Main Drive	INCLINATION: -90°	CONTRACTOR: Terratest
JOB NO:	PS223670	HOLE DIA: 110 mm HOLE DEPTH: 10.00 m	LOGGED: HW DATE: 1/7/25
			CHECKED: BMS DATE: 24/7/25

PointID : BH01 Depth Range: 7.00 - 10.00 m

This report of core photographs must be read in conjunction with accompanying notes and abbreviations. It has been prepared for geotechnical purposes only, without attempt to assess possible contamination. Any references to potential contamination are for information only and do not necessarily indicate the presence or absence of soil or groundwater contamination.

GAP gINT FN. F31
RL1

NON-CORE DRILL HOLE - GEOLOGICAL LOG

HOLE NO : BH02

FILE / JOB NO : PS223670
SHEET : 1 OF 3

CLIENT : Bloompark
LOCATION : Bayview 5 Main Drive
PROJECT : Opal Bayview SI

POSITION : E: 341877, N: 6273566 (MGA2020-56) SURFACE ELEVATION : 26.00 (AHD) ANGLE FROM HORIZONTAL : 90°

RIG TYPE : GEO205 MOUNTING : Track CONTRACTOR : Terratest DRILLER : KM

DATE STARTED : 2/7/2025 DATE COMPLETED : 2/7/2025 DATE LOGGED : 2/7/2025 LOGGED BY : HW CHECKED BY : BMS

DRILLING						MATERIAL					
PROGRESS: DRILLING & CASING	PROGRESS: WATER	DRILLING PENETRATION	GROUND WATER LEVELS	SAMPLES & FIELD TESTS	DEPTH (m) RL (m AHD)	GRAPHIC LOG	GROUP SYMBOL	MATERIAL DESCRIPTION Soil Type, Colour, Plasticity or Particle Characteristic Secondary and Minor Components	MOISTURE CONDITION	CONSISTENCY RELATIVE DENSITY	STRUCTURE & Other Observations
AD/T		F-H	Not Encountered	0.10m ES 0.30m ES 0.50m ES 0.80m ES SPT 3,6,16 N=22 1.0-1.45m D 1.45m 2.00m ES SPT 15,30,30/100mm HB N=R 2.5-2.90m D 2.90m	0.0 26.0			FILL: CONCRETE, pale grey 0.13m			ROAD SURFACE 0.10: PID = 0 ppm 0.11-0.13: Aggregate is angular, 5-20 mm
								FILL SAND: fine to coarse grained, dark orange-brown, poorly graded, trace fine grained gravel 0.30m	M		FILL
					0.5 25.5			FILL Sandy Silty CLAY: low to medium plasticity, dark brown to pale grey, fine to coarse grained sand	w>PL		0.30: PID = 0 ppm 0.50: PID = 0 ppm
					1.0 25.0			1.10m			1.00: PID = 0.2 ppm; 1.00: PP >600 kPa
								Silty CLAY: high plasticity, pale grey to brown-grey, mottled orange-red, with fine to medium grained sand, with coarse grained ironstone gravel, sub-angular to sub-rounded		VSt	RESIDUAL SOIL
					1.5 24.5						
					2.0 24.0		CH		w<PL		2.00: PID = 0 ppm
					2.5 23.5					H	2.50: PP >600 kPa
		VH						2.80m SANDSTONE: fine grained, red-brown to grey-brown, inferred highly weathered, very low to low strength			HIGHLY WEATHERED MATERIAL
					3.0 23.0			3.20m			
								Continued as Cored Drill Hole			
					3.5 22.5						
					4.0 22.0						
					4.5 21.5						
					5.0 21.0						

See Explanatory Notes for details of abbreviations & basis of descriptions.

CORED DRILL HOLE LOG

HOLE NO : BH02

FILE / JOB NO : PS223670
SHEET : 2 OF 3

CLIENT : Bloompark
LOCATION : Bayview 5 Main Drive
PROJECT : Opal Bayview SI

POSITION : E: 341877, N: 6273566 (MGA2020-56) SURFACE ELEVATION : 26.00 (AHD) ANGLE FROM HORIZONTAL : 90°

RIG TYPE : GEO205 MOUNTING : Track CONTRACTOR : Terratest DRILLER : KM

DATE STARTED : 2/7/2025 DATE COMPLETED : 2/7/2025 DATE LOGGED : 2/7/2025 LOGGED BY : HW CHECKED BY : BMS

CASING DIAMETER : 65 mm BARREL (Length) : 1.50 m BIT : 8-step BIT CONDITION : good

DRILLING						MATERIAL				FRACTURES		
PROGRESS: DRILLING & CASING	PROGRESS: WATER	(CORE LOSS RUN %) / DRILL DEPTH	RQD (%)	SAMPLES & FIELD TESTS	DEPTH (m)	GRAPHIC LOG	DESCRIPTION ROCK TYPE : Colour, Grain size, Structure (texture, fabric, mineral composition, hardness alteration, cementation, etc as applicable)	WEATHERING	ESTIMATED STRENGTH UCS=20·$I_{s(50)}$ ● - Axial ○ - Diametral ■ - UCS VL -2 L -6 M -20 H -60 VH -200 EH	NATURAL FRACTURE (mm) 20 40 100 300 1000	VISUAL	ADDITIONAL DATA (joints, partings, seams, zones, etc) Description, orientation, infilling or coating, shape, roughness, thickness, other
					0.0							
					0.5							
					1.0							
					1.5							
					2.0							
					2.5							
					3.0							
							3.20m START CORING AT 3.20m					
HQ3	100% RETURN	0% LOSS 3.45	0		3.5		INTERBEDDED SANDSTONE (80%) AND SILTSTONE (20%): fine grained, red-brown to dark brown-grey, thinly to medium bedded at 0°-5°	HW to MW				FZ, CR infill P, 5°, Fe SN, PR, RF J, 80°, CU, RF, clay infill IS, CR infill, sand infill J, 80°, IR, RF, CR infill
		0% LOSS	50	Is(50) D=0.500 MPa Is(50) A=0.540 MPa	4.0		3.90m: becoming pale grey to pale red-brown					FZ, clay infill P, 0°, CN, PR, RF
		4.80			4.5			HW				FZ, clay infill
		0% LOSS	75	Is(50) D=0.280 MPa Is(50) A=0.470	5.0							FZ, sand infill, CR infill

See Explanatory Notes for details of abbreviations & basis of descriptions.

CORED DRILL HOLE LOG

HOLE NO : BH02

FILE / JOB NO : PS223670
SHEET : 3 OF 3

CLIENT : Bloompark
LOCATION : Bayview 5 Main Drive
PROJECT : Opal Bayview SI

POSITION : E: 341877, N: 6273566 (MGA2020-56) SURFACE ELEVATION : 26.00 (AHD) ANGLE FROM HORIZONTAL : 90°

RIG TYPE : GEO205 MOUNTING : Track CONTRACTOR : Terratest DRILLER : KM

DATE STARTED : 2/7/2025 DATE COMPLETED : 2/7/2025 DATE LOGGED : 2/7/2025 LOGGED BY : HW CHECKED BY : BMS

CASING DIAMETER : 65 mm BARREL (Length) : 1.50 m BIT : 8-step BIT CONDITION : good

DRILLING						MATERIAL				FRACTURES		
PROGRESS: DRILLING & CASING	PROGRESS: WATER	(CORE LOSS RUN %) / DRILL DEPTH	RQD (%)	SAMPLES & FIELD TESTS	DEPTH (m)	GRAPHIC LOG	DESCRIPTION ROCK TYPE : Colour, Grain size, Structure (texture, fabric, mineral composition, hardness alteration, cementation, etc as applicable)	WEATHERING	ESTIMATED STRENGTH UCS=20·$I_{s(50)}$ ● - Axial ○ - Diametral ■ - UCS VL -2 L -6 M -20 H -60 VH -200 EH	NATURAL FRACTURE (mm) 20 40 100 300 1000	VISUAL	ADDITIONAL DATA (joints, partings, seams, zones, etc) Description, orientation, infilling or coating, shape, roughness, thickness, other
HQ3	100% RETURN	0% LOSS 6.00	75	MPa Is(50) D=0.140 MPa Is(50) A=0.270 MPa	5.0 5.5 6.0	6.00m	INTERBEDDED SANDSTONE (80%) AND SILTSTONE (20%): fine grained, red-brown to dark brown-grey, thinly to medium bedded at 0°-5° *(continued)* 5.10m: becoming medium to coarse grained, pale grey to pale brown, stained orange-red, medium bedded at 10°-20° Hole Terminated at 6.00 m Target depth Groundwater monitoring well installed	HW MW				FZ, clay infill P, 10°, Fe SN, PR, RF J, 70°, CN, PR, RF P, 15°, Fe SN, PR, RF

6.5 7.0 7.5 8.0 8.5 9.0 9.5 10.0

See Explanatory Notes for details of abbreviations & basis of descriptions.

HOLE NO : BH02

FILE / JOB NO : PS223670
SHEET : 1 OF 2

CLIENT : Bloompark
LOCATION : Bayview 5 Main Drive

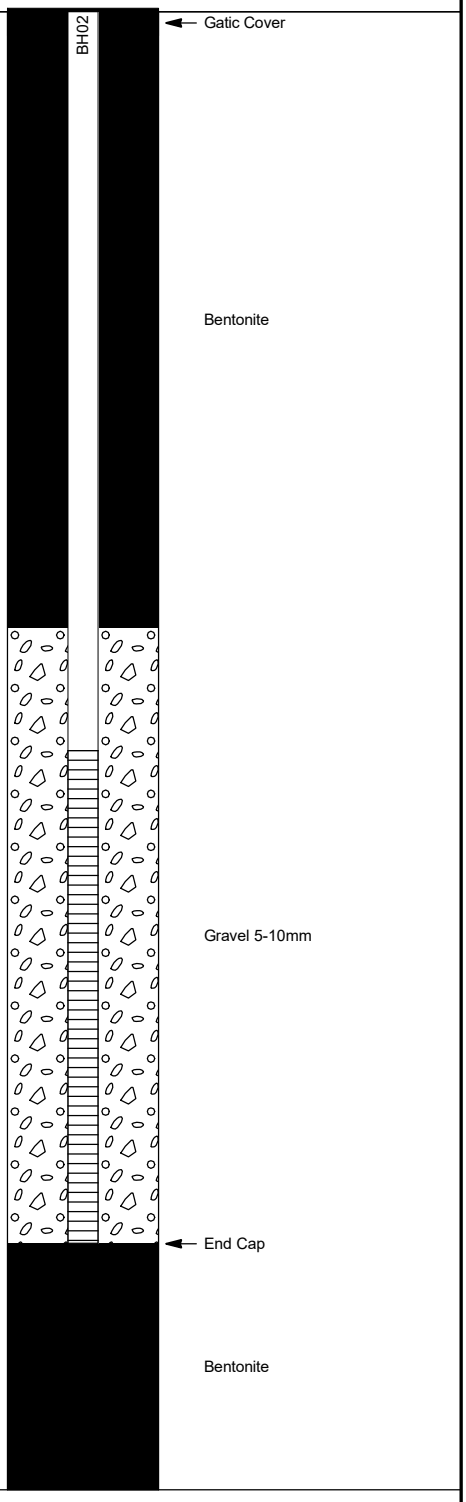
PROJECT : Opal Bayview SI

POSITION : E: 341877, N: 6273566 (MGA2020-56) SURFACE ELEVATION : 26.00 (AHD) ANGLE FROM HORIZONTAL : 90°

RIG TYPE : GEO205 MOUNTING : Track CONTRACTOR : Terratest

DATE STARTED : 2/7/2025 DATE COMPLETED : 2/7/2025 DATE LOGGED : 2/7/2025 LOGGED BY : HW CHECKED BY : BMS

DRILLING				MATERIAL			PIEZOMETER CONSTRUCTION DETAILS					
PROGRESS							ID	Type	Stick Up & RL	Tip Depth & RL	Installation Date	Static Water Level
DRILLING & CASING	WATER	GROUND WATER LEVELS	DEPTH (m)	GRAPHIC LOG	GROUP SYMBOL	MATERIAL DESCRIPTION Soil Type, Colour, Plasticity or Particle Characteristic Secondary and Minor Components	BH02	Standpipe		5.00 m 21.00 m AHD	2/7/2025	
AD/T		Not Encountered	0.0			0.13m FILL: CONCRETE, pale grey						
						0.30m FILL SAND: fine to coarse grained, dark orange-brown, poorly graded, trace fine grained gravel						
			1.0			FILL Sandy Silty CLAY: low to medium plasticity, dark brown to pale grey, fine to coarse grained sand 1.10m						
						CLAY: high plasticity, pale grey to brown-grey, mottled orange-red, with fine to medium grained sand, with coarse grained ironstone gravel, sub-angular to sub-rounded						
			2.0		CH							
						2.80m SANDSTONE: fine grained, red-brown to grey-brown, inferred highly weathered, very low to low strength						
			3.0			3.20m INTERBEDDED SANDSTONE (80%) AND SILTSTONE (20%): fine grained, red-brown to dark brown-grey, thinly to medium bedded at 0°-5°	3.00 m					
HQ3	100% RETURN		4.0			3.90m: becoming pale grey to pale red-brown						
	100% RETURN											
	100% RETURN		5.0			5.10m: becoming medium to coarse grained, pale grey to pale brown, stained orange-red, medium bedded at 10°-20°	5.00 m					
						6.00m Hole Terminated at 6.00 m Target depth Groundwater monitoring well installed						
			6.0									



See Explanatory Notes for details of abbreviations & basis of descriptions.

FINAL REPORT OF CORE PHOTOGRAPHS: BH02

CLIENT:	Bloompark	COORDS: 341877 m E 6273566 m N MGA2020-56	SHEET: 1 OF 1
PROJECT:	Opal Bayview SI	SURFACE RL: 26.00 m DATUM: AHD	DRILL RIG: GEO205
LOCATION:	Bayview - 5 Main Drive	INCLINATION: -90°	CONTRACTOR: Terratest
JOB NO:	PS223670	HOLE DIA: 110 mm HOLE DEPTH: 6.00 m	LOGGED: HW DATE: 2/7/25
			CHECKED: BMS DATE: 24/7/25

PointID : BH02 Depth Range: 3.20 - 6.00 m

This report of core photographs must be read in conjunction with accompanying notes and abbreviations. It has been prepared for geotechnical purposes only, without attempt to assess possible contamination. Any references to potential contamination are for information only and do not necessarily indicate the presence or absence of soil or groundwater contamination.

GAP gINT FN. F31
RL1

NON-CORE DRILL HOLE - GEOLOGICAL LOG

HOLE NO : BH03

FILE / JOB NO : PS223670
SHEET : 1 OF 3

CLIENT : Bloompark
LOCATION : Bayview 5 Main Drive
PROJECT : Opal Bayview SI

POSITION : E: 341910, N: 6273523 (MGA2020-56) | SURFACE ELEVATION : 26.00 (AHD) | ANGLE FROM HORIZONTAL : 90°

RIG TYPE : GEO205 | MOUNTING : Track | CONTRACTOR : Terratest | DRILLER : KM

DATE STARTED : 3/7/2025 | DATE COMPLETED : 4/7/2025 | DATE LOGGED : 4/7/2025 | LOGGED BY : HW | CHECKED BY : BMS

DRILLING					MATERIAL					
PROGRESS: DRILLING & CASING	PROGRESS: WATER	DRILLING PENETRATION	GROUND WATER LEVELS	SAMPLES & FIELD TESTS	DEPTH (m) RL (m AHD)	GRAPHIC LOG	GROUP SYMBOL	MATERIAL DESCRIPTION Soil Type, Colour, Plasticity or Particle Characteristic Secondary and Minor Components	MOISTURE CONDITION	CONSISTENCY RELATIVE DENSITY	STRUCTURE & Other Observations
AD/T		F-H	Not Encountered	0.10m ES 0.30m ES 0.50m ES 0.2-0.7m B 0.80m ES SPT 25,10,13 N=23 1.0-1.45m D 1.45m	0.0 (26.0)			FILL: Asphalt pavement, dark grey 0.10m	D		ROAD SURFACE 0.00-0.10: Aggregate is angular, 5-10 mm FILL 0.10: PID = 0.1 ppm
					0.5 (25.5)			FILL Gravelly SAND: fine to coarse grained, brown-grey, poorly graded, fine to medium grained gravel, sub-angular to angular 0.40m			
					1.0 (25.0)			Silty Sandy CLAY: high plasticity, pale grey to brown, mottled red-orange, sand is fine grained, with fine to coarse grained ironstone gravel, sub-rounded			RESIDUAL SOIL 0.50: PID = 0.1 ppm 1.00: PID = 0.1 ppm; 1.00: PP >600 kPa
					1.5 (24.5)		CH		w<PL	VSt to H	
					2.0 (24.0)						
				SPT 25,15,30/100mm HB N=R 2.5-2.90m D 2.90m	2.5 (23.5)			2.80m			2.50: PP >600 kPa
		VH			3.0 (23.0)			SANDSTONE: fine grained, pale grey to pale brown, inferred highly weathered, very low to low strength 3.10m			HIGHLY WEATHERED MATERIAL
					3.5 (22.5)			Continued as Cored Drill Hole			
					4.0 (22.0)						
					4.5 (21.5)						
					5.0 (21.0)						

See Explanatory Notes for details of abbreviations & basis of descriptions.

CORED DRILL HOLE LOG

HOLE NO : BH03

FILE / JOB NO : PS223670
SHEET : 2 OF 3

CLIENT : Bloompark
LOCATION : Bayview 5 Main Drive
PROJECT : Opal Bayview SI

POSITION : E: 341910, N: 6273523 (MGA2020-56) | SURFACE ELEVATION : 26.00 (AHD) | ANGLE FROM HORIZONTAL : 90°

RIG TYPE : GEO205 | MOUNTING : Track | CONTRACTOR : Terratest | DRILLER : KM

DATE STARTED : 3/7/2025 | DATE COMPLETED : 4/7/2025 | DATE LOGGED : 4/7/2025 | LOGGED BY : HW | CHECKED BY : BMS

CASING DIAMETER : 65 mm | BARREL (Length) : 1.50 m | BIT : 8-step | BIT CONDITION : good

DRILLING					MATERIAL				FRACTURES		
PROGRESS: DRILLING & CASING	PROGRESS: WATER	(CORE LOSS RUN %) / DRILL DEPTH	RQD (%)	SAMPLES & FIELD TESTS	DEPTH (m)	GRAPHIC LOG	DESCRIPTION ROCK TYPE : Colour, Grain size, Structure (texture, fabric, mineral composition, hardness alteration, cementation, etc as applicable)	WEATHERING	ESTIMATED STRENGTH UCS=20·$I_{s(50)}$ ● - Axial ○ - Diametral ■ - UCS VL -2 L -6 M -20 H -60 VH -200 EH	NATURAL FRACTURE (mm) 20 40 100 300 1000	VISUAL	ADDITIONAL DATA (joints, partings, seams, zones, etc) Description, orientation, infilling or coating, shape, roughness, thickness, other
					0.0							
					0.5							
					1.0							
					1.5							
					2.0							
					2.5							
					3.0		3.10m START CORING AT 3.10m					
HQ3	100% RETURN	0% LOSS 3.40	80		3.5		INTERBEDDED SANDSTONE (80%) AND SILTSTONE (20%): fine to coarse grained, pale grey to red-brown, thinly to medium bedded at 5°-10°	HW to MW				FZ, clay infill
	100% RETURN	0% LOSS	83	Is(50) D=0.550 MPa Is(50) A=0.380 MPa	4.0		4.03m: becoming orange-brown to pale grey, with cross bedded at 10°-20°					FZ, clay infill
					4.5							P, 20°, Fe SN, PR, RF
		4.90		Is(50) D=0.0900 MPa				HW				J, 60°, healed
		0% LOSS	100		5.0							

See Explanatory Notes for details of abbreviations & basis of descriptions.

CORED DRILL HOLE LOG

HOLE NO : BH03

FILE / JOB NO : PS223670
SHEET : 3 OF 3

CLIENT : Bloompark
LOCATION : Bayview 5 Main Drive
PROJECT : Opal Bayview SI

POSITION : E: 341910, N: 6273523 (MGA2020-56) SURFACE ELEVATION : 26.00 (AHD) ANGLE FROM HORIZONTAL : 90°

RIG TYPE : GEO205 MOUNTING : Track CONTRACTOR : Terratest DRILLER : KM

DATE STARTED : 3/7/2025 DATE COMPLETED : 4/7/2025 DATE LOGGED : 4/7/2025 LOGGED BY : HW CHECKED BY : BMS

CASING DIAMETER : 65 mm BARREL (Length) : 1.50 m BIT : 8-step BIT CONDITION : good

DRILLING						MATERIAL				FRACTURES		
PROGRESS: DRILLING & CASING	PROGRESS: WATER	(CORE LOSS RUN %) / DRILL DEPTH	RQD (%)	SAMPLES & FIELD TESTS	DEPTH (m)	GRAPHIC LOG	DESCRIPTION ROCK TYPE : Colour, Grain size, Structure (texture, fabric, mineral composition, hardness alteration, cementation, etc as applicable)	WEATHERING	ESTIMATED STRENGTH UCS=20·$I_{s(50)}$ ● - Axial ○ - Diametral ■ - UCS VL -2 L -6 M -20 H -60 VH -200 EH	NATURAL FRACTURE (mm) 20 40 100 300 1000	VISUAL	ADDITIONAL DATA (joints, partings, seams, zones, etc) Description, orientation, infilling or coating, shape, roughness, thickness, other
HQ3	100% RETURN	0% LOSS	100	Is(50) A=0.0200 MPa	5.0		INTERBEDDED SANDSTONE (80%) AND SILTSTONE (20%): fine to coarse grained, pale grey to red-brown, thinly to medium bedded at 5°-10° *(continued)*	MW to SW				P, 10°, Fe SN, PR, RF J, 70°, healed
					5.5		5.30m: becoming pale brown-grey					J, 70°, Fe SN, PR, RF, CR infill
		6.15		Is(50) D=0.250 MPa Is(50) A=0.460 MPa	6.0	6.15m						P, 15°, CN, PR, RF J, 60°, PR, RF, CR infill
							Hole Terminated at 6.15 m Target depth Groundwater monitoring well installed					
					6.5							
					7.0							
					7.5							
					8.0							
					8.5							
					9.0							
					9.5							
					10.0							

See Explanatory Notes for details of abbreviations & basis of descriptions.

HOLE NO : BH03

FILE / JOB NO : PS223670
SHEET : 1 OF 2

CLIENT : Bloompark
LOCATION : Bayview 5 Main Drive

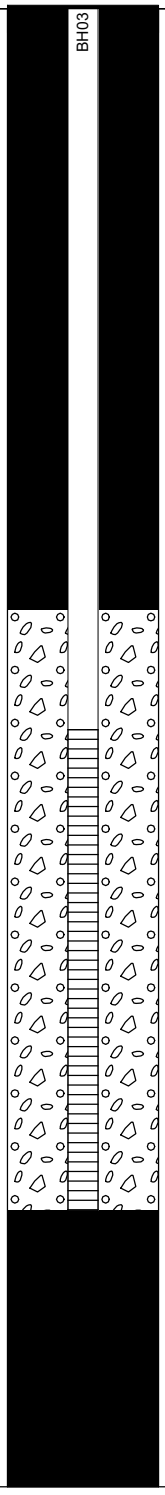
PROJECT : Opal Bayview SI

POSITION : E: 341910, N: 6273523 (MGA2020-56) SURFACE ELEVATION : 26.00 (AHD) ANGLE FROM HORIZONTAL : 90°

RIG TYPE : GEO205 MOUNTING : Track CONTRACTOR : Terratest

DATE STARTED : 3/7/2025 DATE COMPLETED : 4/7/2025 DATE LOGGED : 4/7/2025 LOGGED BY : HW CHECKED BY : BMS

DRILLING				MATERIAL			PIEZOMETER CONSTRUCTION DETAILS					
PROGRESS: DRILLING & CASING	PROGRESS: WATER	GROUND WATER LEVELS	DEPTH (m)	GRAPHIC LOG	GROUP SYMBOL	MATERIAL DESCRIPTION Soil Type, Colour, Plasticity or Particle Characteristic Secondary and Minor Components	ID	Type	Stick Up & RL	Tip Depth & RL	Installation Date	Static Water Level
							BH03	Standpipe		5.00 m 21.00 m AHD	4/7/2025	
AD/T 65mm		Not Encountered	0.0			0.10m FILL: Asphalt pavement, dark grey 0.00-0.10: Aggregate is angular, 5-10 mm 0.40m FILL Gravelly SAND: fine to coarse grained, brown-grey, poorly graded, fine to medium grained gravel, sub-angular to angular						
			1.0		CH	CLAY: high plasticity, pale grey to brown, mottled red-orange, with fine to coarse grained ironstone gravel, sub-rounded						
			2.0			2.80m						
			3.0			SANDSTONE: fine grained, pale grey to pale brown, inferred highly weathered, very low to low strength 3.10m						
HQ3	100% RETURN					INTERBEDDED SANDSTONE (80%) AND SILTSTONE (20%): fine to coarse grained, pale grey to red-brown, thinly to medium bedded at 5°-10°		3.00 m				
	100% RETURN		4.0			4.03m: becoming orange-brown to pale grey, with cross bedded at 10°-20°						
	100% RETURN		5.0			5.30m: becoming pale brown-grey		5.00 m				
	100% RETURN		6.0			6.15m						
						Hole Terminated at 6.15 m Target depth Groundwater monitoring well installed						



See Explanatory Notes for details of abbreviations & basis of descriptions.

FINAL REPORT OF CORE PHOTOGRAPHS: BH03

CLIENT:	Bloompark	COORDS: 341910 m E 6273523 m N MGA2020-56	SHEET: 1 OF 1
PROJECT:	Opal Bayview SI	SURFACE RL: 26.00 m DATUM: AHD	DRILL RIG: GEO205
LOCATION:	Bayview - 5 Main Drive	INCLINATION: -90°	CONTRACTOR: Terratest
JOB NO:	PS223670	HOLE DIA: 110 mm HOLE DEPTH: 6.15 m	LOGGED: HW DATE: 4/7/25
			CHECKED: BMS DATE: 24/7/25

PointID : BH03 Depth Range: 3.10 - 6.15 m

NON-CORE DRILL HOLE - GEOLOGICAL LOG

HOLE NO : BH05

FILE / JOB NO : PS223670
SHEET : 1 OF 1

CLIENT : Bloompark
LOCATION : Bayview 5 Main Drive
PROJECT : Opal Bayview SI

POSITION : E: 341901, N: 6273603 (MGA2020-56) | SURFACE ELEVATION : 28.00 (AHD) | ANGLE FROM HORIZONTAL : 90°

RIG TYPE : GEO205 | MOUNTING : Track | CONTRACTOR : Terratest | DRILLER : KM

DATE STARTED : 1/7/2025 | DATE COMPLETED : 1/7/2025 | DATE LOGGED : 1/7/2025 | LOGGED BY : HW | CHECKED BY : BMS

DRILLING					MATERIAL						
PROGRESS: DRILLING & CASING	PROGRESS: WATER	DRILLING PENETRATION	GROUND WATER LEVELS	SAMPLES & FIELD TESTS	DEPTH (m) RL (m AHD)	GRAPHIC LOG	GROUP SYMBOL	MATERIAL DESCRIPTION Soil Type, Colour, Plasticity or Particle Characteristic Secondary and Minor Components	MOISTURE CONDITION	CONSISTENCY RELATIVE DENSITY	STRUCTURE & Other Observations
AD/T		F-H	Not Encountered	0.10m ES 0.30m ES 0.50m ES 0.80m ES 1.0-1.05m D SPT 30/50mm HB N=R 1.05m	0.0 (28.0)			0.05m FILL: Asphalt pavement, dark grey FILL Gravelly Silty SAND: fine to coarse grained, grey to dark grey, poorly graded, fine to medium grained gravel, sub-angular to sub-rounded 0.40m	D		ROAD SURFACE 0.00-0.05: Aggregate is angular, 5-10 mm FILL 0.10: PID = 0.2 ppm
					0.5 (27.5)			Sandy Gravelly CLAY: high plasticity, pale grey, mottled orange-red, gravel is fine to medium grained, sub-angular, sand is fine to medium grained		VSt	RESIDUAL SOIL 0.50: PID = 0 ppm
					1.0 (27.0)						1.00: PID = 0 ppm; 1.00: PP >600 kPa
					1.5 (26.5)		CH		w<PL		
					2.0 (26.0)					H	
				SPT 7,10,21 N=31 2.5-2.95m D 2.95m	2.5 (25.5)						2.50: PP >600 kPa
		VH			3.0 (25.0)			3.00m SANDSTONE: fine grained, pale grey, stained orange, inferred highly weathered, very low to low strength			HIGHLY WEATHERED MATERIAL
				4.0-4.20m D SPT 25,30/50mm HB N=R 4.20m	3.5 (24.5)						
					4.0 (24.0)			4.20m Hole Terminated at 4.20 m Target depth Grouted to surface			
					4.5 (23.5)						
					5.0 (23.0)						

See Explanatory Notes for details of abbreviations & basis of descriptions.

NON-CORE DRILL HOLE - GEOLOGICAL LOG

HOLE NO : BH06

FILE / JOB NO : PS223670
SHEET : 1 OF 1

CLIENT : Bloompark
LOCATION : Bayview 5 Main Drive
PROJECT : Opal Bayview SI

POSITION : E: 341916, N: 6273551 (MGA2020-56) | SURFACE ELEVATION : 26.00 (AHD) | ANGLE FROM HORIZONTAL : 90°

RIG TYPE : GEO205 | MOUNTING : Track | CONTRACTOR : Terratest | DRILLER : KM

DATE STARTED : 2/7/2025 | DATE COMPLETED : 2/7/2025 | DATE LOGGED : 2/7/2025 | LOGGED BY : HW | CHECKED BY : BMS

DRILLING						MATERIAL					
PROGRESS: DRILLING & CASING	PROGRESS: WATER	DRILLING PENETRATION	GROUND WATER LEVELS	SAMPLES & FIELD TESTS	DEPTH (m) RL (m AHD)	GRAPHIC LOG	GROUP SYMBOL	MATERIAL DESCRIPTION Soil Type, Colour, Plasticity or Particle Characteristic Secondary and Minor Components	MOISTURE CONDITION	CONSISTENCY RELATIVE DENSITY	STRUCTURE & Other Observations
AD/T				0.10m ES	0.0 26.0			0.10m FILL: Brick paver, brown grey			ROAD SURFACE
								0.15m FILL SAND: Fine to coarse grained, grey to brown, well graded			0.10: PID = 0.1 ppm
				0.30m ES				FILL: CONCRETE, pale grey	M to W		FILL 0.15-0.40: Aggregate is angular, 5-20 mm
								0.40m			
				0.50m ES	0.5 25.5			Silty CLAY: high plasticity, pale grey to red-brown, with fine to medium grained sand, trace fine to coarse grained ironstone gravel, sub-rounded			RESIDUAL SOIL 0.50: PID = 0 ppm
		F-H		0.80m ES							
				1.0-1.25m D SPT 15,30/100mm HB N=R	1.0 25.0						1.00: PID = 0 ppm; 1.00: PP >600 kPa
				1.25m							
			Not Encountered		1.5 24.5		CH		w<PL	VSt to H	
					2.0 24.0			2.20m			
								SANDSTONE: fine grained, pale grey to dark brown, inferred highly weathered, very low to low strength			HIGHLY WEATHERED MATERIAL
				2.5-2.70m D SPT 15,30/50mm HB N=R 2.70m	2.5 23.5						
		VH						2.90m			
					3.0 23.0			Hole Terminated at 2.90 m Target depth Grouted to surface			
					3.5 22.5						
					4.0 22.0						
					4.5 21.5						
					5.0 21.0						

See Explanatory Notes for details of abbreviations & basis of descriptions.

NON-CORE DRILL HOLE - GEOLOGICAL LOG

HOLE NO : BH07

FILE / JOB NO : PS223670
SHEET : 1 OF 1

CLIENT : Bloompark
LOCATION : Bayview 5 Main Drive
PROJECT : Opal Bayview SI

POSITION : E: 341945, N: 6273562 (MGA2020-56) | SURFACE ELEVATION : 28.00 (AHD) | ANGLE FROM HORIZONTAL : 90°

RIG TYPE : GEO205 | MOUNTING : Track | CONTRACTOR : Terratest | DRILLER : KM

DATE STARTED : 30/6/2025 | DATE COMPLETED : 30/6/2025 | DATE LOGGED : 30/6/2025 | LOGGED BY : HW | CHECKED BY : BMS

DRILLING					MATERIAL					
PROGRESS: DRILLING & CASING	PROGRESS: WATER	DRILLING PENETRATION	GROUND WATER LEVELS	SAMPLES & FIELD TESTS	DEPTH (m) RL (m AHD)	GRAPHIC LOG	GROUP SYMBOL	MATERIAL DESCRIPTION Soil Type, Colour, Plasticity or Particle Characteristic Secondary and Minor Components	MOISTURE CONDITION	CONSISTENCY RELATIVE DENSITY	STRUCTURE & Other Observations
AD/T		F-H	Not Encountered	0.10m ES	0.0 28.0			FILL: Brick paver, brown grey			ROAD SURFACE 0.00-0.10: Aggregate is angular, 5-10 mm
					0.10m 0.15m			FILL SAND: Fine to coarse grained, grey to brown, well graded	D		0.10: PID = 0.2 ppm
				0.30m ES				FILL: CONCRETE, pale grey			FILL 0.15-0.30: Aggregate is angular, 5-20 mm
					0.30m			FILL Silty SAND: fine to medium grained, grey to dark brown, poorly graded, low plasticity silt	D		
				0.50m ES	0.5 27.5			Silty CLAY: high plasticity, red-brown to orange-grey, with fine to medium grained sand.			RESIDUAL SOIL 0.50: PID = 0.2 ppm RESIDUAL SOIL
				0.80m ES							
				SPT 5,10,19 N=29	1.0 27.0						1.00: PID = 0.2 ppm; 1.00: PP >600 kPa
				1.0-1.45m D			CH		w<PL	VSt	
				1.45m	1.5 26.5			1.50m: becoming pale grey, mottled red			
					2.00m						
		VH		2.5-2.75m D	2.0 26.0			SANDSTONE: fine grained, brown to pale grey, stained red to orange, inferred highly weathered, very low to low strength			HIGHLY WEATHERED MATERIAL 2.00: PID = 0.1 ppm
				SPT 14,30/100mm HB N=R	2.5 25.5						
				2.75m							
					3.0 25.0			3.0m: becoming low to medium strength			
					3.5 24.5						
				4.0-4.05m D							
				SPT 20/50mm HB N=R 4.05m	4.0 24.0						
					4.5 23.5						
					4.70m			Hole Terminated at 4.70 m Target depth Grouted to surface			
					5.0 23.0						

See Explanatory Notes for details of abbreviations & basis of descriptions.

NON-CORE DRILL HOLE - GEOLOGICAL LOG

HOLE NO : BH08

FILE / JOB NO : PS223670
SHEET : 1 OF 1

CLIENT : Bloompark
LOCATION : Bayview 5 Main Drive
PROJECT : Opal Bayview SI

POSITION : E: 341926, N: 6273516 (MGA2020-56) | SURFACE ELEVATION : 27.00 (AHD) | ANGLE FROM HORIZONTAL : 90°

RIG TYPE : GEO205 | MOUNTING : Track | CONTRACTOR : Terratest | DRILLER : KM

DATE STARTED : 3/7/2025 | DATE COMPLETED : 3/7/2025 | DATE LOGGED : 3/7/2025 | LOGGED BY : HW | CHECKED BY : BMS

DRILLING					MATERIAL						
PROGRESS: DRILLING & CASING	PROGRESS: WATER	DRILLING PENETRATION	GROUND WATER LEVELS	SAMPLES & FIELD TESTS	DEPTH (m) RL (m AHD)	GRAPHIC LOG	GROUP SYMBOL	MATERIAL DESCRIPTION Soil Type, Colour, Plasticity or Particle Characteristic Secondary and Minor Components	MOISTURE CONDITION	CONSISTENCY RELATIVE DENSITY	STRUCTURE & Other Observations
AD/T		F-H	Not Encountered	0.10m ES 0.30m ES 0.50m ES 0.2-0.6m B 0.80m ES	0.0 (27.0)			FILL: Asphalt pavement, dark grey	D		ROAD SURFACE 0.00-0.15: Aggregate is angular, 5-10 mm
					0.15m			FILL Gravelly SAND: fine to coarse grained, brown-grey, poorly graded, medium to coarse grained gravel, angular			0.10: PID = 0.2 ppm
					0.30m						FILL
					0.5 (26.5)			Silty CLAY: high plasticity, pale grey to pale brown, mottled red-orange, with fine to medium grained sand, with medium to coarse grained ironstone gravel, sub-rounded			RESIDUAL SOIL 0.50: PID = 0 ppm
				SPT 10,10,17 N=27 1.0-1.45m D	1.0 (26.0)		CH		w<PL	VSt to H	1.00: PID = 0 ppm; 1.00: PP >600 kPa
				1.45m	1.5 (25.5)						
		VH			1.70m			SANDSTONE: fine grained, pale grey to brown-grey, inferred highly weathered, very low to low strength			HIGHLY WEATHERED MATERIAL
					2.0 (25.0)						
					2.50m			Hole Terminated at 2.50 m Target depth Grouted to surface			
					2.5 (24.5)						
					3.0 (24.0)						
					3.5 (23.5)						
					4.0 (23.0)						
					4.5 (22.5)						
					5.0 (22.0)						

See Explanatory Notes for details of abbreviations & basis of descriptions.

NON-CORE DRILL HOLE - GEOLOGICAL LOG

HOLE NO : BH09

FILE / JOB NO : PS223670
SHEET : 1 OF 1

CLIENT : Bloompark
LOCATION : Bayview 5 Main Drive
PROJECT : Opal Bayview SI

POSITION : E: 341948, N: 6273493 (MGA2020-56) SURFACE ELEVATION : 26.00 (AHD) ANGLE FROM HORIZONTAL : 90°

RIG TYPE : GEO205 MOUNTING : Track CONTRACTOR : Terratest DRILLER : KM

DATE STARTED : 3/7/2025 DATE COMPLETED : 3/7/2025 DATE LOGGED : 3/7/2025 LOGGED BY : HW CHECKED BY : BMS

DRILLING						MATERIAL						
PROGRESS: DRILLING & CASING	PROGRESS: WATER	DRILLING PENETRATION	GROUND WATER LEVELS	SAMPLES & FIELD TESTS	DEPTH (m) RL (m AHD)	GRAPHIC LOG	GROUP SYMBOL	MATERIAL DESCRIPTION Soil Type, Colour, Plasticity or Particle Characteristic Secondary and Minor Components	MOISTURE CONDITION	CONSISTENCY RELATIVE DENSITY	STRUCTURE & Other Observations
AD/T		F-H	Not Encountered	0.10m ES 0.30m ES 0.50m ES 0.80m ES 1.0-1.10m D SPT 30/100mm HB N=R 1.10m	0.0 26.0			FILL: Asphalt pavement, dark grey	D		ROAD SURFACE 0.00-0.15: Aggregate is angular, 5-10 mm
								0.15m FILL Gravelly SAND: fine to coarse grained, brown-grey, poorly graded, medium to coarse grained gravel, angular			0.10: PID = 0.1 ppm FILL
								0.30m Silty CLAY: high plasticity, pale grey to pale brown, mottled orange to red, with fine grained sand, with fine to coarse grained ironstone gravel, sub-rounded to rounded			RESIDUAL SOIL
		VH			0.5 25.5		CH		w<PL	H	0.50: PID = 0.4 ppm
					1.0 25.0						1.00: PID = 0.3 ppm; 1.00: PP >600 kPa
								1.30m Hole Terminated at 1.30 m Target depth Grouted to surface			
					1.5 24.5						
					2.0 24.0						
					2.5 23.5						
					3.0 23.0						
					3.5 22.5						
					4.0 22.0						
					4.5 21.5						
					5.0 21.0						

See Explanatory Notes for details of abbreviations & basis of descriptions.

Appendix B

Laboratory certificates

MACQUARIE GEOTECH

Test Report

Determination of the moisture content of a soil - Oven drying method (standard method)

Methodology	AS 1289.2.1.1
Client	WSP Australia Pty Ltd
Address	Level 27, 680 George St, Sydney NSW 2000
Project	PS223670 - Opal Bayview
MG Project No.	S25349-1
Report No.	S107795-AS_MC
Sampling Method	Sampled by Client - results apply to the sample as received
Preparation Method	Prepared in accordance with the test method

MG Sample No.	Sample ID	Date Sampled	Date Tested	Sample Description	Moisture Content (%)
S107795	BH1_1.0-1.45m	Unknown	14/07/2025	Silty CLAY, trace of Sand	14.3
S107798	BH1_2.5-2.7m	Unknown	14/07/2025	Silty CLAY	9.7
S107799	BH2_1.0-1.45m	Unknown	14/07/2025	Silty CLAY	20.5
S107803	BH3_1.0-1.45m	Unknown	14/07/2025	Silty Sandy CLAY	11.7
S107805	BH5_1.0-1.05m	Unknown	14/07/2025	Sandy Gravelly CLAY	7.1
S107807	BH6_1.0-1.25m	Unknown	14/07/2025	Silty CLAY	9.6
S107809	BH7_1.0-1.45m	Unknown	14/07/2025	Silty CLAY	17.5
S107812	BH7_4.0-4.05m	Unknown	14/07/2025	Silty CLAY	6.8
S107813	BH8_1.0-1.45m	Unknown	14/07/2025	Silty CLAY	14.8

Notes

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14 Carter Street, Lidcombe NSW 2141 (Sydney Laboratory)

Authorised Signatory Divye Grover

Date of Issue 25/07/2025

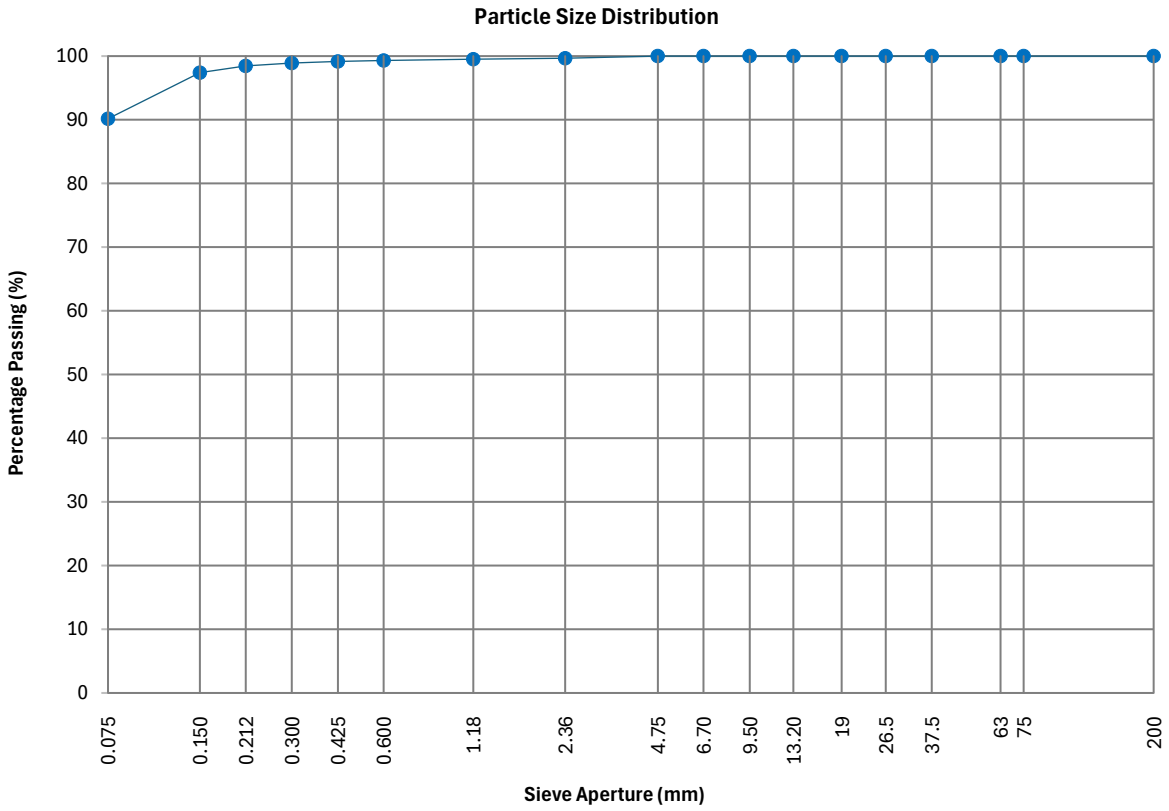
MACQUARIE GEOTECH

Test Report

Determination of the particle size distribution of a soil - Standard method of analysis by sieving

Methodology	AS 1289.3.6.1		
Client	WSP Australia Pty Ltd	**MG Sample No.**	S107795
Address	Level 27, 680 George St, Sydney NSW 2000	**MG Project No.**	S25349-1
Project	PS223670 - Opal Bayview	**Date Sampled**	Unknown
Sample ID	BH1_1.0-1.45m	**Date Received**	4/07/2025
Report No.	S107795-AS_PSD	**Date Tested**	25/07/2025
Sampling Method	Sampled by Client - results apply to the sample as received		
Preparation Method	Prepared in accordance with the test method		
Sample Description	Silty CLAY, trace of Sand		

Sieve Aperture (mm)	Percentage Passing (%)
200	**100**
75	**100**
63	**100**
37.5	**100**
26.5	**100**
19.0	**100**
13.2	**100**
9.5	**100**
6.7	**100**
4.75	**100**
2.36	**100**
1.18	**100**
0.600	**99**
0.425	**99**
0.300	**99**
0.212	**98**
0.150	**97**
0.075	**90**



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Date of Issue 25/07/2025

MACQUARIE GEOTECH

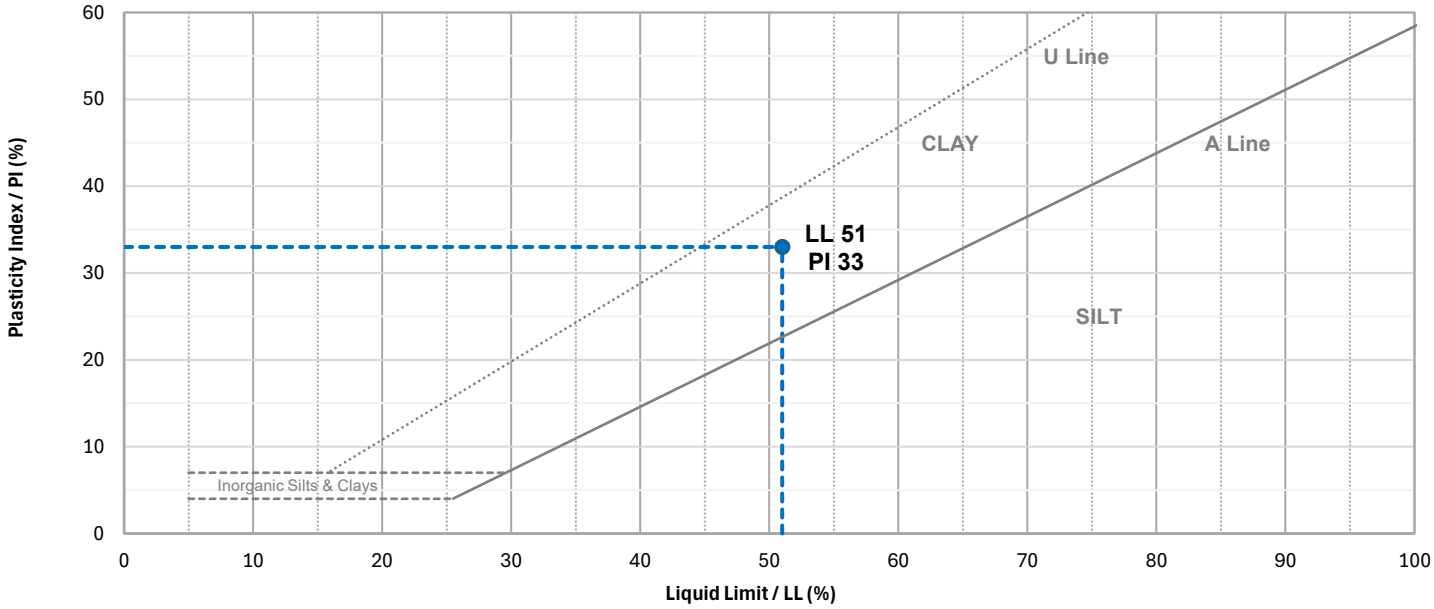
Test Report

Determination of the liquid limit, plastic limit, plasticity index and linear shrinkage of a soil

Methodology	AS 1289.3.1.1, 3.2.1, 3.3.1, 3.4.1		
Client	WSP Australia Pty Ltd	**MG Sample No.**	S107799
Address	Level 27, 680 George St, Sydney NSW 2000	**MG Project No.**	S25349-1
Project	PS223670 - Opal Bayview	**Date Sampled**	Unknown
Sample ID	BH2_1.0-1.45m	**Date Received**	4/07/2025
Report No.	S107799-AS_PI	**Date Tested**	17/07/2025
Sampling Method	Sampled by Client - results apply to the sample as received		
Preparation Method	Prepared in accordance with the test method		
Sample Description	Silty CLAY		

Plasticity Chart for Classification of Fine-Grained Soils

AS 1726:2017 Clause 6.1.6 (Figure 5)



Preparation		**Results**	
Method of Preparation	**Air Dried**	Liquid Limit (%)	**51**
History of the Sample	**Dry Sieved**	Plastic Limit (%)	**18**
Equipment Details		Plasticity Index (%)	**33**
Length of Linear Shrinkage Mould (mm)	**125**	Linear Shrinkage (%)	**12.5**
		Condition Upon Drying	**Linear**

Notes

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Date of Issue 24/07/2025

MACQUARIE GEOTECH

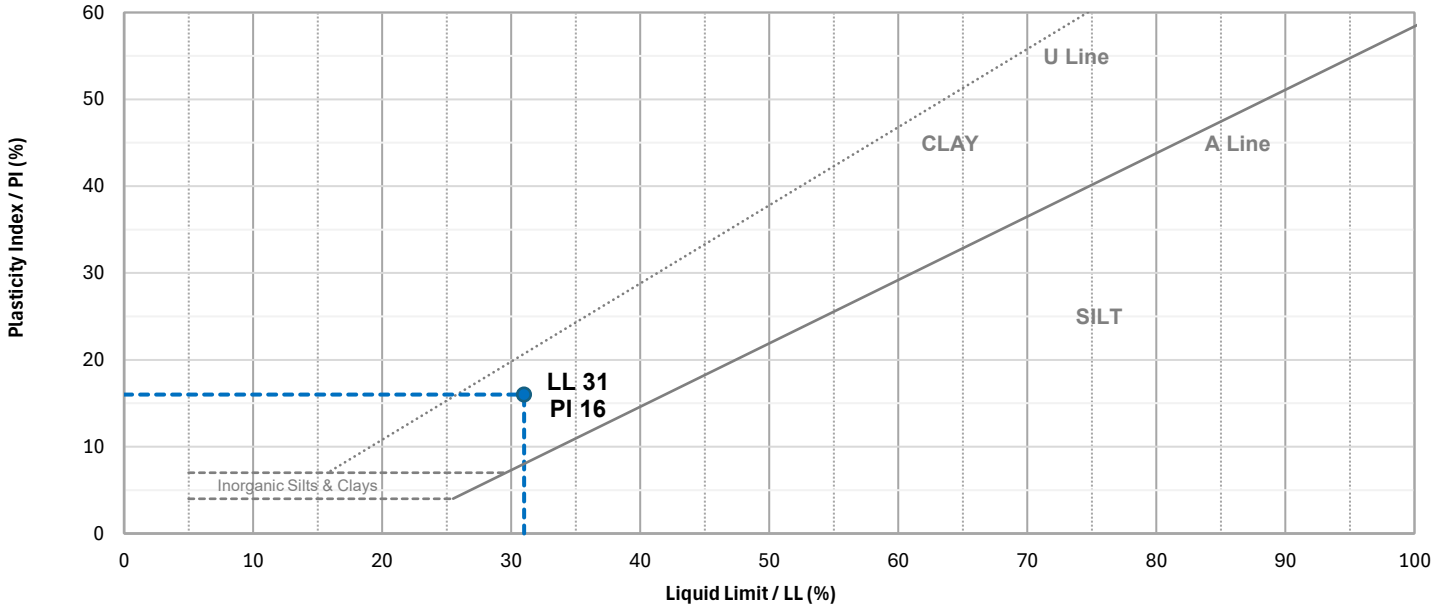
Test Report

Determination of the liquid limit, plastic limit, plasticity index and linear shrinkage of a soil

Methodology	AS 1289.3.1.1, 3.2.1, 3.3.1, 3.4.1		
Client	WSP Australia Pty Ltd	**MG Sample No.**	S107801
Address	Level 27, 680 George St, Sydney NSW 2000	**MG Project No.**	S25349-1
Project	PS223670 - Opal Bayview	**Date Sampled**	Unknown
Sample ID	BH2_2.5-2.9m	**Date Received**	4/07/2025
Report No.	S107801-AS_PI	**Date Tested**	18/07/2025
Sampling Method	Sampled by Client - results apply to the sample as received		
Preparation Method	Prepared in accordance with the test method		
Sample Description	Silty Sandy CLAY		

Plasticity Chart for Classification of Fine-Grained Soils

AS 1726:2017 Clause 6.1.6 (Figure 5)



Preparation		**Results**	
Method of Preparation	**Air Dried**	Liquid Limit (%)	**31**
History of the Sample	**Dry Sieved**	Plastic Limit (%)	**14**
Equipment Details		Plasticity Index (%)	**16**
Length of Linear Shrinkage Mould (mm)	**126**	Linear Shrinkage (%)	**8.0**
		Condition Upon Drying	**Linear**

Notes

MACQUARIE GEOTECH

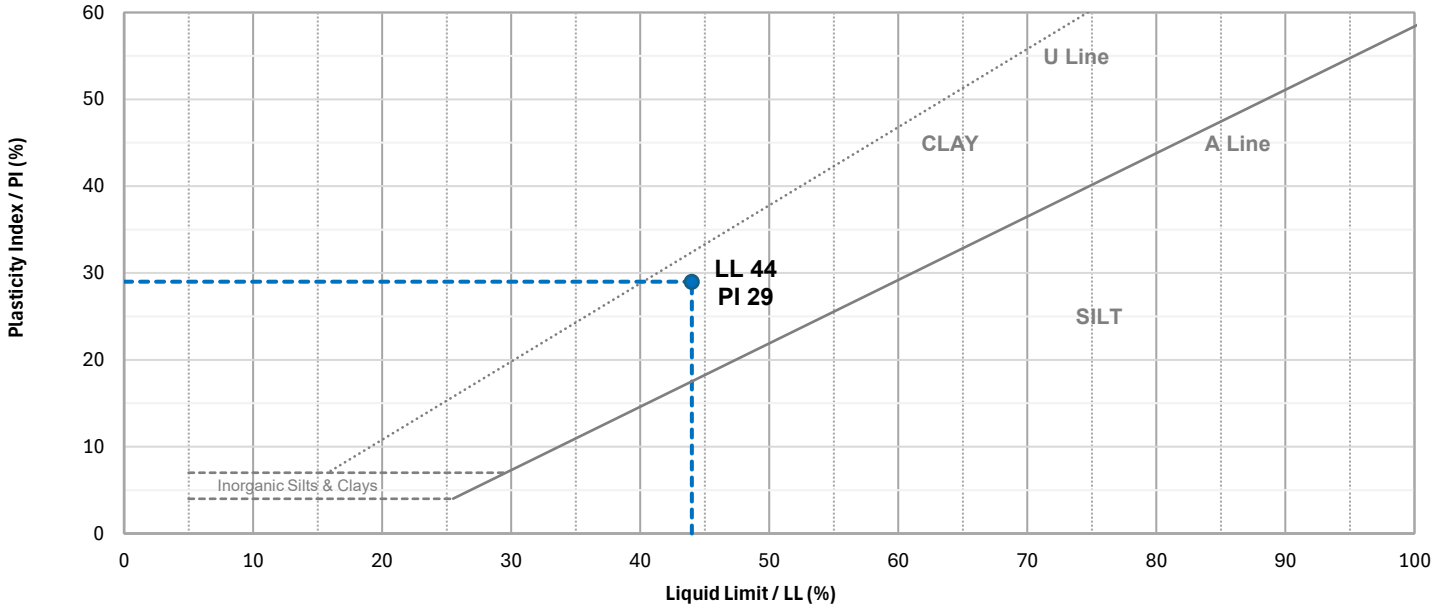
Test Report

Determination of the liquid limit, plastic limit, plasticity index and linear shrinkage of a soil

Methodology	AS 1289.3.1.1, 3.2.1, 3.3.1, 3.4.1		
Client	WSP Australia Pty Ltd	**MG Sample No.**	S107804
Address	Level 27, 680 George St, Sydney NSW 2000	**MG Project No.**	S25349-1
Project	PS223670 - Opal Bayview	**Date Sampled**	Unknown
Sample ID	BH3_2.5-2.9m	**Date Received**	4/07/2025
Report No.	S107804-AS_PI	**Date Tested**	17/07/2025
Sampling Method	Sampled by Client - results apply to the sample as received		
Preparation Method	Prepared in accordance with the test method		
Sample Description	Silty Sandy CLAY		

Plasticity Chart for Classification of Fine-Grained Soils

AS 1726:2017 Clause 6.1.6 (Figure 5)



Preparation		**Results**	
Method of Preparation	**Air Dried**	Liquid Limit (%)	**44**
History of the Sample	**Dry Sieved**	Plastic Limit (%)	**15**
Equipment Details		Plasticity Index (%)	**29**
Length of Linear Shrinkage Mould (mm)	**125**	Linear Shrinkage (%)	**11.0**
		Condition Upon Drying	**Linear**

Notes

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MACQUARIE GEOTECH

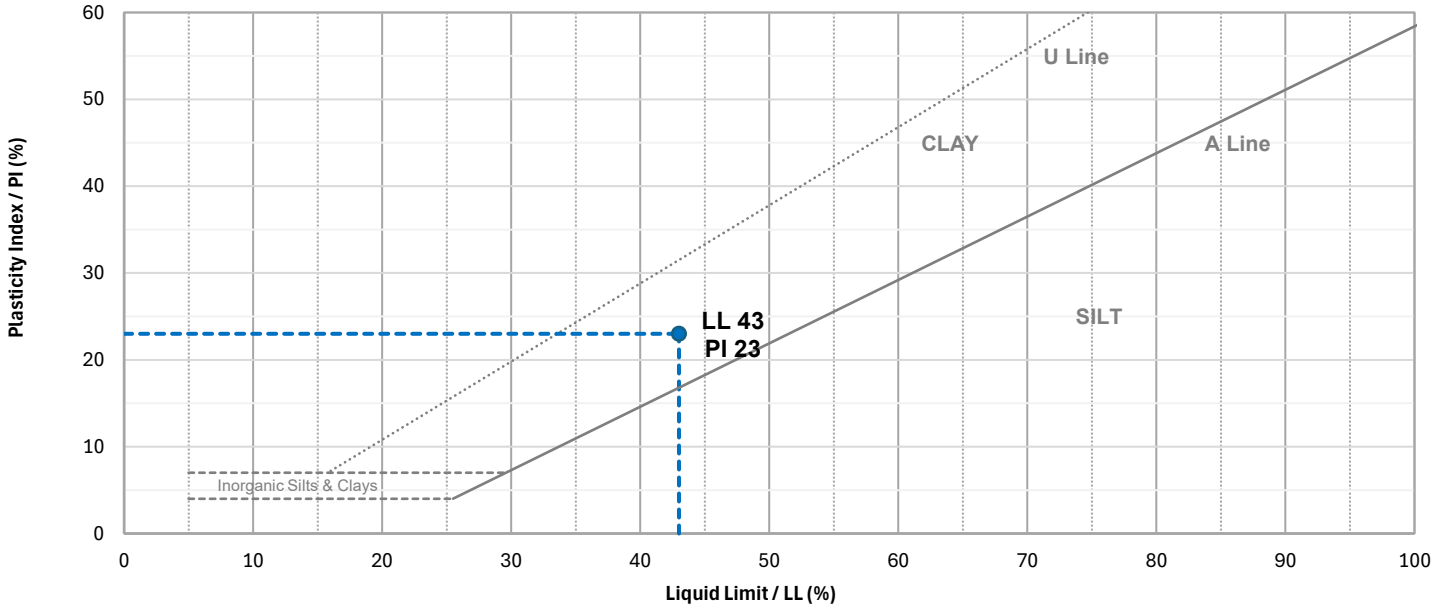
Test Report

Determination of the liquid limit, plastic limit, plasticity index and linear shrinkage of a soil

Methodology	AS 1289.3.1.1, 3.2.1, 3.3.1, 3.4.1		
Client	WSP Australia Pty Ltd	**MG Sample No.**	S107806
Address	Level 27, 680 George St, Sydney NSW 2000	**MG Project No.**	S25349-1
Project	PS223670 - Opal Bayview	**Date Sampled**	Unknown
Sample ID	BH5_2.5-2.95m	**Date Received**	4/07/2025
Report No.	S107806-AS_PI	**Date Tested**	17/07/2025
Sampling Method	Sampled by Client - results apply to the sample as received		
Preparation Method	Prepared in accordance with the test method		
Sample Description	Silty CLAY		

Plasticity Chart for Classification of Fine-Grained Soils

AS 1726:2017 Clause 6.1.6 (Figure 5)



Preparation		Results	
Method of Preparation	**Air Dried**	Liquid Limit (%)	**43**
History of the Sample	**Dry Sieved**	Plastic Limit (%)	**20**
Equipment Details		Plasticity Index (%)	**23**
Length of Linear Shrinkage Mould (mm)	**125**	Linear Shrinkage (%)	**10.0**
		Condition Upon Drying	**Linear**

Notes

Authorised Signatory Divye Grover

Date of Issue 24/07/2025

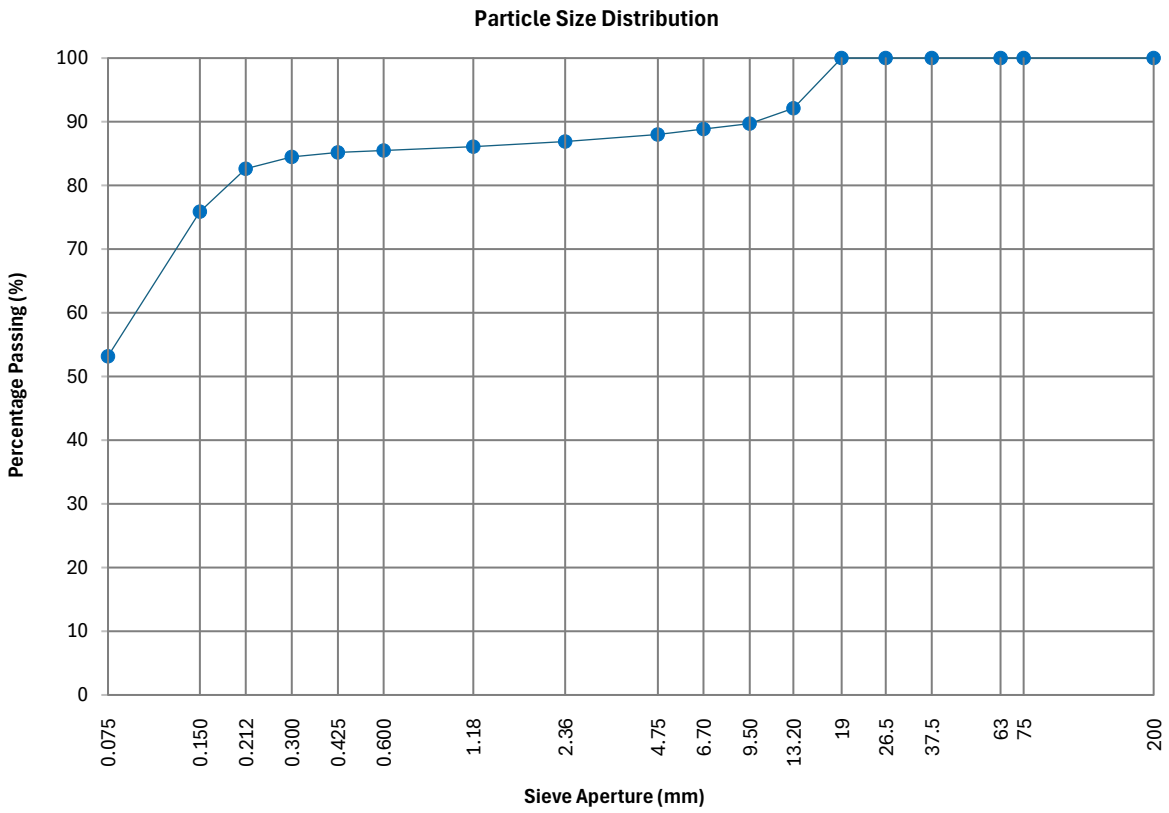
MACQUARIE GEOTECH

Test Report

Determination of the particle size distribution of a soil - Standard method of analysis by sieving

Methodology	AS 1289.3.6.1		
Client	WSP Australia Pty Ltd	**MG Sample No.**	S107811
Address	Level 27, 680 George St, Sydney NSW 2000	**MG Project No.**	S25349-1
Project	PS223670 - Opal Bayview	**Date Sampled**	Unknown
Sample ID	BH7_2.5-2.75m	**Date Received**	4/07/2025
Report No.	S107811-AS_PSD	**Date Tested**	24/07/2025
Sampling Method	Sampled by Client - results apply to the sample as received		
Preparation Method	Prepared in accordance with the test method		
Sample Description	Sandy CLAY, Trace of Gravel		

Sieve Aperture (mm)	Percentage Passing (%)
200	**100**
75	**100**
63	**100**
37.5	**100**
26.5	**100**
19.0	**100**
13.2	**92**
9.5	**90**
6.7	**89**
4.75	**88**
2.36	**87**
1.18	**86**
0.600	**86**
0.425	**85**
0.300	**85**
0.212	**83**
0.150	**76**
0.075	**53**



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Authorised Signatory Raj Mani

Date of Issue 25/07/2025

MACQUARIE GEOTECH

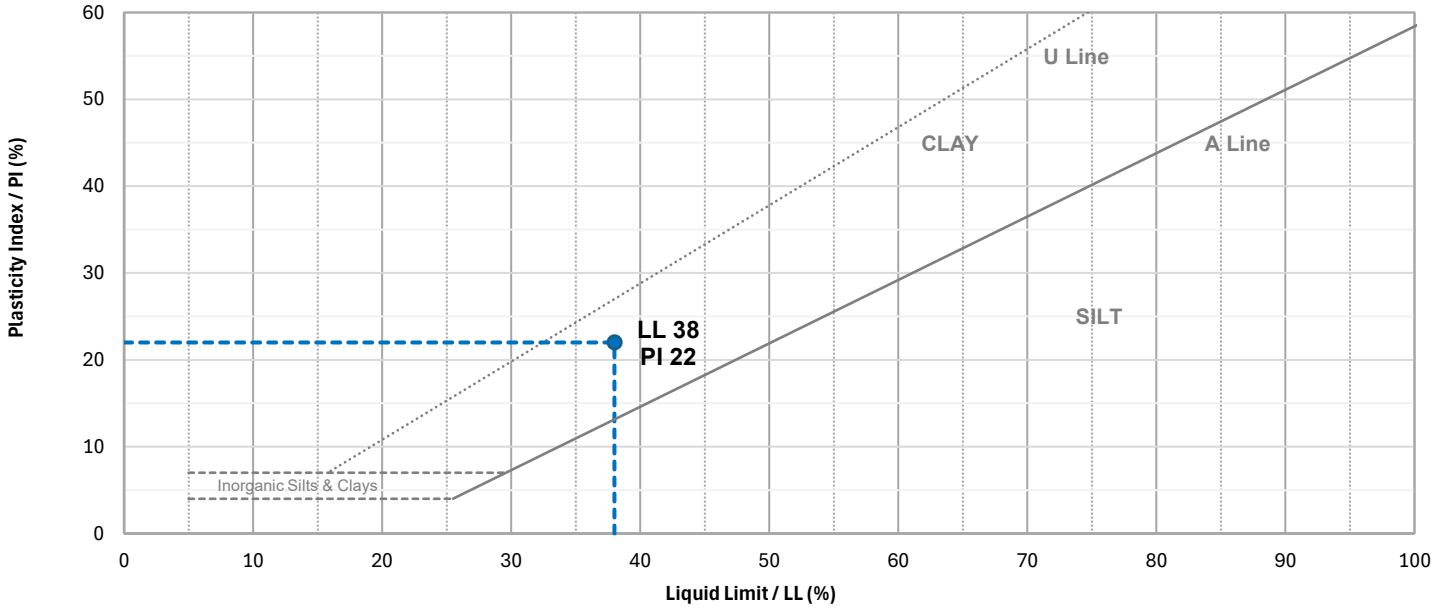
Test Report

Determination of the liquid limit, plastic limit, plasticity index and linear shrinkage of a soil

Methodology	AS 1289.3.1.1, 3.2.1, 3.3.1, 3.4.1		
Client	WSP Australia Pty Ltd	**MG Sample No.**	S107813
Address	Level 27, 680 George St, Sydney NSW 2000	**MG Project No.**	S25349-1
Project	PS223670 - Opal Bayview	**Date Sampled**	Unknown
Sample ID	BH8_1.0-1.45m	**Date Received**	4/07/2025
Report No.	S107813-AS_PI	**Date Tested**	17/07/2025
Sampling Method	Sampled by Client - results apply to the sample as received		
Preparation Method	Prepared in accordance with the test method		
Sample Description	Silty CLAY		

Plasticity Chart for Classification of Fine-Grained Soils

AS 1726:2017 Clause 6.1.6 (Figure 5)



Preparation		**Results**	
Method of Preparation	**Air Dried**	Liquid Limit (%)	**38**
History of the Sample	**Dry Sieved**	Plastic Limit (%)	**16**
Equipment Details		Plasticity Index (%)	**22**
Length of Linear Shrinkage Mould (mm)	**126**	Linear Shrinkage (%)	**10.0**
		Condition Upon Drying	**Linear**

Notes

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Authorised Signatory Divye Grover

Date of Issue 24/07/2025

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 385996

Client Details

Client	Macquarie Geotech (Sydney)
Attention	Jasper Haines
Address	3 Watt Dr, Bathurst, NSW, 2795

Sample Details

Your Reference	**S25349-1, PS223670 - Opal Bayview**
Number of Samples	5 Soil
Date samples received	16/07/2025
Date completed instructions received	16/07/2025

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	23/07/2025
Date of Issue	22/07/2025

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Results Approved By
Priya Samarawickrama, Senior Chemist

Authorised By
Nancy Zhang, Laboratory Manager

Misc Inorg - Soil						
Our Reference		385996-1	385996-2	385996-3	385996-4	385996-5
Your Reference	UNITS	S107798	S107804	S107806	S107808	S107812
Sample ID		BH1	BH3	BH5	BH6	BH7
Depth		2.5-2.7m	2.5-2.9m	2.5-2.95m	2.5-2.7m	4.0-4.05m
Type of sample		Soil	Soil	Soil	Soil	Soil
Date prepared	-	18/07/2025	18/07/2025	18/07/2025	18/07/2025	18/07/2025
Date analysed	-	18/07/2025	18/07/2025	18/07/2025	18/07/2025	18/07/2025
pH 1:5 soil:water	pH Units	7.3	6.0	5.4	5.5	5.3
Sulphate, SO4 1:5 soil:water	mg/kg	130	38	140	75	80
Chloride, Cl 1:5 soil:water	mg/kg	22	<10	57	<10	59
Electrical Conductivity 1:5 soil:water	µS/cm	310	360	280	250	230

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-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	-			18/07/2025	2	18/07/2025	18/07/2025		18/07/2025	[NT]
Date analysed	-			18/07/2025	2	18/07/2025	18/07/2025		18/07/2025	[NT]
pH 1:5 soil:water	pH Units		Inorg-001	[NT]	2	6.0	5.8	3	100	[NT]
Sulphate, SO4 1:5 soil:water	mg/kg	10	Inorg-081	<10	2	38	39	3	119	[NT]
Chloride, Cl 1:5 soil:water	mg/kg	10	Inorg-081	<10	2	<10	<10	0	106	[NT]
Electrical Conductivity 1:5 soil:water	µS/cm	1	Inorg-002	<1	2	360	310	15	98	[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.

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.

Air volumes are typically provided by customers (often as flow rate(s) and sampling time(s) and/or simply volumes) sampled or exposure times (determines 'volume' passive badges are exposed to)). Hence in such circumstances the volume measurement is inevitably not covered by Envirolab's NATA accreditation. An exception may occur where Envirolab Newcastle does the sampling where accreditation exists for certain types of sampling and hence volume determination(s). Note air volumes are often used to determine concentrations for dust and/or analyses on filters, sorbents and in impingers. For canister sampling, the air volume is covered by Envirolab's NATA accreditation.

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

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

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

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

Measurement Uncertainty estimates are available for most tests upon request.

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

For Dust Deposit Gauge (DDG) analysis the sampling, sampling period and funnel exposure area do not fall under Envirolab's NATA accreditation (unless the Newcastle laboratory where responsible for the sampling), hence the annotation on the DDG units of reporting.

Urine Analysis - The BEI values listed are taken from the 2022 edition of "TLVs and BEIs Threshold Limits" by ACGIH.

resource laboratories
AGGREGATE, ROCK, AND SOIL TESTING
ABN: 25 131 532 020
Sydney: 12/1 Boden Road Seven Hills NSW 2147 | PO Box 45 Pendle Hill NSW 2145
Ph: (02) 9674 7711 | **Email:** info@resourcelab.com.au

Test Report

Customer: WSP Australia Pty Limited
Address: GPO Box 5394, Sydney NSW 2001
Project: PS223670
Project Location: 5 Main Dr, Bayview, NSW

Job number: 25-0059
Report number: 1
Page: 1 of 1

California Bearing Ratio

Sampling method: Sample(s) provided by customer, results apply to the sample(s) as received.
Test method(s): AS 1289.1.1, 2.1.1, 5.1.1, 6.1.1
Date tested: 08/07/2025 to 30/07/2025

	Results			
Laboratory sample no.	38088	38089		
Customer sample no.	BH3 0.2-0.7m	BH8 0.2-0.6m		
Date sampled	04/07/2025	04/07/2025		
Material description	silty CLAY, with gravel, trace of sand, yellow-brown/red/pale grey	silty CLAY, trace of sand and gravel, red/pale grey/yellow-brown		
Maximum dry density (t/m^3)	1.86	1.79		
Optimum moisture content (%)	15.6	15.3		
Field moisture content (%)	n/a	n/a		
Oversize retained on 19.0mm sieve (%)	3	1		
Minimum curing time (hours)	168	168		
Dry density before soak (t/m^3)	1.86	1.79		
Dry density after soak (t/m^3)	1.84	1.71		
Moisture content before soak (%)	15.3	15.3		
Moisture content after soak (%)	19.0	19.5		
Moisture content after test - top 30mm (%)	18.5	24.3		
Moisture content after test - remaining depth (%)	16.5	18.8		
Density ratio before soaking (%)	100.0	100.0		
Moisture ratio before soaking (%)	98.0	100.0		
Period of soaking (days)	4	4		
Compactive effort	Standard	Standard		
Mass of surcharge applied (kg)	4.5	4.5		
Swell after soaking (%)	1.5	4.5		
Penetration (mm)	5.0	2.5		
CBR Value (%)	**4.5**	**1.5**		

Notes: Specified density ratio: 100 ±1%, specified moisture content: OMC ±0.5%

Approved Signatory: C. Greely **Date:** 31/07/2025

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