Attachment A16

Geotechnical Assessment Report

Geotechnical Investigation Report

Project

242-258 Young Street, Waterloo NSW

Prepared for

Charvic Pty Ltd, &
International Screen Academy Property Pty Ltd

Date

20 December 2023

Report No

17185-GR-1-1

alliance
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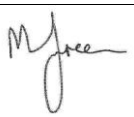
Author Signature		**Reviewer Signature**	
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Title	Geotechnical Engineer	**Title**	Principal Geotechnical Engineer

TABLE OF CONTENTS

APPENDICES

1 Introduction

This report presents the results of a geotechnical investigation for the proposed mixed-use development at 242-258 Young Street, Waterloo NSW (the site). Alliance was contacted by Sustainable Development Group, who were operating on behalf of the property owners, Charvic Pty Ltd and International Screen Academy Property Pty Ltd. The work was carried out in accordance with the quotation by Alliance Geotechnical Pty Ltd (Alliance) dated 8/9/2023, reference 17185-EST8961.

Based on the discussion with the client and the supplied documents, the following objectives were established for the geotechnical investigation:

- Characterise the subsurface geological and groundwater profile,
- Identify potential geotechnical hazards and risks within the influence of the site,
- Provide geotechnical advice for suitable foundation options and foundation layer,
- Provide options for shoring design,
- Provide advice regarding potential tanked basements and dewatering,
- Establish geotechnical parameters for foundation and shoring design,
- Provide classification of soil aggressivity for concrete and steel structures (to AS2159),
- Provide site sub-soil earthquake classification (to AS1170).

2 Proposed Development

To assist with the geotechnical investigation, the following drawings were supplied to us for this investigation comprised:

- Detailed Site Survey plans, prepared by Registered Surveyor Pty Ltd (Ref: 2079; dated:21/06/2022)
- Project Brief for Site Redevelopment with Preliminary Architectural Concept Plans, prepared by Sustainable Development Group (Dated: 09/2023)
- Detailed Site Environmental Investigation, prepared by EI Australia Pty Ltd (Ref: E23915.E02_Rev0; dated: 18/10/2018)

From the client-supplied preliminary architectural plan, it is understood that the proposed development will feature a four to seven storey building, with a single or double level basement level carpark. The proposed use cases for the development include schools, student accommodation, commercial office and retail space.

3 Site Description & Regional Geology

3.1 Site Description

The site is located 242-258 Young Street, Waterloo NSW, on an irregular shaped block bounded by Young Street to the east, Powell Street to the south and Hunter Street to the west. The northern boundary is adjacent another multi-storey structure, with at least a single-storey of basement level carpark. The site is located in an area which generally comprises other mixed-use and high-density residential developments.

At the time of the investigation fieldwork, the site was occupied by one and two storey buildings which were used by automotive businesses and an independent school. It is understood from a review of the previous detailed site environmental investigation that the site was formerly used by a variety of industrial and commercial businesses.

Topographically, the site is located on a slightly inclined slope dipping towards the south-west. The elevation at the north-eastern corner is approximately RL22.0m, and the elevation at the southern corner is approximately RL19.8m

3.2 Regional Geology

The 1:100,000 Sydney Geological Map indicates the site is underlain by coastal deposits, which are characterised by *marine-deposited and aeolian-reworked coastal sand dunes*. The marine deposits (Botany Sands) are underlain by fine-grained sandstones of the Hawkesbury Sandstone, which is characterised by *medium- to coarse-grained quartz sandstone with minor shale and laminite lenses*. An excerpt showing the geological context of the site can be found in Figure 1.

Make reference to the Griffin (1963) map/cross sections in Google Earth.

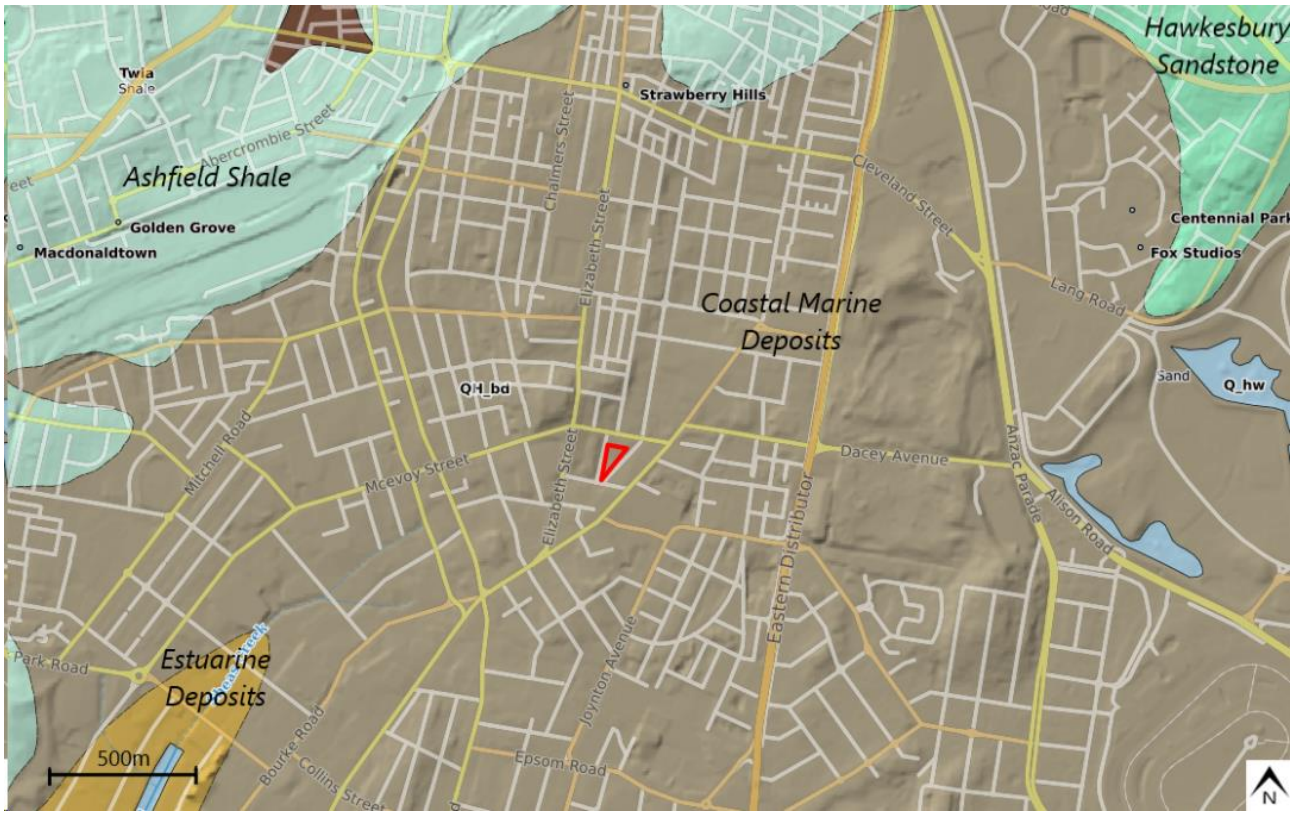

Figure 1-Excerpt from Minview showing the geological context of the site (highlighted red)

3.3 Previous Geotechnical Investigations

Prior to the Alliance investigation, it is understood that there were two previous investigations carried out at the site:

- Environmental Site Investigation, prepared by SGA (Ref: 93099, dated: 09/2012);
- Detailed Site Investigation (DSI), prepared by EI Australia (Ref: E23915.E02_Rev0, dated:18/10/2018)

Alliance was only supplied with the DSI prepared by EI Australia. Their scope of works included:

- Dilling 10 BHs across the site to collect samples for environmental laboratory testing purposes;
- Installation of two groundwater monitoring wells to facilitate sampling of groundwater;
- Laboratory analysis for soil and groundwater contaminates.

From their investigation, the site geological profile was generalised as follows:

Table 1-Generalised sub-surface profile, based on EI Australia DSI (extracted from Table 9-1 of Report E23915.E02_Rev0)

Geological Unit	Material Description	Depth to top and bottom of strata (m bgl)
Fill	Concrete	0.00-0.15
	Gravelly Clayey SAND, fine to medium grained	0.12-0.80

Geological Unit	Material Description	Depth to top and bottom of strata (m bgl)
	SAND, fine to medium grained	0.10-0.20
	Gravelly CLAY, low to medium plasticity	0.15-1.50
	Gravelly SAND, fine to medium grained	0.00-0.70
Residual	SAND, fine grained	0.60-5.00
	Silty CLAY, medium plasticity	1.50-2.00
Bedrock	SANDSTONE, fine grained	0.20-5.50

4 Fieldwork

4.1 Methods

The geotechnical site investigation was carried out between 20 November to 24 November 2023. Selected site photographs taken during the fieldwork are presented in Appendix A.

As a part of the investigation request, the client's representative had nominated four locations across the site for the boreholes based on access constraints. Prior to the commencement of borehole drilling, each location was checked by underground services by a qualified service locator using conventional EMR service location methods. Concrete coring was undertaken at each borehole location using a 150mm concrete coring diatube.

The investigation comprised of the drilling of four boreholes to a depth of 12.0m or approximately 3.0m into sandstone bedrock. The boreholes were drilled using a track-mounted drilling rig operated by a drilling subcontractor. Boreholes were advanced through the soil profile using solid flight augers fitted with a tungsten carbide bit (TC-bit). NMLC coring of the bedrock was initiated upon encountering TC-bit refusal. The encountered soils were logged by an experienced engineering geologist from Alliance and recovered samples were transported to Alliance's NATA accredited materials testing laboratory for further testing and storage. Standard Penetrometer Testing (SPT) was undertaken at 1.5m within the soil stratum to assess the soil consistency. Additionally, a Dynamic Cone Penetrometer (DCP) test was undertaken to a depth of 1.5m at each borehole to assess the upper soil layers consistency.

Three of the borehole locations were surveyed using a hand-held Trimble Rover GPS system. The one borehole which was drilled inside the existing warehouse could not be accurately surveyed, so an estimated value for the elevation and coordinates is provided. The borehole locations are shown on the Borehole Location Plan (Drawing 17185-GR-1-1-B) presented in Appendix B. The borehole log sheets and core photographs are attached in Appendix C. These log sheets should be read in conjunction with the attached Explanatory Notes, which explain the terms, abbreviations and symbols used, together with the interpretation and limitation of the logging procedure.

4.2 Results

Reference to the individual borehole log sheets, attached in Appendix C, should be made for a full description of the subsurface conditions encountered at each borehole. Summarised descriptions of the encountered subsurface geotechnical units are provided in Table 2**.**

Table 2-Summary of the encountered subsurface profile.

Geological Unit	Depth (m)			
	BH01	BH02	BH03	BH04
Pavement: Concrete	0.0 – 0.17	0.0 – 0.15	0.0 – 0.15	-
Topsoil: Sandy SILT, low plasticity	-	-	-	0.0-0.15
Fill: Gravelly SAND / Sandy GRAVEL, fine to coarse grained, appears well-compacted.	0.17 – 1.0	0.15 – 1.5	0.15 – 1.8	0.15 – 0.5
Marine: SAND, fine to medium grained, loose to medium dense.	1.0 – 4.3, 5.4 – 6.0	1.5 – 5.8, 5.8 – 7.3	1.8 – 6.4	0.5 – 6.2, 6.5 – 7.55
Marine: CLAY / Sandy CLAY, high plasticity, firm to stiff.	4.3 – 5.4, 6.0 – 6.3	5.8 – 6.7	6.4 – 8.8	6.2 – 6.5
Extremely Weathered Sandstone: SANDSTONE, fine to medium grained, extremely weathered, very low strength	6.3 – 7.0	7.3 – 8.78	8.8 – 9.0	7.55 – 7.98
Bedrock: SANDSTONE, fine to medium grained, moderately to highly weathered, very low to low strength. Class IV [2]	7.0 – 7.84	-	-	7.98 – 9.07
Bedrock: SANDSTONE, fine to medium grained, moderately to highly weathered, low to medium strength. Class III [2]	7.84 +	8.78 +	9.00 +	9.07 +
Termination Depth (m)	10.22	11.78	12.0	11.94

Notes:

1. The depths and unit thicknesses are based on the information from the test locations only and do not necessarily represent the maximum and minimum values across the site.
2. Classification of sandstone

Bedrock was generally encountered at 7-8m depth below ground level and comprises Hawkesbury Sandstone. The encountered bedrock was predominantly highly weathered, very low strength sandstone, overlying moderately weathered, low to medium strength sandstone. Bedrock defects and seams are listed in the attached logs.

4.3 Groundwater

No groundwater wells were installed as part of Alliance's investigation, however it is understood that previous investigations had installed groundwater monitoring wells. The previous detailed site investigation by EI Australia installed three monitoring wells. During the geotechnical investigation, Alliance used the existing wells to collect groundwater levels for the site, with the results summarised in Table 3. Both the initial groundwater data from the EI Australia DSI (from 14 May 2018) and the Alliance investigation (from 24 November 2023) are included.

Table 3-Summary of groundwater readings from the existing monitoring wells.

Monitoring Well ID	Groundwater Level (m bgl)	
	14/05/2018	24/11/2023
BH01M	3.29	N/A (Silt blockage at 2m depth)
BH09M	2.60	N/A (Not accessible)
BH10M	2.64	2.84

Notably, BH09M could not be accessed and BH01M had a silt blockage part way down the well during Alliance's investigation. It is noted that groundwater levels are prone to frequent fluctuations with weather variation. No long-term groundwater monitoring was carried out, nor were there any long-term groundwater data from the existing wells supplied to Alliance from the previous investigation.

Additionally, the groundwater table was encountered during the augered portion of the boreholes. The groundwater observations made during the drilling are summarised in Table 4 below.

Table 4-Summary of the encountered groundwater levels during drilling.

Borehole ID	Observed Groundwater Level (m bgl)
BH01	4.0
BH02	4.3
BH03	4.3
BH04	3.2

Based on the groundwater data presented. It is recommended that a design groundwater level of RL 18.1m be adopted. It is recommended that additional long-term groundwater monitoring may be required to provide a more accurate estimate of the groundwater table across the site. Given the presence of sand, which generally has higher permeability, the groundwater level is expected to fluctuate with rainfall variation.

5 Laboratory Testing

5.1 Soil Aggressivity

Aggressivity tests were performed to aid in the design of durable concrete and steel materials in contact with the site soils on selected soil samples collected from each of the boreholes. Table 5 presents the results of the aggressivity tests. The results were assessed in conjunction with AS 2159 – 2009 to classify the aggressivity of the soils for concrete and steel piles.

Table 5-Summary of soil aggressivity test results.

Test	Unit	BH01 4.8m	BH02 3.0m	BH03 6.4m	BH04 6.0m
Chloride	Mg/kg (ppm)	<10	<10	70	25
Ph	--	5.3	8.3	9.7	9.6
Sulfate (SO_4)	Mg/kg (ppm)	<10	17	120	33
Conductivity	Us/cm	<10	23	360	160

Test	Unit	BH01 4.8m	BH02 3.0m	BH03 6.4m	BH04 6.0m
Resistivity	Ohm.cm	110,000	43,000	2,800	6,200
Moisture	%	17	3	12	25
With respect to concrete		Moderate	Mild	Mild	Mild
With respect to steel		Non-aggressive	Non-aggressive	Mild	Non-aggressive

5.2 Uniaxial Compressive Strength Results

One sample of rock core was taken from each borehole for uniaxial compressive strength (UCS) testing. The testing was carried out in accordance with AS4133.4.2.2 at a NATA-accredited laboratory. The results are summarised in Table 6, with the detailed test certificates provided in Appendix E.

Table 6-Summary of UCS test results.

Sample ID	Material Description	Uniaxial Compressive Strength (MPa)
BH01 – 9.23-9.54m	Sandstone	14.0
BH02 – 10.34-10.65m	Sandstone	14.0
BH03 – 11.55-11.85m	Sandstone	11.0
BH04 – 10.50-10.76m	Sandstone	26.0

6 Comments and Recommendations

6.1 Excavation Conditions

The proposed development includes bulk excavation of the basement (proposed one or two levels). However, no specific depth of excavation below existing ground level was provided. However, given the encountered soil and rock profile, it is anticipated that the bulk excavation level will be founded on the marine soils, comprising fine to coarse grained sand, or potentially on the low to medium strength sandstone bedrock.

If the bulk excavation is founded within the soil layer, it is anticipated that groundwater ingress may be an issue given the presence of marine sands. Dewatering of the excavation below the excavation level will be required to provide a suitable working platform during construction. It is recommended that the dewatering wells to ensure the water level is at least 1.5m below the excavation base during construction and basement excavation.

Regarding excavatability, the soils should be readily excavated with conventional earthmoving equipment (e.g. excavators fitted with mud-buckets). Excavation through the low to medium strength sandstone encountered at the site may require the use of rock breaking hammers or other easy to hard ripping equipment. Low vibration equipment will be necessary near all site locations where vibration could impact on adjacent structures, infrastructures, and their footings. Alternatively, blocks of cut rock mass can be dislodged using small rock hammers and lifted out without generating large vibration. A rotary grinder may be required to trim rock faces instead of a large impact hammer.

Generally, the peak particle velocity during any demolition, excavation, and construction should be limited to 5mm/s (AS2187.2-1993 Appendix J) which is expected to be achieved provided that low impact rock-breaking equipment is used.

A dilapidation survey on nearby structures and infrastructures is recommended to be undertaken by a structural engineer prior to the commencement of any site excavations. The report should include precise measurements of the existing defects and cracks presented with the relevant photos of the development.

6.2 Excavation Stability and Retaining Structures

From the supplied architectural concept plans, the walls of the basement level are set at the property boundaries. Given the proximity of the site boundaries to adjacent buildings and roads, it is recommended that the excavation be supported by a permanent shoring wall. Batter slopes are not considered, given the site constraints. Temporary shoring options (e.g. sheet piles) were not considered due to the presence of nearby buildings, meaning construction vibration/noise would need to be limited.

From Table 1, it is noted that the site is generally comprised of soils up to a depth of 8.8m (at the deepest point). Given the presence of sandy soils and proximity of nearby buildings, it is recommended to the support the excavation with cantilevered or propped secant pile walls. Weep holes might need to be installed to reduce the build-up of hydrostatic pressure in the retained soil, should the depth of excavation extend below the groundwater table.

It is recommended to construct the piles using Continuous Flight Auger (CFA) techniques, due to the presence of groundwater and sandy soils. The piles would need to extend below the base of the excavation, to retain the soil, and would likely need to be socketed into the underlying sandstone bedrock (although this depends on the depth of the basement level). Notably, should the shoring piles be used to support elements of the structure above, then the pile socket would be extended to provide sufficient pile capacity.

Table 7- Summary of retaining wall design parameters.

Geological Unit	Unit Weight (kN/m^3), γ'	Undrained Shear Strength (kPa), c_u	Friction Angle (°), ϕ	Drained Cohesion (kPa), c'	Lateral Earth Pressure Coefficients			Young's Modulus (MPa), E
					Active, K_a	At-rest, K_0	Passive, K_p	
Fill – Gravelly SAND / Sandy GRAVEL	18	-	27	-	0.376	0.546	2.663	10
Marine – SAND	19	-	27	-	0.376	0.546	2.663	10
Marine - CLAY	17	25	24	2	0.422	0.593	2.371	8
Extremely Weathered Sandstone	21	-	28	50	0.361	0.531	2.770	75
Sandstone – Class IV or better	22	-	33	100	0.295	0.455	3.392	200

The permanent retaining wall should be designed in accordance with AS 4678 Earth Retaining Structures. If it is critical to limit the horizontal deformation an earth pressure coefficient 'at rest' (K_0) should be adopted. Where some lateral movement is acceptable, an 'active' lateral earth pressure coefficient (K_a) is recommended.

The lateral deflection of the design shoring system should be determined by the design engineer, considering the adjacent neighbouring structures footings. Monitoring of the magnitude of the deflections should be carried, particularly where deflections are critical to adjacent structures or critical underground services. Survey monitoring should be carried out during the construction of a shoring system to check and confirm that deflections and movements are within tolerable limits accepted in design. Alliance recommends survey monitoring point targets are installed on the adjacent buildings and then at the top of shoring system. Baseline survey readings should be taken, and then continued monitoring should be sequenced as followed:

1. At each 1.5m vertical lift
2. After excavation to the first row of supports/props, but prior to their installation
3. At the base of excavation and then at weekly intervals until the permanent structures are completed
4. After de-stressing or removal of any supports/props.

An indicative guide for the moment ranges is provided as follows:

- Green (Alert) Zone – For movements up to 80% of the predicted movements as referenced to baseline readings, construction can proceed with normal input from geotechnical and structural engineers.
- Amber (Action Zone) – For movement from 80% to 100% of the predicted movements, the geotechnical and structural engineers must be informed, and monitoring data must be reviewed by both. Construction can proceed under the advice of the geotechnical and structural engineer. The frequency of monitoring should be increased as directed by the engineers.
- Red (Alarm) Zone – For movements greater than the prescribed value, all construction activities must cease immediately, and geotechnical and structural engineers and relevant neighbouring properties/assets owners are to be notified. If the magnitude of movements reaches the ‘Red Zone’, it may be necessary to review the existing structural design and excavation methodology.

Actual threshold values are to be provided by the shoring system designer based on the analysis of the design. A suitable geotechnical monitoring program also depends on the subsurface conditions encountered during excavation and the construction methodology adopted by the contractor. The criteria above should be considered as a minimum.

6.3 Foundation Parameters

It is understood that the current proposed development features one basement level but could be increase to two levels of basement carpark. The proposed structure could be founded on shallow footings founded on low to medium sandstone bedrock at the basement level, assuming the basement extends far enough into the sandstone bedrock.

Alternatively, if the basement depth does not extend into the bedrock, piled foundations founded in the sandstone bedrock may be adopted instead. Given the soil stratum and the presence of groundwater, it is recommended to drill the piles with CFA methods or install temporary steel liners if conventional bored and cast-in-place piling is adopted, to minimise the potential for hole collapse during pile construction. Notably, the piles installed for the shoring wall may also be utilised to support structural loads at the perimeter. Piles should be designed in accordance with AS 2159—2009 Pilling—Design and Installation, using the parameters specified in Table 8.

The design parameters for the deep foundations are presented Table 8. It is recommended that all foundations are founded on the same stratum to minimise the risk of differential settlement.

Table 8-Summary of foundation parameters.

Geological Unit	End Bearing Capacity		Ultimate Shaft Adhesion [3] (kPa)	Young's Modulus (MPa)
	Ultimate [1] (kPa)	Serviceability [2] (kPa)		
Sandstone – Class IV	4,000	2,000	250	100
Sandstone – Class III	10,500	3,500	1,050	350

1 – Limit of approximately linear settlement against bearing pressure

2 – Bearing pressure to limit the settlement to <1% of the minimum footing dimension

3 – For clean sockets which are confirmed to be suitable roughness by a qualified geotechnical engineer on-site during construction. Values for piles in compression. If piles require resistance in tension, half the shaft adhesion values are to be used.

If shallow footings are considered, particularly for foundations located at the basement floor level, the end bearing capacity for the sandstone bedrock provided in Table 8 may be used as the shallow footing allowable bearing capacity. It is recommended that if shallow footings are designed for Class III sandstone, then spoon testing (up to 1.0m below founding level) should be undertaken on 1/3 of the footings to ensure allowable seams are <5% and defect spacing is >200mm.

Geotechnical inspection should be undertaken during pile boring or shallow footing excavation. An experienced geotechnical engineer or engineering geologist should be on site to confirm the design embedment depth and the assumptions made regarding the subsoil conditions. All footing excavations are required to be cleaned of any loose or disturbed material and any water immediately prior to installation of reinforcement casing and placing the concrete. In the case of piling with conventional bored cast-in-place methods, it is recommended that concrete be placed by tremie or concrete pump to ensure the concrete does not segregate during placement due to groundwater ingress.

6.4 Basement Construction and Dewatering

The water level depth below the existing ground levels range between 2.60m to 3.29m. In conjunction with the sandy soils, it is anticipated that the rate of groundwater inflows will be relatively high. As a result, it is recommended that the basement be tanked and the basement slab and walls be designed for a groundwater level of RL 18.1, based on the existing groundwater data. Designers should factor in both hydrostatic pressure and the uplift pressure that this design water level will exert on the basement slab and walls.

Alliance has not undertaken any detailed hydrogeological analysis to assess the hydraulic conductivity of the marine sands or the modelling estimate for the groundwater intake. It is recommended that additional rising head or slug testing be carried out to assess the hydraulic conductivity of the marine sands to better inform the tanked basement design. Typically, the permeability value is of the order of $1x10^{-5}$ m/s.

6.5 Site Classification – Earthquake Actions

Given the thickness of the overlying marine sands, the site sub-soil class is C_e or "*Shallow soil site*" in accordance with AS1170.4. A hazard factor of 0.09 should be adopted, per Table 2.1 from AS1170.4.

7 Limitations

Alliance Geotechnical Pty Ltd (Alliance) has prepared this report for the proposed residential development at 242-258 Young Street, Waterloo NSW in accordance with Alliance's fee proposal and Terms of Engagement. This geotechnical report has been prepared for Charvic Pty Ltd and International Screen Academy Property Pty Ltd for this project and for the purposes outlined in this report. This report cannot be relied upon for other projects, other parties on this alignment or any other site. The comments and recommendations provided in this report are based on the assumption that the geotechnical recommendations contained in this report will be fully complied with during the design and construction of the proposed development.

The borehole investigation results provided in this report are indicative of the subsurface conditions at the site only at the specific sampling and testing location, and to the depth drilled at the time of the investigation. Subsurface conditions can change significantly due to geological and human processes. Where variations in conditions are encountered further geotechnical advice should be sought from Alliance.

Alliance accepts no liability where our recommendations are not followed or are only partially followed.

8 References

AS 1726 - 2017 - Geotechnical Site Investigations

AS 2159 - 2095 - Piling - Design and Installation

AS 3798 – 2007 - Guidelines n Earthworks for Commercial and Residential Developments

AS4678 – Earth Retaining Structures

Pells et al "Foundations on Sandstone and Shale in the Sydney Region" AGJ, 1998

APPENDIX A – Site Photographs

Figure 2-Photo of the drilling setup.

Figure 3-Photo of the marine sands (left) and clay (right) from BH04.

APPENDIX B – Investigation Location Plan

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Site Plan Scale 1:575 on A3

Client Name:	Charvic Pty Ltd & International Screen Academy Property Pty Ltd	Figure Number:	17185-GR-1-1-A
Project Name:	Proposed Multi Storey Complex with single or double level basement	Figure Date:	08/12/2023
Project Location	242-258 Young Street, Waterloo NSW	Report Number:	17185-GR-1-1

N
0 10
Metres

APPENDIX C – Borehole Logs and Explanatory Notes

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Explanatory Notes
Drill & Excavation Logs

General

Information obtained from site investigations is recorded on log sheets. Soils and very low strength rock are commonly drilled using a combination of solid-flight augers with a Tungsten-Carbide (TC) bit. Descriptions of these materials presented on the “Borehole Log” are based on a combination of regular sampling and in-situ testing. Rock coring techniques commences once material is encountered that cannot be penetrated using a combination of solid-flight augers and Tungsten-carbide bit. The "Cored Borehole Log" presents data from drilling where a core barrel has been used to recover material - commonly rock.

The "Excavation – Geological Log" presents data and drawings from exposures of soil and rock resulting from excavation of pits or trenches.

The heading of the log sheets contains information on Project Identification, Hole or Test Pit Identification, Location and Elevation. The main section of the logs contains information on methods and conditions, material description and structure presented as a series of columns in relation to depth below the ground surface which is plotted on the left side of the log sheet. The scale is presented in the depth column as metres below ground level.

As far as is practicable the data contained on the log sheets is factual. Some interpretation is included in the identification of material boundaries in areas of partial sampling, the location of areas of core loss, description and classification of material, estimation of strength and identification of drilling induced fractures, and geological unit. Material description and classifications are based on Australian Standard Geotechnical Site Investigations: AS 1726 - 2017 with some modifications as defined below.

These notes contain an explanation of the terms and abbreviations commonly used on the log sheets.

Drilling

Drilling, Casing and Excavating

Drilling methods deployed are abbreviated as follows

Abbreviation	Method
AS	Auger Screwing
ADV	Auger Drilling with V-Bit
ADT	Auger Drilling with TC Bit
BH	Backhoe
E	Excavator
HA	Hand Auger
HQ	HQ core barrel (~63.5 mm diameter core) *
HMLC	HMLC core barrel (~63.5 mm diameter core) *
NMLC	NMLC core barrel (~51.9 mm diameter core) *
NQ	NQ core barrel (~47.6 mm diameter core) *
RR	Rock Roller
WB	Wash-bore drilling

* Core diameters are approximate and vary due to the strength of material being drilled.

Drilling Fluid/Water

The drilling fluid used is identified and loss of return to the surface estimated as a percentage. It is introduced to assist with the drill process, in particular, when core drilling. The introduction of drill fluid/water does not allow for accurate identification of water seepages.

Drilling Penetration/Drill Depth

Core lifts are identified by a line and depth with core loss per run as a percentage. Ease of penetration in non-core drilling is abbreviated as follows:

Abbreviation	Description
VE	Very Easy
E	Easy
F	Firm
H	Hard
VH	Very Hard

Groundwater Levels

Date of measurement is shown.


Standing water level measured in completed borehole


Level taken during or immediately after drilling


Groundwater inflow water level

Samples/Tests

Samples collected and testing undertaken are abbreviated as follows

Abbreviation	Test
ES	Environmental Sample
DS	Disturbed Sample
BS	Bulk Sample
U50	Undisturbed (50 mm diameter)
C	Core Sample
SPT	Standard Penetration Test
N	Result of SPT (*sample taken)
VS	Vane Shear Test
IMP	Borehole Impression Device
PBT	Plate Bearing Test
PZ	Piezometer Installation
HP	Hand Penetrometer Test
HB	Hammer Bouncing

Excavation Logs

Explanatory notes are provided at the bottom of drill log sheets. Information about the origin, geology and pedology may be entered in the "Structure and other Observations" column. The depth of the base of excavation (for the logged section) at the appropriate depth in the "Material Description" column. Refusal of excavation plant is noted should it occur. A sketch of the exposure may be added. Photos are recommended.

Material Description – Soil

Material Description - In accordance with AS 1726-2017

Classification Symbol - In accordance with the Unified Classification System (AS 1726-2017).

Abbreviation	Typical Name
GW	Well-graded gravels, gravel-sand mixtures, little or no fines.
GP	Poorly graded gravels and gravel-sand mixtures, little or no fines, uniform gravels.
GM	Silty gravels, gravel-sand-silt mixtures.
GC	Clayey gravels, gravel-sand-clay mixtures.
SW	Well graded sands, gravelly sands, little or no fines.
SP	Poorly graded sands and gravelly sands; little or no fines, uniform sands.
SM	Silty sand, sand-silt mixtures.
SC	Clayey sands, sand-clay mixtures.
ML	Inorganic silts and very fine sands, rock flour, silty or clayey fine sands or clayey silts with slight plasticity.
CL, CI	Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays.
OL	Organic silts and organic silty clays of low plasticity. *
MH	Inorganic silts, micaceous or diatomaceous fine sandy or silty soils, clastic silts.
CH	Inorganic clays of high plasticity, fat clays.
OH	Organic clays of medium to high plasticity, organic silts. *
Pt	Peat and other highly organic soils. *

* Additional details may be provided in accordance with the Von Post classification system (1922).

Organic Soils – Identification using laboratory testing:

Material	Organic Content - % of dry mass
Inorganic	<2
Organic Soil	<2 ≤ 25
Peat	> 25

Organic Soils – Descriptive terms for the degree of decomposition of peat:

Term	Decomposition	Remains	Squeeze
Fibrous	Little or none	Clearly recognizable	Only water No solid
Pseudo-fibrous	Moderate	Mixture of fibrous and amorphous	Turbid water < 50% solids
Amorphous	Full	Not recognizable	Paste > 50% solids

Particle Characteristics – Definitions are as follows:

Fraction	Component (& subdivision)		Size (mm)
Oversize	**Boulders**		> 200
	Cobbles		> 63 ≤ 200
Coarse grained soils	**Gravel**	Coarse	> 19 ≤ 63
		Medium	> 6.7 ≤ 19
		Fine	> 2.36 ≤ 6.7
	Sand	Coarse	> 0.6 ≤ 2.36
		Medium	> 0.2 ≤ 0.6
		Fine	> 0.075 ≤ 0.21
Fine grained soils	**Silt**		0.002 ≤ 0.075
	Clay		< 0.002

Secondary and minor soil components

In coarse grained soils – The proportions of secondary and minor components are generally estimated from a visual and tactile assessment of the soils. Descriptions for secondary and minor soil components in coarse grained soils are as follows.

Designation of components	Percentage fines	Terminology (as applicable)	Percentage accessory coarse fraction	Terminology (as applicable)
Minor	≤ 5	Trace clay / silt	≤ 5	Trace sand / gravel
	> 5 ≤12	With clay / silt	> 5 ≤12	With sand / gravel
Secondary	> 12	Silty or clayey	> 30	Sandy or gravelly

Descriptions for secondary and minor soil components in fine grained soils are as follows.

Designation of components	Percentage coarse grained soils	Terminology (as applicable)
Minor	≤ 5	Trace sand / gravel / silt / clay
	> 5 ≤12	With sand / gravel / silt / clay
Secondary	> 30	Sandy / gravelly / silty / clayey

Plasticity Terms - Definitions for fine grained soils are as follows:

Descriptive Term	Range of Liquid Limit for silt	Range of Liquid Limit for clay
Low Plasticity	≤ 50	≤ 35
Medium Plasticity	N/A	> 35 ≤50
High Plasticity	> 50	> 50

Particle Characteristics

Particle shape and angularity are estimated from a visual assessment of coarse-grained soil particle characteristics. Terminology used includes the following:

Particle shape – spherical, platy, elongated,

Particle angularity – angular, sub-angular, sub-rounded, rounded.

Moisture Condition – Abbreviations are as follows:

D	Dry, looks and feels dry.
M	Moist, No free water on remoulding.
W	Wet, free water on remoulding.

Moisture content of fine-grained soils is based on judgement of the soils moisture content relative to the plastic and liquid limit as follows:

MC < PL	Moist, dry of plastic limit.
MC ≈ PL	Moist, near plastic limit.
MC > PL	Moist, wet of plastic limit.
MC ≈ LL	Wet, near liquid limit.
MC > LL	Wet of liquid limit.

Consistency - of cohesive soils in accordance with AS 1726-2017, Table 11 are abbreviated as follows:

Consistency Term	Abbreviation	Indicative Undrained Shear Strength Range (kPa)
Very Soft	**VS**	< 12
Soft	**S**	12 ≤ 25
Firm	**F**	25 ≤ 50
Stiff	**St**	50 ≤ 100
Very Stiff	**VSt**	100 ≤ 200
Hard	**H**	≥ 200
Friable	**Fr**	-

Density Index (%) of granular soils is estimated or is based on SPT results. Abbreviations are as follows:

Description	Abbreviation	Relative Density	SPT N
Very Loose	**VL**	< 15%	0 - 4
Loose	**L**	15 - 35%	4 - 10
Medium Dense	**MD**	35 - 65%	10 - 30
Dense	**D**	65 - 85%	30 - 50
Very Dense	**VD**	> 85%	> 50

Structures – Fissuring and other defects are described in accordance with AS 1726-2017 using the terminology for rock defects

Origin – Where practicable an assessment is provided of the probable origin of the soil, e.g. fill, topsoil, alluvium, colluvium, residual soil.

MATERIAL DESCRIPTION - ROCK

Material Description – In accordance with AS 1726-2017

Rock Naming – Where possible conventional geological names are used within the logs. Engineering properties cannot be inferred directly from the rock names in the table, but the use of a particular name provides an indicative range of characteristics to the reader. Lithological identification of rock is provided to appreciate the geology of an area, to correlate geological profiles seen in boreholes or to distinguish boulders from bedrock.

Grain Size – Grain size is done in accordance with AS1726-2017 as follows:

For sedimentary rock:

Coarse grained	Mainly 0.6mm to 2mm
Medium grained	Mainly 0.2mmto 0.6mm
Fine grained	Mainly 0.06mm to 0.2mm

For igneous and metamorphic rock:

Coarse grained	Mainly greater than 2 mm
Medium grained	Mainly 0.6mm to 2mm
Fine grained	Mainly less than 2mm

Colour - Rock colour is described in the moist condition.

Texture and Fabric

Frequently used terms:

Sedimentary Rock	Metamorphic Rock	Igneous
Bedded	Banded	Amorphous
Cross-bedded	Cleaved	Crystalline
Folded	Folded	Flow banded
Graded	Foliated	Folded
Interbedded	Gneissose	Lineated
Laminated	Lineated	Massive
Massive	Schistose	Porphyritic

Bedding and fabric:

Description	Spacing
Very Thickly Bedded	> 2m
Thickly Bedded	0.6m to 2m
Medium Bedded	0.2m to 0.6m
Thinly Bedded	60mm to 200mm
Very Thinly Bedded	20mm to 60mm
Thickly Laminated	6mm to 20mm
Thinly Laminated	< 6mm

Degree of development:

Massive	No layering or fabric. Rock is homogeneous.
Indistinct	Layering or fabric just visible, There is little effect on strength properties.
Distinct	Layering or fabric obvious. The rock may break more easily parallel to the fabric.

Features, inclusions, and minor components - Features, inclusions and minor components within the rock material shall be described where those features could be significant such as gas bubbles, mineral veins, carbonaceous material, salts, swelling minerals, mineral inclusions, ironstone or carbonate bands, cross-stratification, or minerals the readily oxidise upon atmospheric exposure.

Moisture content - Where possible descriptions are made by the feel and appearance of the rock using one according to following terms:

Dry	Looks and feels dry.
Moist	Feels cool, darkened in colour, but no water is visible on the surface.
Wet	Feels cool, darkened in colour, water film or droplets visible on the surface.

The moisture content of rock cored with water may not be representative of its in-situ condition.

Durability – Descriptions of the materials durability such as tendency to develop cracks, break into smaller pieces or disintegrate upon exposure to air or in contact with water are provided where observed.

Rock Material Strength – The strength of the rock material is based on uniaxial compressive strength (UCS). The following terms are used:

Term / Abbreviation		Description	UCS (MPa)	Point Load Strength Index (MPa)
Very Low	**VL**	Crumbles under firm blow with sharp end of pick, can be peeled with a knife; too hard to cut a triaxial by hand; 30mm pieces can be broken by hand.	0.6 – 2	0.03 – 0.1
Low	**L**	Easily scored with a knifed; indentations 1-3mm show with firm blows of the pick point; has dull sound under hammer. A piece of core 150mm long 50mm diameter may be broken by hand. Sharp edges of core may be friable and break during handling.	2 – 6	0.1 – 0.3
Medium	**M**	Readily scored with a knife; a piece of core 150mm long by 50mm diameter can be broken by hand with difficulty.	6 – 20	0.3 – 1
High	**H**	A piece of core 150mm long by 50mm diameter cannot be broken by hand but can be broken by a pick with a single firm blow; rock rings under hammer.	20 – 60	1 – 3
Very High	**VH**	Hand specimen breaks with pick after more than one blow; rock rings under hammer.	60 – 200	3 – 10
Extremely High	**EH**	Specimen requires many blows with geological pick to break into intact materials; rock rings under hammer.	> 200	> 10

Strengths are estimated and where possible supported by Point Load Index Testing of representative samples. Test results are plotted on the graphical logs as follows:

D	Diametral Point Load Test
A	Axial Point Load Test

Where the estimated strength log covers more than one range it indicates the rock strength varies between the limits shown. Point Load Strength Index test results are presented as $I_{s\,(50)}$ values in MPa.

Weathering – Weathering classification assists in identification but does not imply engineering properties. Descriptions are as follows:

Term / Abbreviation		Description
Residual Soil	**RS**	Material has soil properties. Mass structure and material texture and fabric of original rock not visible, but the soil has not been significantly transported.
Extremely Weathered	**EW**	Material has soil properties. Mass structure, material texture and fabric of original rock are still visible.
Highly Weathered	**HW**	Material is completely discoloured, significant decrease in strength from fresh rock.
Moderately Weathered	**MW**	Material is `completely discoloured, little or no change of strength from fresh rock.
Slightly Weathered	**SW**	Partly stained or discoloured, little or no change to strength from fresh rock.
Fresh	**FR**	No signs of mineral decomposition or colour change.

Alteration – Physical and chemical changes of the rock material due to geological processes by fluids at depth at pressures and temperatures above atmospheric conditions. Unlike weathering, alteration shows no relationship to topography and may occur at any depth. When altered materials are recognized, the following terms are used:

Term / Abbreviation				Description
Extremely Altered		**XA**		Material has soil properties. Structure, texture, and fabric of original rock are still visible. The rock name is replaced with the name of the parent material, e.g., Extremely Altered basalt. Soil descriptive terms are used.
Highly Altered	**Distinctly altered**	**HA**	**DA**	The whole of the rock material is discoloured. Rock strength is changed by alteration. Some primary minerals are altered to clay minerals. Porosity may be higher or lower due to loss of minerals or precipitation of secondary minerals in pores.
Moderately Altered	**Distinctly altered**	**MA**	**DA**	The whole of the rock material is discoloured. Little or no change of strength from fresh rock. The term 'Distinctly Altered' is used where it is not practicable to distinguish between 'Highly Altered' and 'Moderately Altered'. Distinctly Altered is defined as follows: - The rock may be highly discoloured; - Porosity may be higher due to mineral loss; or may be lower due to precipitation of secondary minerals in pores; and - Some change of rock strength.
Slightly Altered		**S**		Rock is slightly discoloured. Little or no change of strength from fresh rock.

Alteration is only described in the context of the project where it has relevance to the civil and structural design.

Defect Descriptions

General and Detailed Descriptions – Defect descriptions are provided to suit project requirements. Generalized descriptions are used for some projects where it is unnecessary to describe each individual defect in a rock mass, or where multiple similar defects are present which are too numerous to log individually. The part of the rock mass to which this applies is delineated.

Detailed descriptions are given of defects judged to be particularly significant in the context of the project. For example, crushed seams in an apparently unstable slope. As a minimum, general descriptions outlining the number of defect sets within the rock mass and their broad characteristics are provided where it is possible to do so.

Defect Type – Defect abbreviations are as follows:

BP	Bedding parting	**SSM**	Sheared seam	**DB**	Drilling break
JT	Joint	**CS**	Crushed seam	**HB**	Handling break
SS	Shear surface	**SM**	Infilled seam		
SZ	Sheared zone	**EWS**	Extremely weathered seam		

Sheared surfaces, sheared zones, sheared seams, and crushed seams are generally faults in geological terms.

Defect Orientation

For oriented core: The dip and dip direction are recorded as a two-digit and three-digit number separated by a slash, are collected e.g., 50°/240° and there is not core loss that could obscure core orientation. If alternative measurements are made, such as dip and strike or dip direction relative to magnetic north this shall be documented.

For non-oriented core: The dip is recorded as a two-digit number, e.g., 10°. In vertical boreholes the dip is generally measured relative to the horizontal plan. If the borehole is inclined the dip is generally measured from the core axis.

Surface Roughness – Defect surface roughness is described as follows:

VR	**Very rough**	Many large surface irregularities with amplitude generally more than 1 mm.
RO	**Rough**	Many small surface irregularities with amplitude generally less than 1 mm.
SO	**Smooth**	Smooth to touch. Few or no surface irregularities.
PO	**Polished**	Shiny smooth surface
SK	**Slickensided**	Grooved or striated surface, usually polished.

Surface Shape – Defect surface roughness is described as follows:

PL	**Planar**	The defect does not vary in orientation.
CU	**Curved**	The defect has a gradual change in orientation
UN	**Undulating**	The defect has a wavy surface.
ST	**Stepped**	The defect has one or more well defined steps
IR	**Irregular**	The defect has many sharp changes of orientation

Defect Infilling – Common abbreviation as follows:

Ca	Calcite	**Fe**	Iron Oxide	**Qz**	Quartz
Cy	Clay	**MS**	Secondary mineral	**X**	Carbonaceous

Defect Coatings and Seam Composition - Coatings are described using the following terms:

CN	**Clean**	No visible coating.
SN	**Stained**	No visible coating but surfaces are discoloured.
VN	**Veneered**	A visible coating of soil or mineral, too thin to measure; may ne patchy.
CO	**Coating**	A visible coating up to 1 mm thick. Soil in-fill greater than 1 mm shall be described using defect terms (e.g., infilled seam). Defects greater than 1 mm aperture containing rock material great described as a vein.

Defect Spacing, Length, Openness and Thickness – Described directly in millimetres and metres. In general descriptions, half order of magnitude categories is used, e.g. joint spacing typically 100 mm to 300 mm, sheared zones 1m to 3m thick.

Depending on project requirements and the scale of observation, spacing may be described as the mean spacing within a set of defects, or as the spacing between all defects within the rock mass. Where spacing is measured within a specific set of defects, measurements shall be made perpendicular to the defect set.

Where significant, the nature of the defect end condition is recorded in the context of the scale of the exposure.

Block Shape – Where it is considered significant, block shape should be described using terms given in Table 23, AS 1725:2017.

Stratigraphic Unit – Geological maps related to the project are used for the designation of lithological formation name and, where possible geological unit name, e.g., Bringelly Shale, Potts Hill Sandstone Member.

Core Loss – Core loss occurs when material is lost during the drilling process It is shown at the bottom of the run unless otherwise indicated where core loss is known.

Total Core Recovery – The percentage of rock recovered excluding core loss per core run.

Defect Spacing – The spacing of successive defects or the mean spacing for relatively broken core.

Fracture Index – Which is the number defects per metre of core.

Rock Quality Designation (RQD) – The percentage of sound core pieces of 100mm or greater per core run and is calculated using Deere et al. (1989) method.

Rock Classification System – For design purpose, Sydney Rock Mass Classification System (Pells et al. 1998, 2019) is adopted.

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BH No: BH01
PAGE 1 OF 4
Job No: 17185

Borehole Log

Client: Charvic Pty Ltd & International Screen Academy Property Pty Ltd
Project: Proposed Mixed-Use Commercial Development
Location: 242-258 Young Street, Waterloo, NSW

Started: 22/11/2023
Finished: 22/11/2023
Borehole Size 110 mm

Rig Type: Massenza MI3 | **Hole Location:** Refer to Drawing 17185-GR-1-1-B | **Driller:** MG | **Logged:** SC
RL Surface: 21.63m | **Contractor:** Stratacore | **Bearing:** --- | **Checked:** MAG

Method	Water	RL (m)	Depth (m)	Graphic Log	Classification Symbol	Material Description	Samples Tests Remarks	Moisture Condition	Consistency/ Density Index	Additional Observations
CC		21.5			-	Concrete, 170mm thickness.		-	-	PAVEMENT
ADT			0.5		-	FILL: Gravelly SAND, fine to medium grained, brown and dark brown, fine sized gravel, with silt, appears well compacted.		-	-	FILL
		21.0				At 0.6-1.0m: rare terracotta and concrete fragments.				
			1.0		SW	SAND, fine to medium grained, dark brown and pale brown.		D	L	MARINE
		20.5	1.5							
		20.0					SPT 5, 5, 3 N=8			
			2.0							
		19.5	2.5							
		19.0			SC	SAND, fine to medium grained, brown grey, trace silt.		W - M	MD	
			3.0			At 2.8m: with silt.				
		18.5					SPT 1, 5, 6 N=11			
			3.5							
		18.0								
	GW @ 4.0m		4.0							
		17.5								
			4.5		SC	Clayey SAND, fine to medium grained, pale grey and grey.		W	-	
		17.0			CH	CLAY, high plasticity, pale grey, trace fine grained sand.	SPT 4, 9, 10 N=19 ES - 4.8m	MC ~ PL	F	
			5.0							

2. NON CORED BOREHOLE (NO COORD/RL) 17185.GPJ GINT STD AUSTRALIA.GDT 20/12/23

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Borehole Log

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Project: Proposed Mixed-Use Commercial Development
Location: 242-258 Young Street, Waterloo, NSW

Started: 22/11/2023
Finished: 22/11/2023
Borehole Size 110 mm

Rig Type: Massenza MI3 | **Hole Location:** Refer to Drawing 17185-GR-1-1-B | **Driller:** MG | **Logged:** SC
RL Surface: 21.63m | **Contractor:** Stratacore | **Bearing:** --- | **Checked:** MAG

Method	Water	RL (m)	Depth (m)	Graphic Log	Classification Symbol	Material Description	Samples Tests Remarks	Moisture Condition	Consistency/ Density Index	Additional Observations
ADT		16.5			CH	CLAY, high plasticity, pale grey, trace fine grained sand. *(continued)*		MC ~ PL	F	
			5.5		SW	SAND, fine to medium grained, pale brown, with trace silt.		W	MD	
		16.0								
			6.0		CH	CLAY, high plasticity, pale grey, trace fine grained sand.	SPT 4, 18, 18 N=36	MC ~ PL	VSt	
		15.5			-	SANDSTONE, fine to medium grained, pale grey, very low strength.		D	-	EXTREMELY WEATHERED MATERIAL
			6.5							
		15.0				Borehole BH01 continued as cored hole				
			7.0							
		14.5								
			7.5							
		14.0								
			8.0							
		13.5								
			8.5							
		13.0								
			9.0							
		12.5								
			9.5							
		12.0								
			10.0							

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Cored Borehole Log

Client: Charvic Pty Ltd & International Screen Academy Property Pty Ltd
Started: 22/11/2023
Project: Proposed Mixed-Use Commercial Development
Finished: 22/11/2023
Location: 242-258 Young Street, Waterloo, NSW
Borehole Size 110 mm

Rig Type: Massenza MI3 **Hole Location:** Refer to Drawing 17185-GR-1-1-B **Driller:** MG **Logged:** SC
RL Surface: 21.63m **Contractor:** Stratacore **Bearing:** --- **Checked:** MAG

Method	Water	RL (m)	Depth (m)	Graphic Log	Material Description	Weathering	Estimated Strength (● Axial, ○ Diametral) EL -0.03 / VL -0.1 / L -0.3 / M -1 / H -3 / VH -10 / EH	$Is_{(50)}$ MPa D- diametral A- axial	RQD %	Defect Spacing mm 30 / 100 / 300 / 1000 / 3000	Additional Data
		16.5	5.5								
		16.0									
			6.0								
		15.5									
			6.5								
		15.0			Continued from non-cored borehole						
NMLC					SANDSTONE, fine to medium grained, pale grey, very low strength. *(continued)*	EW					
			7.0								7.0 - HB.
					SANDSTONE, fine to medium grained, orange brown and red brown, bedding fabric.	HW					7.05 - CS, PL, RO, CT.
		14.5									7.14 - EWS, PL, RO, CN.
			7.5						20		7.28 - EWS, PL, RO, CN.
		14.0									7.58-7.65 - CS, PL, RO, CT.
			8.0					D 0.694			7.78 - BP, PL, RO, CN. 7.78-7.84 - EWS, PL, RO, CN.
		13.5				MW					8.0 - HB.
			8.5								
		13.0									8.58 - EWS, PL, RO, CT.
								D A 0.476 1.246			8.78-8.82 - EWS, PL, RO, CN.
			9.0						97		9.0 - HB.
		12.5									9.24 - BP, 5°, PL, RO, CN.
			9.5								
		12.0									9.72 - HB.
			10.0								

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Location: 242-258 Young Street, Waterloo, NSW

Started: 22/11/2023
Finished: 22/11/2023
Borehole Size 110 mm

Rig Type: Massenza MI3 **Hole Location:** Refer to Drawing 17185-GR-1-1-B **Driller:** MG **Logged:** SC
RL Surface: 21.63m **Contractor:** Stratacore **Bearing:** --- **Checked:** MAG

Method	Water	RL (m)	Depth (m)	Graphic Log	Material Description	Weathering	Estimated Strength (● Axial, ○ Diametral) EL -0.03 / VL -0.1 / L -0.3 / M -1 / H -3 / VH -10 / EH	$Is_{(50)}$ MPa D- diametral A- axial	RQD %	Defect Spacing mm (30, 100, 300, 1000, 3000)	Additional Data
NMLC		11.5			SANDSTONE, fine to medium grained, orange brown and red brown, bedding fabric. *(continued)*	MW		D 1.22 A 1.69	97		10.0 - HB. 10.06 - BP.
					Target depth. BH01 terminated at 10.22m						End of Borehole.

11.0 10.5
10.5 11.0
10.0 11.5
9.5 12.0
9.0 12.5
8.5 13.0
8.0 13.5
7.5 14.0
7.0 14.5
15.0

BH01	Box 1/1	6.63-10.22m

alliance	Client Name	Charvic Pty Ltd International Screen Academy Property Pty Ltd	Photo Date: 22/11/23
	Project Name	Proposed Mixed Use Development	Report Number: 17185-GR-1-1
	Project Location	242-258 Young Street, Waterloo NSW	

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Borehole Log

Client: Charvic Pty Ltd & International Screen Academy Property Pty Ltd
Project: Proposed Mixed-Use Commercial Development
Location: 242-258 Young Street, Waterloo, NSW

Started: 20/11/2023
Finished: 20/11/2023
Borehole Size 110 mm

Rig Type: Massenza MI3 | **Hole Location:** Refer to Drawing 17185-GR-1-1-B | **Driller:** MG | **Logged:** SC
RL Surface: 21.23m | **Contractor:** Stratacore | **Bearing:** --- | **Checked:** MAG

Method	Water	RL (m)	Depth (m)	Graphic Log	Classification Symbol	Material Description	Samples Tests Remarks	Moisture Condition	Consistency/ Density Index	Additional Observations
CC					-	Concrete, 150mm thickness.		-	-	PAVEMENT
ADT		21.0	0.5		-	FILL: Gravelly SAND, fine to coarse grained, dark brown, fine to medium sized gravel, with high plasticity clay, appears well compacted.		D	-	FILL
		20.5	1.0							
		20.0	1.5							
		19.5	2.0		SW	SAND, fine to medium grained, brown, trace silt.	SPT 5, 7, 6 N=13	D	MD	MARINE
		19.0	2.5							
		18.5	3.0							
		18.0	3.5		SW	SAND, fine to coarse grained, pale brown, trace silt.	SPT 6, 9, 9 N=18 ES - 3.0m	D	MD	
		17.5	4.0							
	GW @ 4.3m	17.0	4.5			At 4.3m: dark brown.		W	L	
		16.5	5.0				SPT 1, 1, 2 N=3			4.5m: Potential sand collapse or affected by groundwater ingress.

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Finished: 20/11/2023
Borehole Size 110 mm

Rig Type: Massenza MI3 | **Hole Location:** Refer to Drawing 17185-GR-1-1-B | **Driller:** MG | **Logged:** SC
RL Surface: 21.23m | **Contractor:** Stratacore | **Bearing:** --- | **Checked:** MAG

Method	Water	RL (m)	Depth (m)	Graphic Log	Classification Symbol	Material Description	Samples Tests Remarks	Moisture Condition	Consistency/ Density Index	Additional Observations
ADT		16.0	5.5		SW	SAND, fine to coarse grained, pale brown, trace silt. *(continued)*		D	MD	
		15.5								
			6.0		CH	CLAY, high plasticity, pale grey, with fine to medium grained sand.	SPT 3, 6, 9 N=15	MC > PL	St	
		15.0	6.5							
		14.5			SW	SAND, fine to coarse grained, dark brown, trace silt.		W	MD	
			7.0							
		14.0			-	SANDSTONE, fine to coarse grained, pale grey, very low strength.		D	-	EXTREMELY WEATHERED MATERIAL
			7.5							
		13.5								
			8.0							
		13.0								
			8.5							
		12.5								
			9.0			Borehole BH02 continued as cored hole				
		12.0								
			9.5							
		11.5								
			10.0							

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Finished: 20/11/2023
Location: 242-258 Young Street, Waterloo, NSW
Borehole Size 110 mm

Rig Type: Massenza MI3 **Hole Location:** Refer to Drawing 17185-GR-1-1-B **Driller:** MG **Logged:** SC
RL Surface: 21.23m **Contractor:** Stratacore **Bearing:** --- **Checked:** MAG

Method	Water	RL (m)	Depth (m)	Graphic Log	Material Description	Weathering	Estimated Strength (● Axial, ○ Diametral) EL -0.03, VL -0.1, L -0.3, M -1, H -3, VH -10, EH	$Is_{(50)}$ MPa D- diametral A- axial	RQD %	Defect Spacing mm (30, 100, 300, 1000, 3000)	Additional Data
		16.0	5.5								
		15.5	6.0								
		15.0	6.5								
		14.5	7.0								
		14.0	7.5								
		13.5	8.0								
		13.0	8.5								
		12.5			Continued from non-cored borehole						
NMLC			9.0		SANDSTONE, fine to medium grained, red brown, bedding fabric.	MW		D A 1.095 1.37	92		8.78 - DB. 9.0 - HB. 9.42 - BP, 10°, PL, RO, CN.
		12.0	9.5								
		11.5	10.0					D A 2.092 2.947			9.78 - BP, 5°, PL, RO, CN.

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Cored Borehole Log

Client: Charvic Pty Ltd & International Screen Academy Property Pty Ltd
Started: 20/11/2023
Project: Proposed Mixed-Use Commercial Development
Finished: 20/11/2023
Location: 242-258 Young Street, Waterloo, NSW
Borehole Size 110 mm

Rig Type: Massenza MI3 **Hole Location:** Refer to Drawing 17185-GR-1-1-B **Driller:** MG **Logged:** SC
RL Surface: 21.23m **Contractor:** Stratacore **Bearing:** --- **Checked:** MAG

Method	Water	RL (m)	Depth (m)	Graphic Log	Material Description	Weathering	Estimated Strength (● Axial, ○ Diametral) EL -0.03 VL -0.1 L -0.3 M -1 H -3 VH -10 EH	$Is_{(50)}$ MPa D- diametral A- axial	RQD %	Defect Spacing mm (30 100 300 1000 3000)	Additional Data
NMLC		11.0	10.5		SANDSTONE, fine to medium grained, red brown, bedding fabric. *(continued)*	MW		D 1.448 A 1.698	92		10.0 - HB. 10.35 - BP, 5°, PL, RO, SN. 10.73 - BP, 15°, PL, RO, VN. 10.86-10.88 - EWS, PL, RO, clay. 10.88-10.9 - EWS, PL, RO, CT. 11.0 - HB. 11.04 - BP, 5°, PL, RO, VN. 11.07-11.12 - EWS, PL, RO, clay. 11.35 - HB. 11.39 - BP, 15°, PL, RO, SN. 11.63 - DB.
		10.5	11.0								
		10.0	11.5								
		9.5						D 2.882 A 2.569			
		9.0	12.0		Target depth. BH02 terminated at 11.78m						End of Borehole.
		8.5	12.5								
		8.0	13.0								
		7.5	13.5								
		7.0	14.0								
		6.5	14.5								
			15.0								

BH02	Box 1/1	8.78-11.78m

alliance	Client Name	Charvic Pty Ltd International Screen Academy Property Pty Ltd	Photo Date: 20/11/23
	Project Name	Proposed Mixed Use Development	Report Number: 17185-GR-1-1
	Project Location	242-258 Young Street, Waterloo NSW	

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Borehole Log

Client: Charvic Pty Ltd & International Screen Academy Property Pty Ltd
Project: Proposed Mixed-Use Commercial Development
Location: 242-258 Young Street, Waterloo, NSW

Started: 23/11/2023
Finished: 23/11/2023
Borehole Size 110 mm

Rig Type: Massenza MI3 | **Hole Location:** Refer to Drawing 17185-GR-1-1-B | **Driller:** MG | **Logged:** SC
RL Surface: 21.45m | **Contractor:** Stratacore | **Bearing:** --- | **Checked:** MAG

Method	Water	RL (m)	Depth (m)	Graphic Log	Classification Symbol	Material Description	Samples Tests Remarks	Moisture Condition	Consistency/ Density Index	Additional Observations
CC					-	Concrete, 150mm thickness.		-	-	PAVEMENT
ADT		21.0	0.5		-	FILL: Sandy CLAY, high plasticity, brown and dark brown, fine to medium grained sand, trace fine sized gravel, reworked clay, appears well compacted.		MC < PL	F	FILL
		20.5	1.0							
		20.0	1.5				SPT 10, 16, 16 N=32			
		19.5	2.0		SW	SAND, fine to medium grained, dark grey.		M	L - MD	MARINE
		19.0	2.5							
		18.5	3.0				SPT 1, 1, 2 N=3			
		18.0	3.5							
		17.5	4.0			At 3.8m: with silt and organic content, slight hydrocarbon odour, wood fragments.				
	GW @ 4.3m	17.0	4.5		SW	SAND, fine to medium grained, pale grey and dark grey.		W	MD	
		16.5	5.0				SPT 4, 7, 8 N=15			

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Borehole Log

Client: Charvic Pty Ltd & International Screen Academy Property Pty Ltd
Project: Proposed Mixed-Use Commercial Development
Location: 242-258 Young Street, Waterloo, NSW

Started: 23/11/2023
Finished: 23/11/2023
Borehole Size 110 mm

Rig Type: Massenza MI3 | **Hole Location:** Refer to Drawing 17185-GR-1-1-B | **Driller:** MG | **Logged:** SC
RL Surface: 21.45m | **Contractor:** Stratacore | **Bearing:** --- | **Checked:** MAG

Method	Water	RL (m)	Depth (m)	Graphic Log	Classification Symbol	Material Description	Samples Tests Remarks	Moisture Condition	Consistency/ Density Index	Additional Observations
ADT		16.0	5.5		SW	SAND, fine to medium grained, pale grey and dark grey. *(continued)*		W	MD	
		15.5	6.0				SPT 3, 2, 3 N=5 ES - 6.4m			6.0m: Potential sand collapse or affected by groundwater ingress.
		15.0	6.5		CH	CLAY, high plasticity, pale grey, trace fine grained sand.		MC ~ PL	F	
		14.5	7.0							
		14.0	7.5				SPT 3, 5, 8 N=13			
		13.5	8.0							
		13.0	8.5							
		12.5	9.0		-	SANDSTONE, fine to medium grained, pale grey, very low strength.		D	-	EXTREMELY WEATHERED MATERIAL
						Borehole BH03 continued as cored hole				
		12.0	9.5							
		11.5	10.0							

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Cored Borehole Log

Client: Charvic Pty Ltd & International Screen Academy Property Pty Ltd
Project: Proposed Mixed-Use Commercial Development
Location: 242-258 Young Street, Waterloo, NSW

Started: 23/11/2023
Finished: 23/11/2023
Borehole Size 110 mm

Rig Type: Massenza MI3 | **Hole Location:** Refer to Drawing 17185-GR-1-1-B | **Driller:** MG | **Logged:** SC
RL Surface: 21.45m | **Contractor:** Stratacore | **Bearing:** --- | **Checked:** MAG

Method	Water	RL (m)	Depth (m)	Graphic Log	Material Description	Weathering	Estimated Strength (● Axial, ○ Diametral) EL -0.03 / VL -0.1 / L -0.3 / M -1 / H -3 / VH -10 / EH	$Is_{(50)}$ MPa D- diametral A- axial	RQD %	Defect Spacing mm (30, 100, 300, 1000, 3000)	Additional Data
		16.0	5.5								
		15.5	6.0								
		15.0	6.5								
		14.5	7.0								
		14.0	7.5								
		13.5	8.0								
		13.0	8.5								
		12.5	9.0		Continued from non-cored borehole						
NMLC		12.0	9.5		SANDSTONE, fine to medium grained, orange brown and pale grey, bedding fabric.	MW		D 1.075 A 2.525	91		9.2 - BP, 5°, PL, RO, CN. 9.6 - DB. 9.8 - HB.
		11.5	10.0								

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Cored Borehole Log

Client: Charvic Pty Ltd & International Screen Academy Property Pty Ltd
Started: 23/11/2023
Project: Proposed Mixed-Use Commercial Development
Finished: 23/11/2023
Location: 242-258 Young Street, Waterloo, NSW
Borehole Size 110 mm

Rig Type: Massenza MI3 **Hole Location:** Refer to Drawing 17185-GR-1-1-B **Driller:** MG **Logged:** SC
RL Surface: 21.45m **Contractor:** Stratacore **Bearing:** --- **Checked:** MAG

Method	Water	RL (m)	Depth (m)	Graphic Log	Material Description	Weathering	Estimated Strength (● Axial, ○ Diametral) EL -0.03 VL -0.1 L -0.3 M -1 H -3 VH -10 EH	$Is_{(50)}$ MPa D- diametral A- axial	RQD %	Defect Spacing mm 30 100 300 1000 3000	Additional Data
NMLC		11.0	10.5		SANDSTONE, fine to medium grained, orange brown and pale grey, bedding fabric. *(continued)*	MW		D A 1.36 1.82			10.0 - HB. 10.15 - BP, 5°, PL, RO, SN. 10.19 - BP, 55°, PL, RO, SN. 10.56-10.69 - EWS, PL, RO.
		10.5	11.0						91		11.0 - HB. 11.16 - DB.
		10.0	11.5								11.55 - BP, 5°, PL, RO, CN.
		9.5	12.0					D A 1.16 21.47			
					BH03 terminated at 12m						End of Borehole.
		9.0	12.5								
		8.5	13.0								
		8.0	13.5								
		7.5	14.0								
		7.0	14.5								
		6.5	15.0								

BH03	Box 1/1	9.0-12.0m

alliance	Client Name	Charvic Pty Ltd International Screen Academy Property Pty Ltd	Photo Date:	23/11/23
	Project Name	Proposed Mixed Use Development	Report Number:	17185-GR-1-1
	Project Location	242-258 Young Street, Waterloo NSW		

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Borehole Log

Client: Charvic Pty Ltd & International Screen Academy Property Pty Ltd
Project: Proposed Mixed-Use Commercial Development
Location: 242-258 Young Street, Waterloo, NSW

Started: 21/11/2023
Finished: 21/11/2023
Borehole Size 110 mm

Rig Type: Massenza MI3 | **Hole Location:** Refer to Drawing 17185-GR-1-1-B | **Driller:** MG | **Logged:** SC
RL Surface: 20.25m | **Contractor:** Stratacore | **Bearing:** --- | **Checked:** MAG

Method	Water	RL (m)	Depth (m)	Graphic Log	Classification Symbol	Material Description	Samples Tests Remarks	Moisture Condition	Consistency/ Density Index	Additional Observations
ADT		20.0	0.0		-	TOPSOIL: Sandy SILT, low plasticity, brown, fine to coarse grained, trace fine to medium sized gravel, organic.		MC < PL	F	TOPSOIL
					-	FILL: Sandy GRAVEL, fine to coarse sized, subangular grey, fine to coarse grained sand, appears well compacted.		D	MD - D	FILL
					-	FILL: SAND, fine to medium grained, pale brown, appears well compacted. At 0.3m: rare red brick.		D	MD	
		19.5	0.5		SW	SAND, fine to medium grained, pale brown.		D	MD	MARINE
		19.0	1.0							
		18.5	1.5				SPT 6, 7, 9 N=16			
		18.0	2.0							
		17.5	2.5							
		17.0	3.0				SPT 3, 2, 4 N=6			3.0m: Potential sand collapse or affected by groundwater ingress.
	GW @ 3.2m				SW	SAND, fine to medium grained, pale grey, trace silt.		W	L - MD	
		16.5	3.5							
		16.0	4.0							
		15.5	4.5			At 4.5m: becoming dense.	SPT 4, 9, 14 N=23			
			5.0							

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Borehole Log

Client: Charvic Pty Ltd & International Screen Academy Property Pty Ltd
Project: Proposed Mixed-Use Commercial Development
Location: 242-258 Young Street, Waterloo, NSW

Started: 21/11/2023
Finished: 21/11/2023
Borehole Size 110 mm

Rig Type: Massenza MI3 | **Hole Location:** Refer to Drawing 17185-GR-1-1-B | **Driller:** MG | **Logged:** SC
RL Surface: 20.25m | **Contractor:** Stratacore | **Bearing:** --- | **Checked:** MAG

Method	Water	RL (m)	Depth (m)	Graphic Log	Classification Symbol	Material Description	Samples Tests Remarks	Moisture Condition	Consistency/ Density Index	Additional Observations
ADT		15.0	5.5		SW	SAND, fine to medium grained, pale grey, trace silt. *(continued)*		W	L - MD	
		14.5	6.0				ES - 6.0m			
		14.0			CH	Sandy CLAY, high plasticity, pale brown mottled pale brown, fine to medium grained sand.	SPT 2, 3, 3 N=6	MC > PL	F	
			6.5		SW	SAND, fine to medium grained, pale grey, trace silt.		W	D	
		13.5	7.0							
		13.0	7.5			Borehole BH04 continued as cored hole				
		12.5	8.0							
		12.0	8.5							
		11.5	9.0							
		11.0	9.5							
		10.5	10.0							

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Cored Borehole Log

Client: Charvic Pty Ltd & International Screen Academy Property Pty Ltd
Started: 21/11/2023
Project: Proposed Mixed-Use Commercial Development
Finished: 21/11/2023
Location: 242-258 Young Street, Waterloo, NSW
Borehole Size 110 mm

Rig Type: Massenza MI3 **Hole Location:** Refer to Drawing 17185-GR-1-1-B **Driller:** MG **Logged:** SC
RL Surface: 20.25m **Contractor:** Stratacore **Bearing:** --- **Checked:** MAG

Method	Water	RL (m)	Depth (m)	Graphic Log	Material Description	Weathering	Estimated Strength ● - Axial ○ - Diametral (EL -0.03, VL -0.1, L -0.3, M -1, H -3, VH -10, EH)	$Is_{(50)}$ MPa D- diametral A- axial	RQD %	Defect Spacing mm (30, 100, 300, 1000, 3000)	Additional Data
		15.0	5.5								
		14.5	6.0								
		14.0	6.5								
		13.5	7.0								
		13.0	7.5		Continued from non-cored borehole						
NMLC		12.5	8.0		SANDSTONE, fine to medium grained, pale grey and orange brown.	EW					
					SANDSTONE, fine to medium grained, white, bedding fabric.	MW		D 0.054 A 0.601	59		8.0 - HB. 8.04 - BP, PL, RO, CN. 8.11 - BP, 5°, PL, RO, CN. 8.15-8.19 - EWS, PL, RO. 8.22 - HB. 8.44 - BP, 5°, PL, RO, CN. 8.69 - BP, 5°, PL, RO, CN. 8.96-9.0 - EWS, PL, RO. 9.0 - HB. 9.07 - BP, PL, RO, SN.
		12.0	8.5								
		11.5	9.0								
		11.0			CLAY, high plasticity, pale grey, trace fine to medium grained sand.	N/A					
		10.5	9.5		SANDSTONE, fine to medium grained, white, bedding fabric.	MW		D 2.431 A 2.384	93		9.59 - HB. 9.63 - BP, 5°, PL, RO, CT. 9.94 - BP, 5°, PL, RO, VN.
			10.0								

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Cored Borehole Log

Client: Charvic Pty Ltd & International Screen Academy Property Pty Ltd
Started: 21/11/2023
Project: Proposed Mixed-Use Commercial Development
Finished: 21/11/2023
Location: 242-258 Young Street, Waterloo, NSW
Borehole Size 110 mm

Rig Type: Massenza MI3 **Hole Location:** Refer to Drawing 17185-GR-1-1-B **Driller:** MG **Logged:** SC
RL Surface: 20.25m **Contractor:** Stratacore **Bearing:** --- **Checked:** MAG

Method	Water	RL (m)	Depth (m)	Graphic Log	Material Description	Weathering	Estimated Strength (● Axial, ○ Diametral) EL -0.03 VL -0.1 L -0.3 M -1 H -3 VH -10 EH	$Is_{(50)}$ MPa D- diametral A- axial	RQD %	Defect Spacing mm 30 100 300 1000 3000	Additional Data
NMLC		10.0	10.5		SANDSTONE, fine to medium grained, white, bedding fabric. *(continued)*	MW		D 3.995 A 5.617			< 10.0 - HB. 10.15 - HB. 10.3 - BP.
		9.5									10.76 - HB.
			11.0						93		
		9.0									11.0 - HB.
			11.5								
		8.5									11.68-11.72 - EWS, PL, RO. 11.81 - DB.
			12.0		BH04 terminated at 11.94m			D 0.890 A 0.894			End of Borehole.
		8.0									
			12.5								
		7.5									
			13.0								
		7.0									
			13.5								
		6.5									
			14.0								
		6.0									
			14.5								
		5.5									
			15.0								

BH04	Box 1/1	7.55-11.94m

alliance	Client Name	Charvic Pty Ltd International Screen Academy Property Pty Ltd	Photo Date: 21/11/23
	Project Name	Proposed Mixed Use Development	Report Number: 17185-GR-1-1
	Project Location	242-258 Young Street, Waterloo NSW	

APPENDIX D – Laboratory Testing Results

Material Test Report

Alliance Specialised Testing

Date Issued:	07/12/2023
Report Number:	P233937-1
Issue Number:	1
Reissue Reason:	N/A

Client:	Alliance Geotechnical Pty Ltd
Client Address:	8-10 Welder Road, Seven Hills NSW 2147
Client Contact:	Eric Wu <eric@allgeo.com.au>

Project Number:	P233937
Project Name:	242-258 Young Street, Waterloo
Project Location:	242-258 Young Street, Waterloo NSW

Page	Test Date	Sample Number	Borehole	Depth	Test
2	04/12/2023	23-31055A	BH01	9.23-9.54m	Rock Strength - AS 4133.4.2.2
3	04/12/2023	23-31055B	BH02	10.34-10.65m	Rock Strength - AS 4133.4.2.2
4	04/12/2023	23-31055C	BH03	11.55-11.85m	Rock Strength - AS 4133.4.2.2
5	04/12/2023	23-31055D	BH04	10.50-10.76m	Rock Strength - AS 4133.4.2.2

Work Request:	31055
Date Sampled:	29/11/2023
Sampling Method:	Sampled by Client
	The results apply to the sample as received
Specification:	-

Approved Signature:

Ian Goldschmidt
Specialist Testing Manager

Accredited for compliance with ISO/IEC 17025 - Testing
NATA Accredited Laboratory Number: 15100

NATA
WORLD RECOGNISED ACCREDITATION

alliance Specialty Testing

Office & Laboratory 8-10 Welder Road, Seven Hills, NSW
Mailing Address PO Box 275, Seven Hills, NSW 1730
Phone 1800 288 188
Email ian@allgeo.com.au
Website allgeo.com.au

alliance

Specialised Testing - 1800 288 188

Uniaxial Compressive Strength of Rock Strength less than 50MPa

Test Method: AS4133.4.2.2

Report Number:	P233937-1	Sample Date:	29/11/2023
Sample Number:	23-31055A	Test Date:	04/12/2023
Sample Source:	BH01, Depth: 9.23-9.54m	Report Date:	07/12/2023

Project Name:	242-258 Young Streeet, Waterloo
Client:	Alliance Geotechnical Pty Ltd
Identification:	Sandstone
Storage History, Curing and Environment:	Stored in laboratory at room temperature.

Specimen Details	
Diameter (mm)	51.8
Height (mm)	133.0
Moisture Content at Time of Test (%)	8.0

Results	
Uniaxial Compressive Strength (MPa)	14
Rate of Displacement (mm/min)	0.10
Test Duration (min)	15.4
Description of Failure	Single Shear Plane
Pertinent Observations	N/A

Photos

Before Testing	After Testing
	

Comments

N/A.

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NATA Accredited Laboratory Number: 15100

Approved Signature:

Ian Goldschmidt
Specialised Testing Manager

alliance
Specialised Testing - 1800 288 188

Uniaxial Compressive Strength of Rock Strength less than 50MPa

Test Method: AS4133.4.2.2

Report Number:	P233937-1	Sample Date:	29/11/2023
Sample Number:	23-31055B	Test Date:	04/12/2023
Sample Source:	BH02, Depth: 10.34-10.65m	Report Date:	07/12/2023

Project Name:	242-258 Young Streeet, Waterloo
Client:	Alliance Geotechnical Pty Ltd
Identification:	Rock Core
Storage History, Curing and Environment:	Stored in laboratory at room temperature.

Specimen Details	
Diameter (mm)	51.7
Height (mm)	137.7
Moisture Content at Time of Test (%)	7.4

Results	
Uniaxial Compressive Strength (MPa)	14
Rate of Displacement (mm/min)	0.10
Test Duration (min)	16.1
Description of Failure	Single Shear Plane
Pertinent Observations	N/A

Photos

Before Testing	After Testing
	

Comments

N/A.

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Accredited for compliance with ISO/IEC 17025 - Testing
NATA Accredited Laboratory Number: 15100

Approved Signature:

Ian Goldschmidt
Specialised Testing Manager

alliance
Specialised Testing - 1800 288 188

Uniaxial Compressive Strength of Rock Strength less than 50MPa

Test Method: AS4133.4.2.2

Report Number:	P233937-1	Sample Date:	29/11/2023
Sample Number:	23-31055C	Test Date:	04/12/2023
Sample Source:	BH03, Depth: 11.55-11.85m	Report Date:	07/12/2023

Project Name:	242-258 Young Streeet, Waterloo
Client:	Alliance Geotechnical Pty Ltd
Identification:	Rock Core
Storage History, Curing and Environment:	Stored in laboratory at room temperature.

Specimen Details	
Diameter (mm)	51.7
Height (mm)	135.8
Moisture Content at Time of Test (%)	8.1

Results	
Uniaxial Compressive Strength (MPa)	11
Rate of Displacement (mm/min)	0.10
Test Duration (min)	12.2
Description of Failure	Mixed Mode
Pertinent Observations	N/A

Photos

Before Testing	After Testing
	

Comments

N/A.

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Accredited for compliance with ISO/IEC 17025 - Testing
NATA Accredited Laboratory Number: 15100

Approved Signature:

Ian Goldschmidt
Specialised Testing Manager

alliance

Specialised Testing - 1800 288 188

Uniaxial Compressive Strength of Rock Strength less than 50MPa

Test Method: AS4133.4.2.2

Report Number:	P233937-1	Sample Date:	29/11/2023
Sample Number:	23-31055D	Test Date:	04/12/2023
Sample Source:	BH04, Depth: 10.50-10.76m	Report Date:	07/12/2023

Project Name:	242-258 Young Streeet, Waterloo
Client:	Alliance Geotechnical Pty Ltd
Identification:	Rock Core
Storage History, Curing and Environment:	Stored in laboratory at room temperature.

Specimen Details	
Diameter (mm)	51.7
Height (mm)	136.5
Moisture Content at Time of Test (%)	7.0

Results	
Uniaxial Compressive Strength (MPa)	26
Rate of Displacement (mm/min)	0.10
Test Duration (min)	8.9
Description of Failure	Single Shear Plane
Pertinent Observations	N/A

Photos

Before Testing	After Testing
	

Comments

N/A.

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NATA Accredited Laboratory Number: 15100

Approved Signature:

Ian Goldschmidt
Specialised Testing Manager

Alliance Geotechnical
10 Welder Road
Seven Hills
NSW 2147

Attention: **Sean Cunningham**

Report **1046817-S**
Project name 242-258 YOUNG STREET WATERLOO
Project ID 17185
Received Date Nov 22, 2023

Client Sample ID			**BH01**	**BH02**	**BH04**
Sample Matrix			**Soil**	**Soil**	**Soil**
Eurofins Sample No.			**S23-No0055939**	**S23-No0055940**	**S23-No0055941**
Date Sampled			**Nov 22, 2023**	**Nov 21, 2023**	**Nov 20, 2023**
Test/Reference	LOR	Unit			
Chloride	10	mg/kg	< 10	< 10	25
Conductivity (1:5 aqueous extract at 25 °C as rec.)	10	uS/cm	< 10	23	160
pH (1:5 Aqueous extract at 25 °C as rec.)	0.1	pH Units	5.3	8.3	9.6
Resistivity*	0.5	ohm.m	1100	430	62
Sulphate (as SO4)	10	mg/kg	< 10	17	33
Sample Properties					
% Moisture	1	%	17	3.0	25

Sample History

Where samples are submitted/analysed over several days, the last date of extraction is reported.

If the date and time of sampling are not provided, the Laboratory will not be responsible for compromised results should testing be performed outside the recommended holding time.

Description	Testing Site	Extracted	Holding Time
Chloride	Sydney	Nov 23, 2023	28 Days
- Method: LTM-INO-4270 Anions by Ion Chromatography			
Conductivity (1:5 aqueous extract at 25 °C as rec.)	Sydney	Nov 23, 2023	7 Days
- Method: LTM-INO-4030 Conductivity			
pH (1:5 Aqueous extract at 25 °C as rec.)	Sydney	Nov 23, 2023	7 Days
- Method: LTM-GEN-7090 pH by ISE			
Sulphate (as SO4)	Sydney	Nov 23, 2023	28 Days
- Method: In-house method LTM-INO-4270 Sulphate by Ion Chromatograph			
% Moisture	Sydney	Nov 23, 2023	14 Days
- Method: LTM-GEN-7080 Moisture			

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NATA# 1261	NATA# 1261	NATA# 1261	NATA# 1261	NATA# 1261	Site# 25079 & 25289
Site# 1254	Site# 25403	Site# 18217	Site# 25466	Site# 20794	

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NZBN: 9429046024954

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IANZ# 1327	IANZ# 1290	IANZ# 1402

Company Name: Alliance Geotechnical
Address: 10 Welder Road
Seven Hills
NSW 2147

Project Name: 242-258 YOUNG STREET WATERLOO
Project ID: 17185

Order No.:
Report #: 1046817
Phone: 1800 288 188
Fax: 02 9675 1888

Received: Nov 22, 2023 6:50 PM
Due: Nov 28, 2023
Priority: 3 Day
Contact Name: - ALL SRAS/RESULTS/INVOICES

Eurofins Analytical Services Manager : Andrew Black

Sample Detail						Aggressivity Soil Set	Moisture Set
Sydney Laboratory - NATA # 1261 Site # 18217						X	X
External Laboratory							
No	**Sample ID**	**Sample Date**	**Sampling Time**	**Matrix**	**LAB ID**		
1	BH01	Nov 22, 2023		Soil	S23-No0055939	X	X
2	BH02	Nov 21, 2023		Soil	S23-No0055940	X	X
3	BH04	Nov 20, 2023		Soil	S23-No0055941	X	X
Test Counts						3	3

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Internal Quality Control Review and Glossary

General

1. Laboratory QC results for Method Blanks, Duplicates, Matrix Spikes, and Laboratory Control Samples follow guidelines delineated in the National Environment Protection (Assessment of Site Contamination) Measure 1999, as amended May 2013. They are included in this QC report where applicable. Additional QC data may be available on request.
2. All soil/sediment/solid results are reported on a dry weight basis unless otherwise stated.
3. All biota/food results are reported on a wet weight basis on the edible portion unless otherwise stated.
4. For CEC results where the sample's origin is unknown or environmentally contaminated, the results should be used advisedly.
5. Actual LORs are matrix dependent. Quoted LORs may be raised where sample extracts are diluted due to interferences.
6. Results are uncorrected for matrix spikes or surrogate recoveries except for PFAS compounds.
7. SVOC analysis on waters is performed on homogenised, unfiltered samples unless noted otherwise.
8. Samples were analysed on an 'as received' basis.
9. Information identified in this report with blue colour indicates data provided by customers that may have an impact on the results.
10. This report replaces any interim results previously issued.

Holding Times

Please refer to the 'Sample Preservation and Container Guide' for holding times (QS3001).

For samples received on the last day of holding time, notification of testing requirements should have been received at least 6 hours before sample receipt deadlines as stated on the SRA.

If the Laboratory did not receive the information in the required timeframe, and despite any other integrity issues, suitably qualified results may still be reported.

Holding times apply from the date of sampling; therefore, compliance with these may be outside the laboratory's control.

For VOCs containing vinyl chloride, styrene and 2-chloroethyl vinyl ether, the holding time is 7 days; however, for all other VOCs, such as BTEX or C6-10 TRH, the holding time is 14 days.

Units

mg/kg: milligrams per kilogram
mg/L: milligrams per litre
µg/L: micrograms per litre
ppm: parts per million
ppb: parts per billion
%: Percentage
org/100 mL: Organisms per 100 millilitres
NTU: Nephelometric Turbidity Units
MPN/100 mL: Most Probable Number of organisms per 100 millilitres
CFU: Colony forming unit

Terms

APHA	American Public Health Association
CEC	Cation Exchange Capacity
COC	Chain of Custody
CP	Client Parent - QC was performed on samples pertaining to this report
CRM	Certified Reference Material (ISO17034) - reported as percent recovery.
Dry	Where moisture has been determined on a solid sample, the result is expressed on a dry weight basis.
Duplicate	A second piece of analysis from the same sample and reported in the same units as the result to show comparison.
LOR	Limit of Reporting.
LCS	Laboratory Control Sample - reported as percent recovery.
Method Blank	In the case of solid samples, these are performed on laboratory-certified clean sands and in the case of water samples, these are performed on de-ionised water.
NCP	Non-Client Parent - QC performed on samples not pertaining to this report, QC represents the sequence or batch that client samples were analysed within.
RPD	Relative Percent Difference between two Duplicate pieces of analysis.
SPIKE	Addition of the analyte to the sample and reported as percentage recovery.
SRA	Sample Receipt Advice
Surr - Surrogate	The addition of a like compound to the analyte target and reported as percentage recovery.
TBTO	Tributyltin oxide (*bis*-tributyltin oxide) - individual tributyltin compounds cannot be identified separately in the environment; however free tributyltin was measured, and its values were converted stoichiometrically into tributyltin oxide for comparison with regulatory limits.
TCLP	Toxicity Characteristic Leaching Procedure
TEQ	Toxic Equivalency Quotient or Total Equivalence
QSM	US Department of Defense Quality Systems Manual Version 5.4
US EPA	United States Environmental Protection Agency
WA DWER	Sum of PFBA, PFPeA, PFHxA, PFHpA, PFOA, PFBS, PFHxS, PFOS, 6:2 FTSA, 8:2 FTSA

QC - Acceptance Criteria

The acceptance criteria should be used as a guide only and may be different when site-specific Sampling Analysis and Quality Plan (SAQP) have been implemented.

RPD Duplicates: Global RPD Duplicates Acceptance Criteria is 30%; however the following acceptance guidelines are equally applicable: Results <10 times the LOR: No Limit

Results between 10-20 times the LOR: RPD must lie between 0-50%

Results >20 times the LOR: RPD must lie between 0-30%

NOTE: pH duplicates are reported as a range, not as RPD

Surrogate Recoveries: Recoveries must lie between 20-130% for Speciated Phenols & 50-150% for PFAS. SVOCs recoveries 20 – 150%

PFAS field samples that contain surrogate recoveries above the QC limit designated in QSM 5.4, where no positive PFAS results have been reported, have been reviewed, and no data was affected.

QC Data General Comments

1. Where a result is reported as less than (<), higher than the nominated LOR, this is due to either matrix interference, extract dilution required due to interferences or contaminant levels within the sample, high moisture content or insufficient sample provided.
2. Duplicate data shown within this report that states the word "BATCH" is a Batch Duplicate from outside of your sample batch but within the laboratory sample batch at a 1:10 ratio. The Parent and Duplicate data shown are not data from your samples.
3. pH and Free Chlorine analysed in the laboratory - Analysis on this test must begin within 30 minutes of sampling. Therefore, laboratory analysis is unlikely to be completed within holding time.Analysis will begin as soon as possible after sample receipt.
4. Recovery Data (Spikes & Surrogates) - where chromatographic interference does not allow the determination of recovery, the term "INT" appears against that analyte.
5. For Matrix Spikes and LCS results, a dash "-" in the report means that the specific analyte was not added to the QC sample.
6. Duplicate RPDs are calculated from raw analytical data; thus, it is possible to have two sets of data.

Quality Control Results

Test			Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Method Blank									
Chloride			mg/kg	< 10			10	Pass	
Conductivity (1:5 aqueous extract at 25 °C as rec.)			uS/cm	< 10			10	Pass	
Sulphate (as SO4)			mg/kg	< 10			10	Pass	
LCS - % Recovery									
Chloride			%	108			70-130	Pass	
Conductivity (1:5 aqueous extract at 25 °C as rec.)			%	101			70-130	Pass	
Resistivity*			%	101			70-130	Pass	
Sulphate (as SO4)			%	108			70-130	Pass	
Test	**Lab Sample ID**	**QA Source**	**Units**	**Result 1**			**Acceptance Limits**	**Pass Limits**	**Qualifying Code**
Spike - % Recovery									
				Result 1					
Chloride	W23-No0041097	NCP	%	109			70-130	Pass	
Sulphate (as SO4)	W23-No0041097	NCP	%	104			70-130	Pass	
Test	**Lab Sample ID**	**QA Source**	**Units**	**Result 1**			**Acceptance Limits**	**Pass Limits**	**Qualifying Code**
Duplicate									
				Result 1	Result 2	RPD			
Chloride	S23-No0055939	CP	mg/kg	< 10	< 10	<1	30%	Pass	
Conductivity (1:5 aqueous extract at 25 °C as rec.)	S23-No0055939	CP	uS/cm	< 10	12	22	30%	Pass	
pH (1:5 Aqueous extract at 25 °C as rec.)	S23-No0055939	CP	pH Units	5.3	5.1	<1	30%	Pass	
Resistivity*	S23-No0055939	CP	ohm.m	1100	870	22	30%	Pass	
Sulphate (as SO4)	S23-No0055939	CP	mg/kg	< 10	< 10	<1	30%	Pass	
Duplicate									
Sample Properties				Result 1	Result 2	RPD			
% Moisture	S23-No0055916	NCP	%	8.7	8.8	1.3	30%	Pass	

Comments

Sample Integrity

Custody Seals Intact (if used)	N/A
Attempt to Chill was evident	Yes
Sample correctly preserved	Yes
Appropriate sample containers have been used	Yes
Sample containers for volatile analysis received with minimal headspace	Yes
Samples received within HoldingTime	Yes
Some samples have been subcontracted	No

Authorised by:

Andrew Black	Analytical Services Manager
Ryan Phillips	Senior Analyst-Inorganic

Glenn Jackson
Managing Director

Final Report – this report replaces any previously issued Report

- Indicates Not Requested

* Indicates NATA accreditation does not cover the performance of this service

Measurement uncertainty of test data is available on request or please click here.

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Certificate of Analysis

Alliance Geotechnical
10 Welder Road
Seven Hills
NSW 2147

NATA Accredited
Accreditation Number 1261
Site Number 18217

Accredited for compliance with ISO/IEC 17025 – Testing
NATA is a signatory to the ILAC Mutual Recognition Arrangement for the mutual recognition of the equivalence of testing, medical testing, calibration, inspection, proficiency testing scheme providers and reference materials producers reports and certificates.

Attention: **Sean Cunningham**

Report **1047848-S**
Project name 242-258 YOUNG STREET WATERLOO
Project ID 17185
Received Date Nov 24, 2023

Client Sample ID			**BH03 - 6.4m**
Sample Matrix			**Soil**
Eurofins Sample No.			**S23-No0063215**
Date Sampled			**Nov 24, 2023**
Test/Reference	LOR	Unit	
Chloride	10	mg/kg	70
Conductivity (1:5 aqueous extract at 25 °C as rec.)	10	uS/cm	360
pH (1:5 Aqueous extract at 25 °C as rec.)	0.1	pH Units	9.7
Resistivity*	0.5	ohm.m	28
Sulphate (as SO4)	10	mg/kg	120
Sample Properties			
% Moisture	1	%	12

Sample History

Where samples are submitted/analysed over several days, the last date of extraction is reported.

If the date and time of sampling are not provided, the Laboratory will not be responsible for compromised results should testing be performed outside the recommended holding time.

Description	Testing Site	Extracted	Holding Time
Chloride	Sydney	Nov 27, 2023	28 Days
- Method: LTM-INO-4270 Anions by Ion Chromatography			
Conductivity (1:5 aqueous extract at 25 °C as rec.)	Sydney	Nov 27, 2023	7 Days
- Method: LTM-INO-4030 Conductivity			
pH (1:5 Aqueous extract at 25 °C as rec.)	Sydney	Nov 27, 2023	7 Days
- Method: LTM-GEN-7090 pH by ISE			
Sulphate (as SO4)	Sydney	Nov 27, 2023	28 Days
- Method: In-house method LTM-INO-4270 Sulphate by Ion Chromatograph			
% Moisture	Sydney	Nov 25, 2023	14 Days
- Method: LTM-GEN-7080 Moisture			

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Eurofins Environment Testing Australia Pty Ltd
ABN: 50 005 085 521

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Dandenong South	Grovedale	Girraween	Mitchell	Murarrie	Mayfield West NSW 2304
VIC 3175	VIC 3216	NSW 2145	ACT 2911	QLD 4172	Tel: +61 2 4968 8448
Tel: +61 3 8564 5000	Tel: +61 3 8564 5000	Tel: +61 2 9900 8400	Tel: +61 2 6113 8091	Tel: +61 7 3902 4600	NATA# 1261
NATA# 1261	NATA# 1261	NATA# 1261	NATA# 1261	NATA# 1261	Site# 25079 & 25289
Site# 1254	Site# 25403	Site# 18217	Site# 25466	Site# 20794	

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Company Name: Alliance Geotechnical
Address: 10 Welder Road
Seven Hills
NSW 2147

Project Name: 242-258 YOUNG STREET WATERLOO
Project ID: 17185

Order No.:
Report #: 1047848
Phone: 1800 288 188
Fax: 02 9675 1888

Received: Nov 24, 2023 7:10 PM
Due: Nov 30, 2023
Priority: 3 Day
Contact Name: Sean Cunningham

Eurofins Analytical Services Manager : Andrew Black

Sample Detail						Aggressivity Soil Set	Moisture Set
Sydney Laboratory - NATA # 1261 Site # 18217						X	X
External Laboratory							
No	**Sample ID**	**Sample Date**	**Sampling Time**	**Matrix**	**LAB ID**		
1	BH03 - 6.4m	Nov 24, 2023		Soil	S23-No0063215	X	X
Test Counts						1	1

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Internal Quality Control Review and Glossary

General

1. Laboratory QC results for Method Blanks, Duplicates, Matrix Spikes, and Laboratory Control Samples follow guidelines delineated in the National Environment Protection (Assessment of Site Contamination) Measure 1999, as amended May 2013. They are included in this QC report where applicable. Additional QC data may be available on request.
2. All soil/sediment/solid results are reported on a dry weight basis unless otherwise stated.
3. All biota/food results are reported on a wet weight basis on the edible portion unless otherwise stated.
4. For CEC results where the sample's origin is unknown or environmentally contaminated, the results should be used advisedly.
5. Actual LORs are matrix dependent. Quoted LORs may be raised where sample extracts are diluted due to interferences.
6. Results are uncorrected for matrix spikes or surrogate recoveries except for PFAS compounds.
7. SVOC analysis on waters is performed on homogenised, unfiltered samples unless noted otherwise.
8. Samples were analysed on an 'as received' basis.
9. Information identified in this report with blue colour indicates data provided by customers that may have an impact on the results.
10. This report replaces any interim results previously issued.

Holding Times

Please refer to the 'Sample Preservation and Container Guide' for holding times (QS3001).

For samples received on the last day of holding time, notification of testing requirements should have been received at least 6 hours before sample receipt deadlines as stated on the SRA.

If the Laboratory did not receive the information in the required timeframe, and despite any other integrity issues, suitably qualified results may still be reported.

Holding times apply from the date of sampling; therefore, compliance with these may be outside the laboratory's control.

For VOCs containing vinyl chloride, styrene and 2-chloroethyl vinyl ether, the holding time is 7 days; however, for all other VOCs, such as BTEX or C6-10 TRH, the holding time is 14 days.

Units

mg/kg: milligrams per kilogram	**mg/L:** milligrams per litre	**ppm:** parts per million
µg/L: micrograms per litre	**ppb:** parts per billion	**%:** Percentage
org/100 mL: Organisms per 100 millilitres	**NTU:** Nephelometric Turbidity Units	**MPN/100 mL:** Most Probable Number of organisms per 100 millilitres
CFU: Colony forming unit	**Colour:** Pt-Co Units	

Terms

APHA	American Public Health Association
CEC	Cation Exchange Capacity
COC	Chain of Custody
CP	Client Parent - QC was performed on samples pertaining to this report
CRM	Certified Reference Material (ISO17034) - reported as percent recovery.
Dry	Where moisture has been determined on a solid sample, the result is expressed on a dry weight basis.
Duplicate	A second piece of analysis from the same sample and reported in the same units as the result to show comparison.
LOR	Limit of Reporting.
LCS	Laboratory Control Sample - reported as percent recovery.
Method Blank	In the case of solid samples, these are performed on laboratory-certified clean sands and in the case of water samples, these are performed on de-ionised water.
NCP	Non-Client Parent - QC performed on samples not pertaining to this report, QC represents the sequence or batch that client samples were analysed within.
RPD	Relative Percent Difference between two Duplicate pieces of analysis.
SPIKE	Addition of the analyte to the sample and reported as percentage recovery.
SRA	Sample Receipt Advice
Surr - Surrogate	The addition of a similar compound to the analyte target is reported as percentage recovery. See below for acceptance criteria.
TBTO	Tributyltin oxide (*bis*-tributyltin oxide) - individual tributyltin compounds cannot be identified separately in the environment; however, free tributyltin was measured, and its values were converted stoichiometrically into tributyltin oxide for comparison with regulatory limits.
TCLP	Toxicity Characteristic Leaching Procedure
TEQ	Toxic Equivalency Quotient or Total Equivalence
QSM	US Department of Defense Quality Systems Manual Version 5.4
US EPA	United States Environmental Protection Agency
WA DWER	Sum of PFBA, PFPeA, PFHxA, PFHpA, PFOA, PFBS, PFHxS, PFOS, 6:2 FTSA, 8:2 FTSA

QC - Acceptance Criteria

The acceptance criteria should only be used as a guide and may be different when site-specific Sampling Analysis and Quality Plan (SAQP) have been implemented.

RPD Duplicates: Global RPD Duplicates Acceptance Criteria is ≤30%; however, the following acceptance guidelines are equally applicable:

Results <10 times the LOR:	No Limit
Results between 10-20 times the LOR:	RPD must lie between 0-50%
Results >20 times the LOR:	RPD must lie between 0-30%

NOTE: pH duplicates are reported as a range, not as RPD

Surrogate Recoveries: Recoveries must lie between 20-130% for Speciated Phenols & 50-150% for PFAS. SVOCs recoveries 20 – 150%, VOC recoveries 70 – 130%

PFAS field samples containing surrogate recoveries above the QC limit designated in QSM 5.4, where no positive PFAS results have been reported or reviewed, and no data was affected.

QC Data General Comments

1. Where a result is reported as less than (<), higher than the nominated LOR, this is due to either matrix interference, extract dilution required due to interferences or contaminant levels within the sample, high moisture content or insufficient sample provided.
2. Duplicate data shown within this report that states the word "BATCH" is a Batch Duplicate from outside of your sample batch but within the laboratory sample batch at a 1:10 ratio. The Parent and Duplicate data shown are not data from your samples.
3. pH and Free Chlorine analysed in the laboratory - Analysis on this test must begin within 30 minutes of sampling. Therefore, laboratory analysis is unlikely to be completed within holding time.Analysis will begin as soon as possible after sample receipt.
4. Recovery Data (Spikes & Surrogates) - where chromatographic interference does not allow the determination of recovery, the term "INT" appears against that analyte.
5. For Matrix Spikes and LCS results, a dash "-" in the report means that the specific analyte was not added to the QC sample.
6. Duplicate RPDs are calculated from raw analytical data; thus, it is possible to have two sets of data.

Quality Control Results

Test			Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Method Blank									
Chloride			mg/kg	< 10			10	Pass	
Conductivity (1:5 aqueous extract at 25 °C as rec.)			uS/cm	< 10			10	Pass	
Sulphate (as SO4)			mg/kg	< 10			10	Pass	
LCS - % Recovery									
Chloride			%	101			70-130	Pass	
Conductivity (1:5 aqueous extract at 25 °C as rec.)			%	99			70-130	Pass	
Resistivity*			%	99			70-130	Pass	
Sulphate (as SO4)			%	103			70-130	Pass	
Test	**Lab Sample ID**	**QA Source**	**Units**	**Result 1**			**Acceptance Limits**	**Pass Limits**	**Qualifying Code**
Spike - % Recovery									
				Result 1					
Chloride	S23-No0053551	NCP	%	106			70-130	Pass	
Sulphate (as SO4)	S23-No0053551	NCP	%	113			70-130	Pass	
Test	**Lab Sample ID**	**QA Source**	**Units**	**Result 1**			**Acceptance Limits**	**Pass Limits**	**Qualifying Code**
Duplicate									
				Result 1	Result 2	RPD			
Chloride	S23-No0053558	NCP	mg/kg	< 10	< 10	<1	30%	Pass	
Conductivity (1:5 aqueous extract at 25 °C as rec.)	S23-No0063215	CP	uS/cm	360	320	12	30%	Pass	
pH (1:5 Aqueous extract at 25 °C as rec.)	S23-No0063215	CP	pH Units	9.7	9.8	<1	30%	Pass	
Resistivity*	S23-No0063215	CP	ohm.m	28	31	12	30%	Pass	
Sulphate (as SO4)	S23-No0053558	NCP	mg/kg	36	36	<1	30%	Pass	
Duplicate									
Sample Properties				Result 1	Result 2	RPD			
% Moisture	S23-No0063224	NCP	%	4.5	4.0	11	30%	Pass	

Comments

Sample Integrity

Custody Seals Intact (if used)	N/A
Attempt to Chill was evident	Yes
Sample correctly preserved	Yes
Appropriate sample containers have been used	Yes
Sample containers for volatile analysis received with minimal headspace	Yes
Samples received within HoldingTime	Yes
Some samples have been subcontracted	No

Authorised by:

Andrew Black	Analytical Services Manager
Dilani Samarakoon	Senior Analyst-Inorganic

Glenn Jackson
Managing Director

Final Report – this report replaces any previously issued Report

- Indicates Not Requested

* Indicates NATA accreditation does not cover the performance of this service

Measurement uncertainty of test data is available on request or please click here.