ELOURA HOLDINGS PTY LTD

SEPTEMBER 2018

GEOTECHNICAL INVESTIGATION REPORT

176-184 GEORGE STREET, CONCORD WEST NSW

Question today
Imagine tomorrow
Create for the future

176-184 George Street, Concord West
Geotechnical Investigation Report

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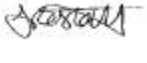
Reviewed by:	Aaron Rastall	07/09/2018	
Approved by:	Rob Kingsland	13/09/2018	

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1 INTRODUCTION

1.1 BACKGROUND

WSP Australia Pty Ltd (WSP) has been engaged by Eloura Holdings to conduct a geotechnical investigation for a proposed residential development planned for the site of 176-184 George Street, Concord West, NSW

The site is currently occupied by warehouse industrial buildings, loading docks and car parking areas. We understand the site is planned to be rezoned for R3 high density residential purposes. The development requires geotechnical information and recommendations for design.

All geotechnical works have been carried out in general accordance with the WSP proposal (PP108978-CLM-LTR-001 Rev C).

1.2 SCOPE OF WORKS

The scope of works comprised the following:

- Non-intrusive services search at the proposed geotechnical / pavement location
- Geotechnical field investigation comprising three (3) cored / augured boreholes, at locations presented in Figure 1, Appendix A
- Installation of three (3) standpipe piezometers
- Geotechnical laboratory testing of selected soil samples recovered
- Interpretative geotechnical reporting

1.3 PURPOSE OF THIS REPORT

This Geotechnical Investigation Report (GIR) has been prepared to collate and interpret relevant geotechnical design information for the site. The GIR includes a review of regional geology, site topography and geotechnical information derived from field and laboratory testing, provision of preliminary geotechnical design parameters for inclusion into subsequent design phases, and advice on geotechnical issues relevant to the proposed development of the site.

The objective of the GIR was to provide comments and recommendations on the following:

- Subsurface conditions, soil properties and depths across the site
- Rock properties and depths across the site
- Groundwater levels at the time of investigations (if encountered)
- Geotechnical design parameters for retaining walls and foundations
- Foundation and excavation conditions, excavatability of material
- Stability of batter slopes and shoring systems options/requirements
- Foundation design

The geotechnical investigation was undertaken concurrently with a Contamination Investigation, with the results and recommendations presented in Detailed Site Investigation and Remediation Plan, (WSP, 2018).

2 SITE CHARACTERISATION

2.1 SITE DESCRIPTION

The topography is characterised by a gentle cross slope across the project site, in a general east-west direction. The western extent of the project site has an elevation of approximately 4 m AHD along the boundary of the Powells Creek Reserve, whilst the eastern edge of the site along George Street has an elevation of approximately 5-6 m AHD.

2.2 SOIL LANDSCAPE

The 1:100,000 scale Sydney Soils Landscape Sheet (9130) indicates that the soils in the project area belong to the Blacktown (bt) soil landscape group. These soils are derived from weathering of the Wianamatta Group rocks and comprise shallow to moderately deep, hard setting clay loam to silty clay loam soils with mottled texture, red and brown podzolic soils on crests grading to yellow podzolic soils on lower slopes and in drainage lines. The Blacktown landscape soils are typically moderately reactive, have poor soil drainage and low fertility.

2.3 REGIONAL GEOLOGY

The Sydney 1:100,000 scale Geological Sheet (9030) indicates near surface geology within the project site is underlain by Ashfield Shale (Rwa) of the Wianamatta Group, comprising siltstone, claystone fine grained sandstones and finely interlaminated beds of siltstone and sandstone.

The map also indicates man-made fill comprising dredged soils, demolition rubble and waste materials overlies the Ashfield Shale along the western part of the project site.

2.4 ACID SULFATE SOILS

Acid sulfate soils (ASS) are generally likely to be present in marine and estuarine sediments of the recent (Holocene) geological age, in soils generally less than five meters above mean sea level and within a marine or estuarine setting. These sediments show traces of sulfate, which upon exposure to air, can oxidise to form sulfuric acid. The acid reacts with clay minerals and dissolves metal particles in the soil such as iron and aluminium. The resulting acid and dissolved metals that leach from the soil are often toxic to flora and fauna. Advice on acid sulfate soils can be found in contamination investigation report (WSP, 2018).

3 SITE INVESTIGATION METHODOLOGY

3.1 PLANNING AND APPROVALS

Project specific plans were produced prior to the start of the site investigation. These included a Health, Environment and Safety Plan (HESP) and a Ground Penetration Permit (GPP) for individual hole locations.

The HESP identifies key site specific hazards and corresponding controls measures to be adopted to safely complete the scope of works.

The GPP provides information pertaining to the type and location of services proximal to proposed investigation locations, specifies minimum offset distances based on those stipulated by asset owners, provides a range of control measures, and prompts a site assessment of all potential visible indicators of services. Information was gathered from Dial Before You Dig (DBYD) plans.

3.2 SERVICES SEARCH

The proposed locations were reviewed against the DBYD and allowing potential conflicts with existing utilities to be identified, and relocation of investigation boreholes where required. An accredited service locator, Utility Locating Services was subcontracted to identify buried services for each borehole location using a combination of conventional equipment and ground penetrating radar (GPR). None of the proposed geotechnical investigation locations were moved due to buried services. Locations were repositioned as required to facilitate more suitable placement of the drilling rig inside the warehouse at the site location.

3.3 SITE INVESTIGATION

To assess subsurface conditions across the site, a total of three boreholes were drilled (by Stratacore Drilling) using a Comacchio Geo205 track mounted drilling rig. BH30 and BH44 were hand augered to 1.5 m, then auger drilled using continuous flight augers, and extended into bedrock using NMLC coring equipment to a depth of 10 m. A push tube was used to 2.2 m depth in BH35, after which the same method of auger and NMLC drilling was used to reach Target Depth.

So as to obtain an understanding of the ground conditions across the site, boreholes were positioned in the North Eastern, Central Eastern and South Western areas of the site. The location of each investigation is presented in Figure 1 in Appendix A.

Boreholes were logged by a geotechnical engineer who nominated sampling depths and collected disturbed samples of soil materials for laboratory testing. Standard Penetration Testing (SPT) testing was carried out in each borehole at 1.5 m intervals to assess the consistency or relative density of the soils. Rock core was logged, photographed, and point load tested (Is50) to assess strength parameters.

Piezometers were installed in all three geotechnical boreholes to assess groundwater levels and inflow rates. An additional 19 soil investigation boreholes were drilled to depths of up to 3 m as part of the contamination investigation. For well construction details refer to the Detailed Site Investigation and Remediation Plan, (WSP, 2018).

3.4 GROUNDWATER MONITORING

All three geotechnical bores drilled as part of the geotechnical investigation were converted into groundwater monitoring bores. The groundwater monitoring bores are screened in the residual soil and Ashfield Shale. There are also two existing groundwater wells near the site.

4 INVESTIGATION RESULTS

4.1 BOREHOLES

A summary of the boreholes is presented in Table 4.1. Engineering logs are presented in Appendix C along with core photos and explanatory notes. Borehole coordinates have been identified with a combination of hand held GPS and site plans and are accurate to +/- 5 m. Reduced levels have been approximated using handheld GPS and available GIS data and is accurate to +/- 10 m.

Table 4.1 Geotechnical borehole summary

ID	EASTING (MGA 94)	NORTHING (MGA 94)	REDUCED LEVEL (m AHD)	TERMINATION DEPTH (M)
BH30	322670	6252761	4	10
BH44	322704	6252929	4	10
BH35	322702	6252831	4	10

4.2 SUBSURFACE CONDITIONS

Subsurface conditions encountered for the site investigation were generally consistent with geology and soil landscape maps of the area, and uniform across the site. A summary of the ground conditions encountered is presented in Table 4.2. Reference to the individual logging sheets should be made for a detailed description of the soil conditions encountered during the site investigation.

Table 4.2 Generalised ground profile at each borehole

INVESTIGATION ID	MATERIAL	DEPTH BELOW EXISTING GROUND SURFACE (m)	THICKNESS (m)
BH30	Pavement: Concrete	0.0	0.14
	Fill: Gravelly Sand/Gravelly Clayey Sand, fine to medium grained, low plasticity, trace plastics and glass and fabric	0.14	2.96
	Weathered Rock: Shale, very low to medium strength	3.1	2.06
	Bedrock: Shale, medium to very high strength	5.16	Full thickness not proven
BH44	Pavement: Concrete	0.0	0.25
	Fill: Sandy/Gravelly Clay, low plasticity, fine to coarse grained gravel.	0.25	2.75
	Alluvial: Silty Clay, medium to high plasticity, trace fine to medium grained gravel, soft.	3.0	0.5
	Residual: Silty clay, high plasticity, Stiff to Very Stiff	3.5	1.2
	Weathered Rock: Shale, very low to medium strength	4.7	1.55

INVESTIGATION ID	MATERIAL	DEPTH BELOW EXISTING GROUND SURFACE (m)	THICKNESS (m)
	Bedrock: Shale, medium to very high strength	6.25	Full thickness not proven
BH35	Pavement: Concrete	0.0	0.32
	Residual: Silty clay, high plasticity, Stiff to Very Stiff	0.32	2.28
	Weathered Rock: Shale, very low to medium strength	2.6	3.40
	Bedrock: Shale, medium to very high strength	6.0	Full thickness not proven

4.3 GEOTECHNICAL MODEL

A geotechnical long section outlining inferred subsurface conditions across the project site based on lithological information from three geotechnical boreholes and contamination boreholes is presented in Appendix D. Detailed geotechnical and contamination borehole logs can be found in Appendix C, and Contamination investigation report, WSP (2018), respectively. Interpretation of geological units are in accordance with the geological descriptions summarised in Section 4.2.

4.4 GEOTECHNICAL LABORATORY TESTING

4.4.1 LABORATORY AND TESTING DETAILS

Selected soil samples collected during the investigation were tested at a NATA accredited laboratory (Resource Laboratories Pty Ltd) for the scheduled tests listed in Table 4.3.

Laboratory test certificates/ reports are presented in Appendix E.

Table 4.3 Summary of laboratory testing

LABORATORY TEST	TEST METHOD	QUANTITY
Field Moisture Content	AS1289.1.1, 2.1.1	3
Atterberg Limits	AS1289.1.1, 2.1.1, 3.1.2, 3.2.1, 3.3.1.3.4.1	3
Soil Aggressivity	AS 1289.1.1, EA002, ED040S, ED045G	3
Unconfirmed Compressive Strength	AS4133.1.1.1, 4.2.2	3

4.4.2 MOISTURE CONTENT AND ATTERBERG LIMITS

A total of three (3) samples collected from investigations were tested for moisture content and Atterberg limits. The results are summarised in Table 4.4.

Table 4.4 Summary of moisture content and Atterberg limit test results

INVESTIGATION ID	SAMPLE DEPTH (m)	MATERIAL	FIELD MOISTURE CONTENT (%)	LIQUID LIMIT (%)	PLASTIC LIMIT (%)	PLASTICITY INDEX (%)
BH44	3.0-3.45	Silty CLAY	27.3	48	20	28

INVESTIGATION ID	SAMPLE DEPTH (m)	MATERIAL	FIELD MOISTURE CONTENT (%)	LIQUID LIMIT (%)	PLASTIC LIMIT (%)	PLASTICITY INDEX (%)
BH44	3.5-4.0	Silty CLAY	19.3	50	19	31
BH35	1.0-1.8	Silty CLAY	27.9	59	22	37

The tabulated results are shown on the plasticity chart (Atterberg limit chart) in Figure 4-1. The results indicate that the encountered material can be generally classified as medium to high plasticity.

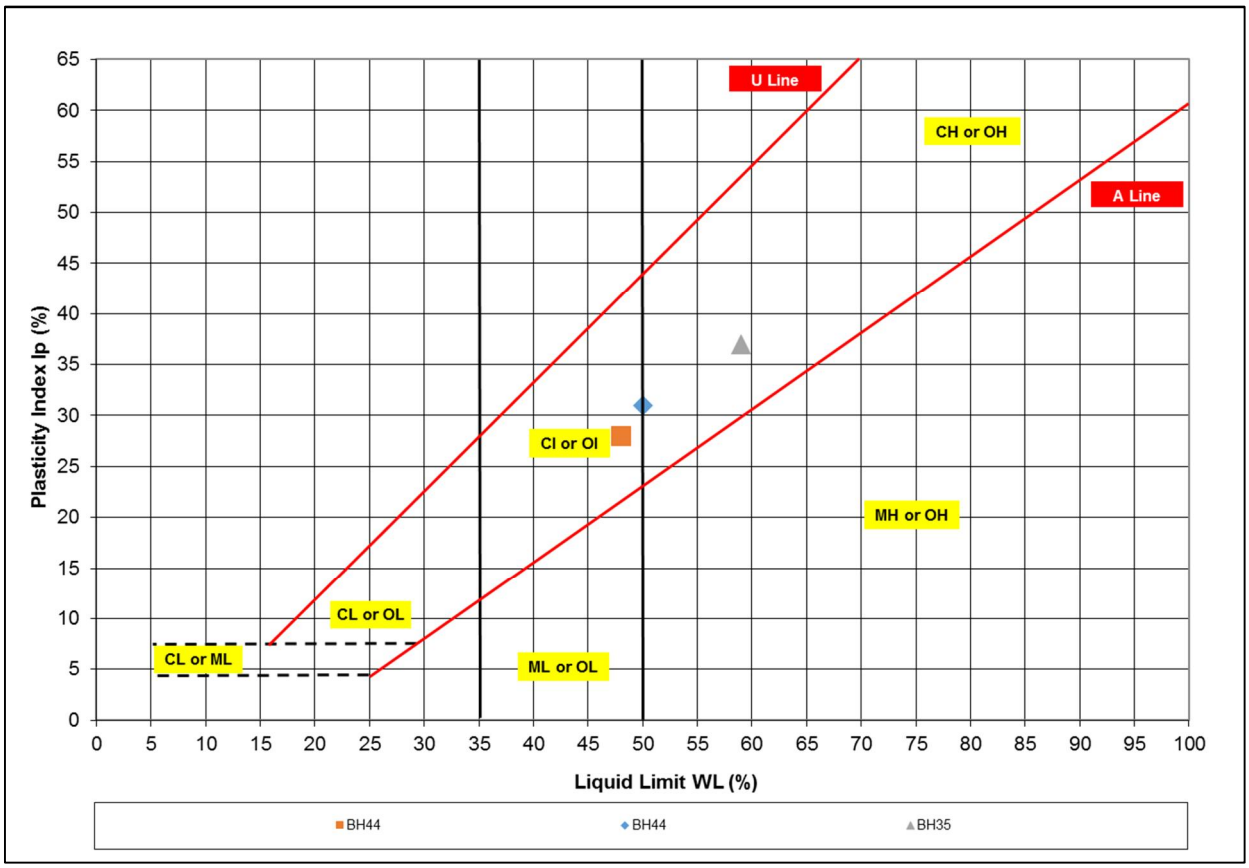


Figure 4-1 Atterberg limit results

4.4.3 SOIL AGGRESSIVITY

Laboratory testing for soil aggressivity was carried out on three (3) samples. The test results are presented in Table 4.5.

Table 4.5 Summary of soil aggressivity results

INVESTIGATION ID	SAMPLE DEPTH (m)	PH	CHLORIDE – Cl (mg/kg)	SULFATE – SO_4 (mg/kg)	CONDUCTIVITY (µS/CM)
BH30	4.5-5.0	8.7	310	110	194
BH44	3.0-3.45	5.2	160	180	174
BH35	1.0-1.8	5.8	<50	60	64

4.4.4 UNCONFINED COMPRESSIVE STRENGTH

Laboratory testing for Unconfined Compressive Strength was carried out in three (3) samples. The test results are presented in Table 4.6.

Table 4.6 Summary of unconfined compressive strength

INVESTIGATION ID	DEPTH	ROCK TYPE	UCS (MPa)
BH30	8.65-8.94	SHALE	47
BH44	6.65-6.96	SHALE	40
BH35	9.00-9.23	SHALE	27

4.5 GROUNDWATER MONITORING

Groundwater levels in all wells were measured 26/07/2018, approximately one week after installation, and are listed in Table 4.7.

Table 4.7 Summary of groundwater observations

ID	TERMINATION DEPTH (MBGL)	GROUNDWATER LEVEL (MBGL)
BH35	10	5.615
BH44	10	4.94
BH30	10	5.095
BH34	8	Dry
Ex (Existing) 1	6.68	4.29
Ex (Existing) 2	7.20	Dry

5 DISCUSSION AND RECOMMENDATIONS

5.1 RECOMMENDED GEOTECHNICAL PARAMETERS

Based on the results of the geotechnical investigation and our engineering experience, the geotechnical parameters recommended for the design of the shallow foundations and retaining structures are provided in Table 5.1.

Table 5.1 Recommended geotechnical parameters for shallow foundations and retaining structures

Unit Description	Consistency/Strength	Unit Weight (kN/m^3)	C_u $(kPa)^3$	c' $(kPa)^3$	ϕ'[3]	v' [3]	E' $(MPa)^3$	Active Earth Pressure (Ka)	Passive Earth Pressure (Kp)	At rest Earth Pressure (Ko)	Allowable Bearing capacity (kPa)	Allowable Horizontal Bearing Capacity (kPa)
Existing Fill	-	18	-	0-2	26-28	0.3	8-12	0.39	2.6	0.56	-	-
Alluvial Soil	Soft to Firm	17	25	2	25	0.35	5	0.41	2.46	0.58	-	-
Residual Clay	Stiff	18	75	4	27	0.3	15	0.38	2.66	0.55	100	50
	Very Stiff	19	100	5	28	0.3	30	0.36	2.77	0.53	150	75
	Hard	20	200	5	30	0.3	40	0.33	3	0.50	200	100
Rock	Extremely Low to very low strength	22	300	10	30	0.3	80	0.33	3	1	400 to 1000	200 to 500
	Medium to high	24	-	-	-	-	-	-	-	-	3500	-
	High to very high	24	-	-	-	-	-	-	-	-	5000	-

Notes: Cu= undrained shear strength; c'= drained friction angle; ϕ'= drained friction angle; E'= drained Young's modulus; v'= drained Poisson's ratio.

1. – Refer to the nearest borehole for detailed information. Borehole logs are included in Appendix C.
2. – Parameters provided are averaged and indicative for this unit, which varies in material and properties, and with depth.
3. – Geotechnical laboratory testing was not undertaken on the soil samples to obtain geotechnical parameters.

5.1.1 SITE CLASSIFICATION TO AS2870

Due to the extensive uncontrolled fill across the site, the site will be classified as Class P in accordance with AS2870. However, it is assumed that the designed basement level will be below the level of uncontrolled fill materials encountered across the project site (3 m).

Where footings are constructed fully on a natural soil profile, the site classification in accordance with AS2870 would be Class H1 with an estimated characteristic surface movement (Y_s) of 40 to 60 mm.

5.1.2 SOIL AGGRESSIVITY

Laboratory test results for soil aggressivity were compared with the exposure classifications presented in Australian Standard AS2159-2009 (Piling – Design and Installation). The exposure classifications for steel and concrete piles are presented in Table 5.2.

Table 5.2 Exposure classification for steel and concrete piles

BOREHOLE	SAMPLE DEPTH (m)	STEEL PILES – EXPOSURE CLASSIFICATION	CONCRETE PILES - EXPOSURE CLASSIFICATION
BH30	4.5-5.0	Non-aggressive	Non-aggressive
BH35	3.0-3.45	Non-aggressive	Non-aggressive
BH44	1.0-1.8	Non-aggressive	Mild

5.1.3 SEISMICITY

A hazard factor (Z) of 0.08 would be considered appropriate for the project site in accordance with Australian Standards AS 1170.4-2007 Structural design actions – Part 4: Earthquake actions in Australia. The site sub-soil class would be assigned Class C_e.

5.2 CONSTRUCTABILITY

5.2.1 EXCAVATION

We understand that the development of the site will involve the excavation of a basement car park. With reference to the borehole logs presented in Appendix C and the summary of ground conditions presented in Section 4.2, the subsurface conditions likely to be encountered across the project site will comprise fill materials and residual soils overlying weathered shale. The upper layers of weathered rock are highly fractured, however, the deeper, fresher rock has few defects. This transition was observed between approximately 4-6 mbgl.

Weathered rock materials encountered above this level should be able to be excavated using conventional earthmoving equipment such as backhoes and tracked excavators. It is possible that localised zones of higher strength/less fractured rock could be encountered above this level whereby excavators fitted with pneumatic rock hammers or ripping tines may be required. The deeper fresher rock below the transition noted above is also likely to require pneumatic rock hammers and or ripping tines for excavation.

Vibration levels should be managed in accordance with NSW EPA guidelines. Assessment of the volume of bulk excavation in rock, equipment required and vibrations induced associated with such activities can be undertaken following detailed design of the proposed development.

It should be noted that any off-site disposal of spoil requires assessment for re-use or classification in accordance with current Waste Classification Guidelines. Refer to the Phase 2 Contamination Investigation report (WSP, 2018) for more information.

5.2.2 TEMPORARY BATTERS AND SHORING

In order to ensure the stability of excavated faces and safety of workers during construction excavation, a suitable batter/stepped benching or near vertical trenching with temporary supports must be considered.

Based on the borehole information and likely materials to be encountered within the top 3.0 m, recommended temporary better angles are provided in Table 5.3. Temporary batters could also be used below the groundwater table but only in conjunction with a dewatering programme to temporarily lower the water level to increase stability which may not be feasible in the medium to long term.

It should be noted using batter slopes for temporary shoring of uncontrolled fill and alluvial soils is inappropriate and these materials should be removed or supported.

Table 5.3 Recommended temporary batter slope grades (for batters less than 3 m deep)

MATERIAL	TEMPORARY BATTER SLOPE
Residual Soils and extremely low to very low strength rock	1 (Vertical): 1 (Horizontal)
Low strength rock or better	2 (Vertical): 1 (Horizontal)

In lieu of battering the excavation to the recommended angle, use of a temporary shoring system will be required. Temporary shoring options for temporary support of vertical excavations include anchored soldier piles with sprayed concrete infill panels or contiguous piling. Anchoring would likely be required, deepening on excavation depth, as a cantilever system may not be sufficiently rigid to avoid excessive surface (lateral) deflections. Surcharge loads, particularly due to traffic and machinery, must be considered in the design or temporary shoring. All temporary excavations should be inspected by a Geotechnical Engineer prior to any personnel working beneath them, to assess the risk of instability and to provide advice on any support measures required.

5.2.3 FOUNDING MATERIALS AND FOUNDATION OPTION

Depending on basement design levels, it is anticipated that the founding materials will be weathered shale of varying strength, with associated allowable bearing pressures as presented in Table 5.1.

To determine the strength of the rock, a total of 27 point load index (PLI) tests were carried out (axial and diametrical) and 3 uniaxial compressive strength (UCS) tests were performed on the rock cores retrieved from the boreholes. Assessment was performed to correlate the PLI and UCS; the plot is presented in Figure 5-1. A multiplier of 20 has been adopted for the rock strength classifications for the shale of medium strength or better encountered at the site, which is at the lower bound of expected variability.

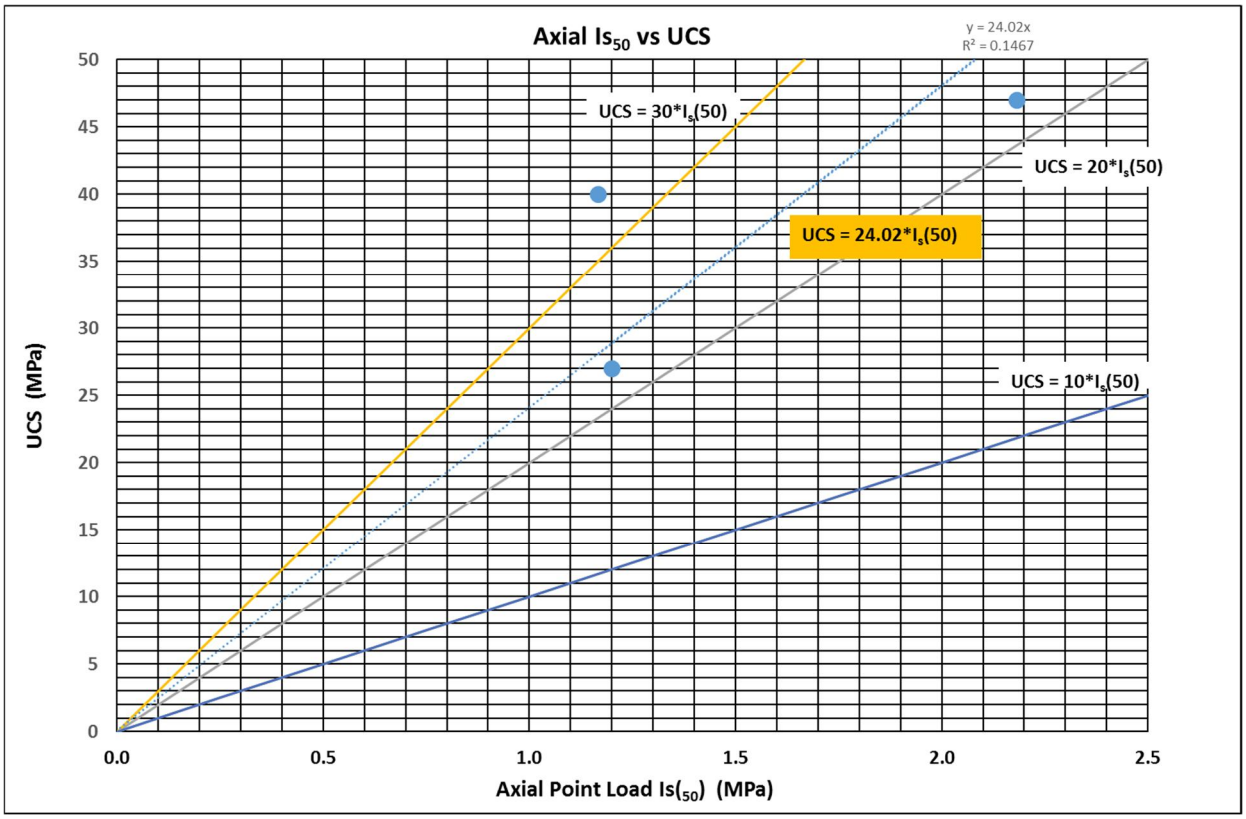


Figure 5-1 Correlation between point load index and uniaxial compressive strength

Given the presence of relatively shallow rock, likely footing systems would comprise strip or pad footings founded on medium strength rock or better. Footings founded on this material using the recommended allowable capacities should have load induced settlements of no greater than 1.0% of the footing width.

It is recommended that foundations be inspected by an experienced Geotechnical Engineer to confirm a suitable foundation treatment or to asses that anticipated bearing capacity of a foundation material has been achieved (where required). The allowable bearing pressure values recommended in Section 5.1 above assume the bearing surfaces are clean and free from spoil and other soft and loose materials, and free from water.

The walls and slab will need to be designed to resist hydrostatic pressure both globally (i.e. uplift of the entire building) and locally (i.e. pressure between column/slab supports). Sections of the building may have insufficient deadweight to resist buoyancy uplift forces, so alternatively an under-floor drainage system would need to be provided. Such a drainage system could comprise a herringbone-type trench arrangement with each trench gravel filled and drained to sump points for pumping.

6 LIMITATIONS

6.1 SCOPE OF SERVICES

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

6.2 RELIANCE ON DATA

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

6.3 GEOTECHNICAL INVESTIGATION

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

6.4 THIS GEOTECHNICAL REPORT IS BASED ON PROJECT-SPECIFIC FACTORS

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

— When the nature of any proposed development is changed

— When the size, configuration location or orientation of any proposed development is modified

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

— The limitations of site investigation

In making an assessment of a site from a limited number of boreholes or test pits there is the possibility that variations may occur between test locations. Site exploration identifies specific subsurface conditions only at those points from which samples have been taken. The risk that variations will not be detected can be reduced by increasing the frequency of test locations; however this often does not result in any overall cost savings for the project. The investigation program undertaken is a professional estimate of the scope of investigation required to provide a general profile of the subsurface

conditions. The data derived from the site investigation program and subsequent laboratory testing are extrapolated across the site to form an inferred geological model and an engineering opinion is rendered about overall subsurface conditions and their likely behaviour with regard to the proposed development. Despite investigation the actual conditions at the site might differ from those inferred to exist, since no subsurface exploration program, no matter how comprehensive, can reveal all subsurface details and anomalies.

The borehole logs are the subjective interpretation of subsurface conditions at a particular location, made by trained personnel. The interpretation may be limited by the method of investigation, and cannot always be definitive. For example, inspection of an excavation or test pit allows a greater area of the subsurface profile to be inspected than borehole investigation, however, such methods are limited by depth and site disturbance restrictions. In borehole investigation, the actual interface between materials may be more gradual or abrupt than a report indicates.

6.5 SUBSURFACE CONDITIONS ARE TIME DEPENDENT

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

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

6.6 AVOID MISINTERPRETATION

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

6.7 BORE/PROFILE LOGS SHOULD NOT BE SEPARATED FROM THE ENGINEERING REPORT

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

6.8 GEOTECHNICAL INVOLVEMENT DURING CONSTRUCTION

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

7 REFERENCES

- Soil Landscapes Series Sydney 1:100 000 Map Sheet (9130), 1989, NSW Office of Environment and Heritage
- The Geological Sheet for Sydney 1:100 000 Sheet (9130), NSW Department of Industry Resources & Energy http://www.resourcesandenergy.nsw.gov.au. Accessed 05/01/2017
- National Acid Sulfate Soils Atlas and CSIRO ASRIS GIS tool: http://www.asris.csiro.au
- PS109581 CLM REP 100, Detailed Site Investigation and Remediation Report, WSP, 2018

APPENDIX A

SITE INVESTIGATION PLAN

Projection	MGA Zone 56
Datum	AHD
Sources	Google maps

Scale 1:1,000 @ A4

Drawn	GW	Date	11/09/18
Approved	DW	Date	11/09/18

Legend

- Geotechnical Borehole

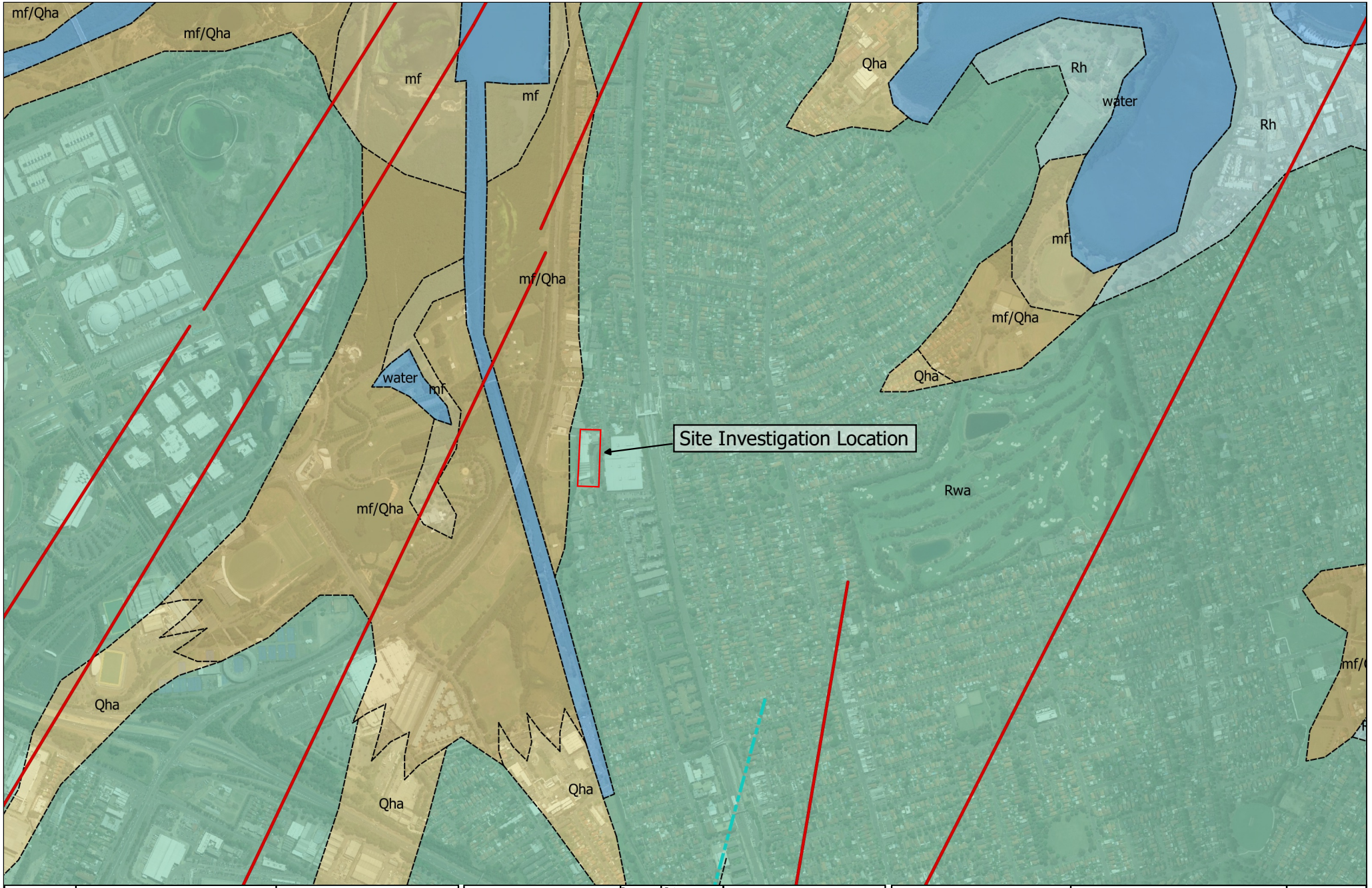
Project

176-184 George Street, Concord West
Site Investigation

Project No.	PS109581
Figure No.	1
Rev	A

APPENDIX B

GEOLOGICAL MAP



Projection	MGA Zone 56
Datum	AHD
Sources	Herbert C., 1983, Sydney Geological sheet 9130, 1st Edition. Geological Survey of New South Wales, Sydney

Scale
1:15,000 @ A4

Drawn	GW	Date	01/08/2018
Approved	DW	Date	01/08/2018

Notes
See Figure 2 for Geological Legend and Stratigraphy

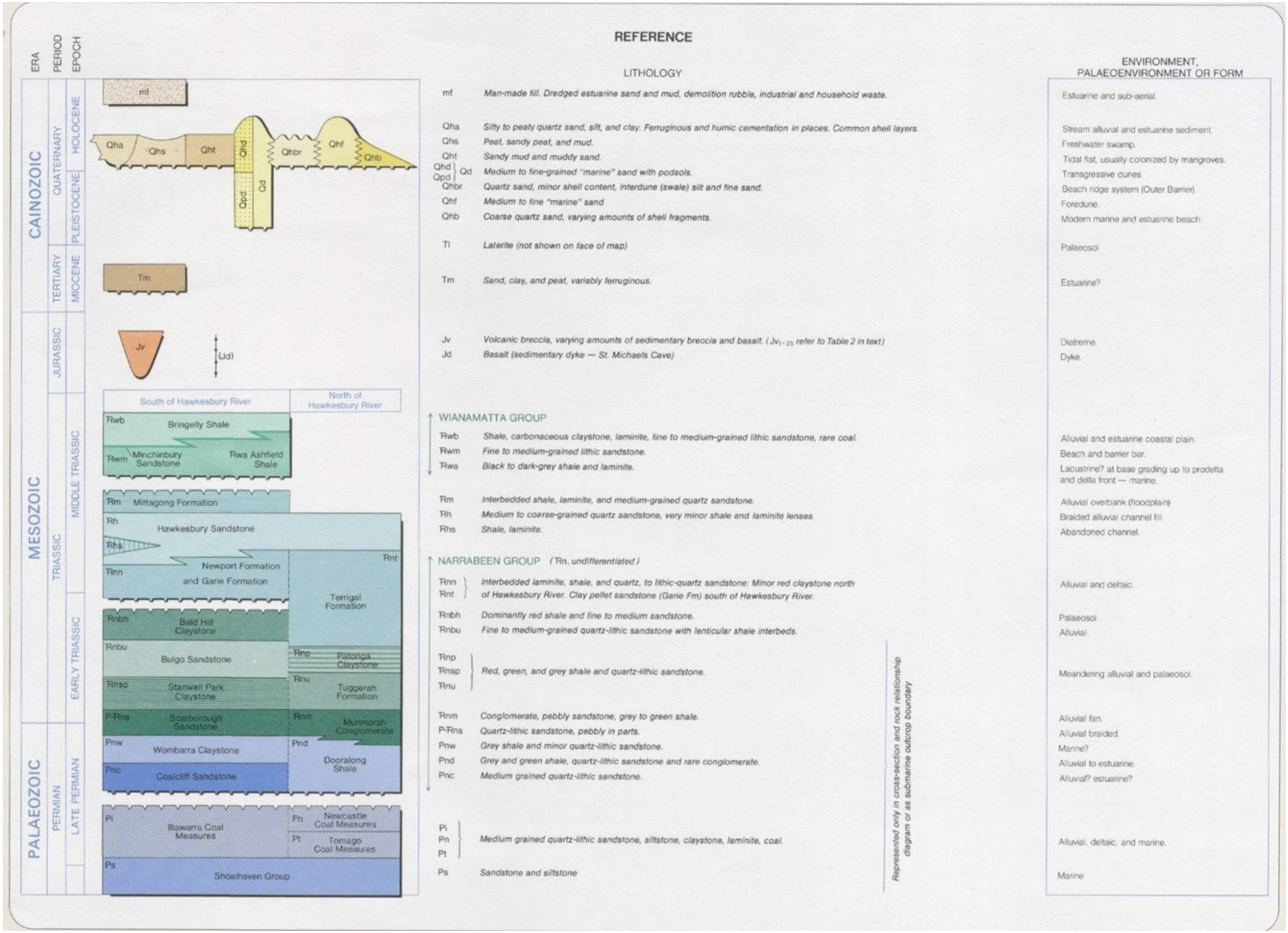
176-184 George Street, Concord West Site Investigation

Regional Geology

Project No. PS109581

Figure No. 1 of 2

Rev A



Projection	MGA Zone 56	COPYRIGHT AND REPRODUCTION Copyright in the drawings, information and data recorded hereon and their format and presentation ("data") is the property of WSP Australia Pty Limited ("WSP") and may not be used, copied or reproduced in whole or part for any purpose other than that for which it is supplied by WSP without the prior consent of WSP. WSP is not responsible for any document or part of a document produced containing data unless that document or the relevant part is identical to the document provided herewith ("the accompanying document"). The terms printed on this label are part of the data and the accompanying documents and must be contained in or affixed to any reproduction of the data or the accompanying documents.	Scale	Drawn	Date	Notes		**176-184 George Street, Concord West Site Investigation**	Project No.	
Datum	AHD		GW	01/08/2018	Sydney (9130) Geological Map				PS109581
Sources	Herbert C., 1983, Sydney Geological sheet 9130, 1st Edition. Geological Survey of New South Wales, Sydney		@ A4	Approved DW	Date 01/08/2018		Regional Geology Reference Page	Figure No. 2 of 2	Rev A

APPENDIX C

BOREHOLE LOGS

Explanatory Notes — Soil Description

In engineering terms soil includes every type of uncemented or partially cemented inorganic material found in the ground. In practice, if the material can be remoulded by hand in its field condition or in water it is described as a soil. The dominant soil constituent is given in capital letters, with secondary textures in lower case. The dominant feature is assessed from the Unified Soil Classification system and a soil symbol is used to define a soil layer as follows:

UNIFIED SOIL CLASSIFICATION

The appropriate symbols are selected on the result of visual examination, field tests and available laboratory tests, such as, sieve analysis, liquid limit and plasticity index.

USC Symbol	Description
GW	Well graded gravel
GP	Poorly graded gravel
GM	Silty gravel
GC	Clayey gravel
SW	Well graded sand
SP	Poorly graded sand
SM	Silty sand
SC	Clayey sand
ML	Silt of low plasticity
CL	Clay of low plasticity
OL	Organic soil of low plasticity
MH	Silt of high plasticity
CH	Clay of high plasticity
OH	Organic soil of high plasticity
Pt	Peaty Soil

MOISTURE CONDITION

Dry - Cohesive soils are friable or powdery
Cohesionless soil grains are free-running

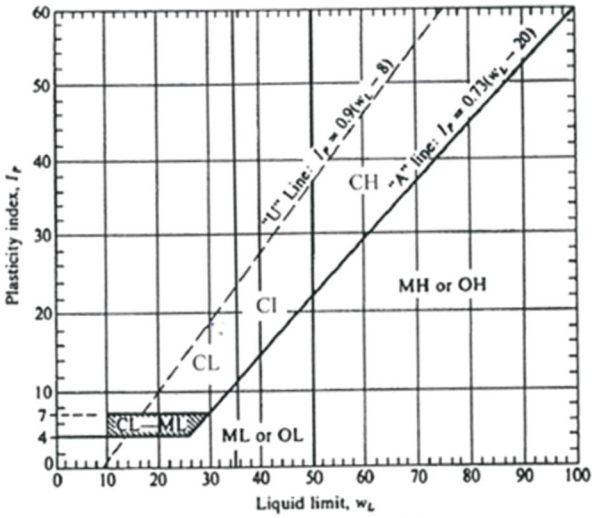
Moist - Soil feels cool, darkened in colour
Cohesive soils can be moulded
Cohesionless soil grains tend to adhere

Wet - Cohesive soils usually weakened
Free water forms on hands when handling

For cohesive soils the following codes may also be used:

MC>PL Moisture Content greater than the Plastic Limit.
MC~PL Moisture Content near the Plastic Limit.
MC<PL Moisture Content less than the Plastic Limit.

PLASTICITY



The potential for soil to undergo change in volume with moisture change is assessed from its degree of plasticity. The classification of the degree of plasticity in terms of the Liquid Limit (LL) is as follows:

Description of Plasticity	LL (%)
Low	<35
Medium or Intermediate	35 to 50
High	>50

COHESIVE SOILS - CONSISTENCY

The consistency of a cohesive soil is defined by descriptive terminology such as very soft, soft, firm, stiff, very stiff and hard. These terms are assessed by the shear strength of the soil as observed visually, by the pocket penetrometer values and by resistance to deformation to hand moulding.

A Pocket Penetrometer may be used in the field or the laboratory to provide approximate assessment of unconfined compressive strength of cohesive soils. The values are recorded in kPa, as follows:

Strength	Symbol	Pocket Penetrometer Reading (kPa)
Very Soft	VS	< 25
Soft	S	20 to 50
Firm	F	50 to 100
Stiff	St	100 to 200
Very Stiff	VSt	200 to 400
Hard	H	> 400

COHESIONLESS SOILS - RELATIVE DENSITY

Relative density terms such as very loose, loose, medium, dense and very dense are used to describe silty and sandy material, and these are usually based on resistance to drilling penetration or the Standard Penetration Test (SPT) 'N' values. Other condition terms, such as friable, powdery or crumbly may also be used.

The Standard Penetration Test (SPT) is carried out in accordance with AS 1289, 6.3.1. For completed tests the number of blows required to drive the split spoon sampler 300 mm is recorded as the N value. For incomplete tests the number of blows and the penetration beyond the seating depth of 150 mm are recorded. If the 150 mm seating penetration is not achieved the number of blows to achieve the measured penetration is recorded. SPT correlations may be subject to corrections for overburden pressure and equipment type.

Term	Symbol	Density Index	N Value (blows /0.3 m)	DCPT (blows /100m
Very Loose	VL	0 to 15	0 to 4	0 to 1
Loose	L	15 to 35	4 to 10	1 to 2
Medium Dense	MD	35 to 65	10 to 30	2 to 5
Dense	D	65 to 85	30 to 50	5 to 10
Very Dense	VD	>85	>50	>10

COHESIONLESS SOILS - PARTICLE SIZE TERMS

Name	Subdivision	Size
Boulders		>200mm
Cobbles		63mm to 200mm
Gravel	coarse	20mm to 63mm
	medium	6mm to 20mm
	fine	2.36mm to 6mm
Sand	coarse	600mm to 2.36mm
	medium	200mm to 600mm
	fine	75mm to 200mm

Explanatory Notes — Rock Description

The rock is described with strength and weathering symbols as shown below. Other features such as bedding and dip angle are given.

ROCK QUALITY

The fracture spacing is shown where applicable and the Rock Quality Designation (RQD) where:

$$\text{RQD (\%)} = \frac{\text{Sum of Axial lengths of core > 100mm long}}{\text{total length considered}}$$

ROCK STRENGTH

Rock strength is described using AS1726 & ISRM - Commission on Standardisation of Laboratory & Field Tests, "Suggested method of determining the Uniaxial Compressive Strength of Rock materials & the Point Load Index", as follows:

Term	Symbol	Point Load Index $Is_{(50)}$ (MPa)
Extremely Low	EL	<0.03
Very Low	VL	0.03 to 0.1
Low	L	0.1 to 0.3
Medium	M	0.3 to 1
High	H	1 to 3
Very High	VH	3 to 10
Extremely High	EH	>10

● Diametral Point Load Index test

■ Axial Point Load Index test

ROCK MATERIAL WEATHERING

Rock weathering is described using the following abbreviations and definitions used in AS1726.

Term	Symbol	Definition
Residual soil	RS	Soil developed on extremely weathered rock, the mass structure & substance fabric are no longer evident; there is a large change in volume but the soil has not been significantly transported.
Extremely weathered	EW	Rock is weathered to such an extent that it has 'soil' properties, ie: it either disintegrates or can be remoulded in water, but the texture of original rock is evident.
Highly weather	HW	Rock substance affected by weathering to the extent that limonite staining or bleaching affects the whole of the rock substance and other signs of chemical or physical decomposition are evident.
Distinctly weathered	DW	Rock strength usually changed by weathering. The rock may be highly discoloured, usually ironstaining. Porosity may be increased by leaching, or may be decreased due to deposition of weathering products in pores.
Moderately weathered	MW	Rock substance affected by weathering to the extent that staining extends throughout the whole of the rock substance and the original colour of the fresh rock is no longer recognisable
Slightly weathered	SW	Rock is slightly discoloured but shows little or no change of strength from fresh rock.
Fresh	FR	Rock shows no sign of decomposition or staining.

If differentiation between highly and moderately weathered rock can not be determined, then distinctly weathered is used which complies to terms described in Australian Standard AS1726.

DEFECT SPACING/BEDDING THICKNESS

Measured at right angles to defects of same set or bedding.

Term	Defect Spacing	Bedding
Extremely closely spaced	<6 mm 6 to 20 mm	Thinly Laminated Laminated
Very closely spaced	20 to 60 mm	Very Thin
Closely spaced	0.06 to 0.2 m	Thin
Moderately widely spaced	0.2 to 0.6 m	Medium
Widely spaced	0.6 to 2 m	Thick
Very widely spaced	>2 m	Very Thick

DEFECT DESCRIPTION

Symbol	Term
Bg	Bedding
Pt	Parting
F	Fault
C	Cleavage
Jt	Joint
SZ	Shear Zone
Se	Seam
Vn	Vein
DB	Drill Break

PLANARITY/ROUGHNESS

Planarity	Description
Pl	Planar
Un	Undulating
Ir	Irregular
St	Stepped
Roughness	**Description**
Sm	Smooth
Ro	Rough
Po	Polished
Sl	Slickensided

The inclination if defects are measured from the perpendicular to the core axis.

DRILLING/EXCAVATION METHODS

Symbol	Term
AS	Auger Screwing
BH	Backhoe
CT	Cable Tool Rig
DT	Diatube
EE	Existing Excavation/Cutting
EX	Excavator
HA	Hand Auger
JET	Jetting
NMCL	Diamond Core
NQ/HQ/PQ	Diamond Core – wireline
PC	Percussion
PT	Push Tube
RAB	Rotary Air Blast
RC	Reverse Circulation
S	Sonic drill
VB	Vibrocoring
WB	Washbore with blade
WR	Washbore with roller (tricone)

NFGWE **No Free Groundwater Encountered**

The observation of groundwater, whether present or not, was not possible due to drilling water, surface seepage or cave in of the borehole/test pit.

WATER SYMBOLS AND DEFINITIONS

Water level at date shown

Partial water loss **Water inflow**

Complete water loss

Graphic Symbols for Soils & Rocks

Typical symbols for soils and rocks are as follows. Combinations of these symbols may be used to indicate mixed materials such as clayey sand.

Soil Symbols

Main components


CLAY


SILT


SAND


GRAVEL


BOULDERS / COBBLES


TOPSOIL


PEAT

Minor Components


Clayey


Silty


Sandy


Gravelly

Other


FILL


BITUMEN


CONCRETE

Rock Symbols

Sedimentary Rocks


SANDSTONE


SILTSTONE


CLAYSTONE, MUDSTONE


SHALE


LAMINITE


COAL


LIMESTONE


CONGLOMERATE

Igneous Rocks


GRANITE


BASALT


UNDIFFERENTIATED IGNEOUS

Metamorphic Rocks


SLATE, PHYLLITE, SCHIST


GNEISS

QUARTZITE

NFGWE No Free Groundwater Encountered: The borehole/test pit was dry soon after excavation; however groundwater could be present in less permeable strata. Inflow may have been observed had the borehole/test pit been left open for a longer period.

These tables are an extract from LANDSLIDE RISK MANAGEMENT CONCEPTS AND GUIDELINES as presented in Australian Geomechanics, Vol. 35, No. 1, 2000 which discusses the matter more fully.

BOREHOLE ENGINEERING LOG

BOREHOLE NO.

BH35

SHEET : 1 OF 3

Client:	**Eloura Holdings**	Date Commenced:	**20/7/18**
Project:	**176-184 George Street**	Date Completed:	**20/7/18**
Borehole Location:	**Inside warehouse, central area, near eastern wall**	Recorded By:	**GW**
Project Number:	**PS109581**	Log Checked By:	**DW**

Drill Model/Mounting:	**Comacchio Geo 205/ Track**	Hole Angle:	**-90°**	Surface RL:	**4 m AHD**
Borehole Diameter:	**75/120/300 mm**	Bearing:	**---**	Co-ords:	**E 322702.1 N 6252831.4 MGA94 56**

Borehole Information							Field Material Description					
METHOD	SUPPORT	WATER	RL (m AHD)	DEPTH (m)	FIELD TEST	SAMPLE	GRAPHIC LOG	GROUP SYMBOL	SOIL/ROCK MATERIAL FIELD DESCRIPTION	MOISTURE	RELATIVE DENSITY / CONSISTENCY (VS S F ST VST H / FB VL L MD D VD)	POCKET PENETROMETER (kPa)	STRUCTURE AND ADDITIONAL OBSERVATIONS
DT	Nil	NFGWE		0.10					CONCRETE; light grey, max aggregate 25mm, poorly graded, sub-angular to angular, with minor voids, 5mm steel reinforcement at 45mm.				PAVEMENT MATERIAL
				0.25					CONCRETE; light grey, max aggregate 20mm, poorly graded, sub-angular to angular, with minor voids.				
PT				0.40					FILL: Clayey GRAVEL; fine to coarse grained, dark brown, poorly graded, angular, low plasticity clay.	M			FILL
			3.5	0.5		D		CI-CH	Silty CLAY; medium to high plasticity, red/orange-brown, trace fine to medium grained gravel.	MC=PL			RESIDUAL SOIL
			3.0	1.0									
						D							
			2.5	1.5									
			2.0	2.0					2.00m: 5mm band of black, ashy material, fine grained, loose			=200 - =250	
AS				2.20				CH	Silty CLAY; high plasticity, brown, trace fine grained gravel.	MC>PL			
			1.5	2.5	SPT 0, 1, 11 N=12	SPT						=75	Potentially unreliable SPT values due to push tube
			1.0	3.0									
				3.25					SHALE; dark brown, inferred highly weathered to moderately weathered, inferred very low-medium strength, bands of high strength.				WEATHERED ROCK
			0.5	3.5		D							
			0.0	4.0									
			-0.5	4.5					REFER TO CORED BOREHOLE LOG				

This Borehole log should be read in conjunction with WSP's accompanying explanatory notes.

CORED BOREHOLE ENGINEERING LOG

BOREHOLE NO.

BH35

SHEET : 2 OF 3

Client:	**Eloura Holdings**	Date Commenced:	**20/7/18**
Project:	**176-184 George Street**	Date Completed:	**20/7/18**
Borehole Location:	**Inside warehouse, central area, near eastern wall**	Recorded By:	**GW**
Project Number:	**PS109581**	Log Checked By:	**DW**

Drill Model/Mounting:	**Comacchio Geo 205/ Track**	Hole Angle:	**-90°**	Surface RL:	**4 m AHD**
Borehole Diameter:	**75/120/300 mm**	Bearing:	**---**	Co-ords:	**E 322702.1 N 6252831.4 MGA94 56**

Borehole Information							Field Material Description					
METHOD	SUPPORT	WATER	TOTAL CORE RECOVERY (TCR)	RQD	RL (m AHD)	DEPTH (m)	GRAPHIC LOG	SOIL/ROCK MATERIAL FIELD DESCRIPTION	WEATHERING	INFERRED STRENGTH MPa ($Is_{(50)}$/UCS) VL 0.03 / 0.6, L 0.1 / 2, M 0.3 / 6, H 1 / 20, VH 3 / 60, EH 10 / 200	AVERAGE DEFECT SPACING (mm) <20, 20-60, 60-200, 200-600, 600-2000, >2000	STRUCTURE AND ADDITIONAL OBSERVATIONS
					3.5	0.5						
					3.0	1.0						
					2.5	1.5						
					2.0	2.0						
					1.5	2.5						
					1.0	3.0						
					0.5	3.5						
					0.0	4.0		START CORING AT 4.20m				
HMLC	C	(Nil)	100	0	4.20 -0.5	4.5		SHALE; fine grained, dark grey and brown, layered, bedding 0-5deg, iron staining throughout	MW to HW			4.22m: Bg, 0 - 5°, Pl, Sm, Sn Fe 4.45m: Se 20mm 4.55m: Jt, 85°, Ir, Sn Cl 4.55m: CZ, x4, 10mm, 20mm spacing 4.85m: Jt x3, 45°, Pl, Ro, In Cl 4.9m: Jt

This Borehole log should be read in conjunction with WSP's accompanying explanatory notes.

CORED BOREHOLE ENGINEERING LOG

BOREHOLE NO.

BH35

SHEET : 3 OF 3

Client:	**Eloura Holdings**	Date Commenced:	**20/7/18**
Project:	**176-184 George Street**	Date Completed:	**20/7/18**
Borehole Location:	**Inside warehouse, central area, near eastern wall**	Recorded By:	**GW**
Project Number:	**PS109581**	Log Checked By:	**DW**

Drill Model/Mounting:	**Comacchio Geo 205/ Track**	Hole Angle:	**-90°**	Surface RL:	**4 m AHD**
Borehole Diameter:	**75/120/300 mm**	Bearing:	**---**	Co-ords:	**E 322702.1 N 6252831.4 MGA94 56**

Borehole Information | **Field Material Description**

METHOD	SUPPORT	WATER	TOTAL CORE RECOVERY (TCR)	RQD	RL (m AHD)	DEPTH (m)	GRAPHIC LOG	SOIL/ROCK MATERIAL FIELD DESCRIPTION	WEATHERING	INFERRED STRENGTH MPa ($Is_{(50)}$/UCS)	AVERAGE DEFECT SPACING (mm)	STRUCTURE AND ADDITIONAL OBSERVATIONS
HMLC	C	26/07/18 ▽ (Nil)	100	0				SHALE; fine grained, dark grey and brown, layered, bedding 0-5deg, iron staining throughout	MW to HW	VL 0.03 / 0.6, L 0.1 / 2, M 0.3 / 6, H 1 / 20, VH 3 / 60, EH 10 / 200	<20, 20-60, 60-200, 200-600, 600-2000, >2000	5m: Jt x4, 0°, Pl, Sm, Sn Fe
								as above, with 5deg bedding				5.18m: Se
												5.3m: CZ 20mm
												5.42m: CZ 10mm
					-1.5	5.5			MW			5.5m: Bg x7, 0 - 5°, Ir, Ro, Sn Fe
												5.63m: CZ 20mm
												5.75m: CZ 5mm
												5.8m: Bg x3, 0 - 5°, Pl, Sm, Cln
					-2.0	6.0						5.95m: SZ, 0 - 10°
			100	40				as above, less laminated	SW			6.25m: Jt, 45°, Ir, In Fe
												6.4m: Jt, 85 - 90°, Cu, Ro, Sn Fe
					-2.5	6.5						6.47m: Jt, 85 - 90°, Cu, Ro, Sn Fe
												6.52m: Jt, 85 - 90°, Cu, Ro, Sn Fe
								as above, brown laminae becoming light grey				6.65m: Jt, 45°, Pl, Ro, Cln
									FR			
					-3.0	7.0						7.02m: Jt, 50°, Pl, Sm, Cln
					-3.5	7.5						
					-4.0	8.0						
			100	99	-4.5	8.5		as above, 90% siltstone, laminations less visible				8.55m: CZ 5mm
					-5.0	9.0						
					-5.5	9.5						9m: DB x5

END OF BOREHOLE AT 10.00 m
Target depth achieved

This Borehole log should be read in conjunction with WSP's accompanying explanatory notes.

PointID : BH35 Depth Range: 4.20 - 9.00 m

	TITLE: Eloura Holdings Concord West 176-184 George Street Core Photo - BH35	DRAWN: GW	DATE: 27/07/2018
		CHECKED: DW	DATE: 27/07/2018
		SCALE: Not To Scale	A4
		PROJECT No: PS109581	FIGURE No: 1/2

PointID : BH35 Depth Range: 9.00 - 10.00 m

	TITLE Eloura Holdings Concord West 176-184 George Street Core Photo - BH35	DRAWN GW / DATE 27/07/2018 CHECKED DW / DATE 27/07/2018 SCALE Not To Scale / A4 PROJECT No PS109581 / FIGURE No 2/2	

BOREHOLE ENGINEERING LOG

BOREHOLE NO.

BH44

SHEET : 1 OF 3

Client:	**Eloura Holdings**	Date Commenced:	**19/7/18**
Project:	**176-184 George Street**	Date Completed:	**20/7/18**
Borehole Location:	**Inside warehouse, north eastern corner**	Recorded By:	**GW**
Project Number:	**PS109581**	Log Checked By:	**DW**

Drill Model/Mounting:	**Comacchio Geo 205/ Track**	Hole Angle:	**-90°**	Surface RL:	**4 m AHD**
Borehole Diameter:	**75/120/300 mm**	Bearing:	**---**	Co-ords:	**E 322704.1 N 6252928.5 MGA94 56**

Borehole Information							Field Material Description						
METHOD	SUPPORT	WATER	RL (m AHD)	DEPTH (m)	FIELD TEST	SAMPLE	GRAPHIC LOG	GROUP SYMBOL	SOIL/ROCK MATERIAL FIELD DESCRIPTION	MOISTURE	RELATIVE DENSITY / CONSISTENCY (VS S F ST VST / VL L MD D VD H)	POCKET PENETROMETER (kPa)	STRUCTURE AND ADDITIONAL OBSERVATIONS
DT	Nil			0.12					CONCRETE; brown-grey, max aggregate 20mm, poorly graded, sub-rounded to sub-angular, with minor voids, 5mm reinforcement at 45mm.				PAVEMENT MATERIAL
				0.22					CONCRETE; light grey, max aggregate 20mm, poorly graded, sub-rounded.				
				0.32					CONCRETE; dark grey, max aggregate 15mm, poorly graded, sub-rounded to sub-angular, 5mm reinforcement at 240mm.				
HA			3.5	0.5		D			FILL: Gravelly CLAY; low plasticity, dark brown, coarse grained, angular gravel.	MC=PL			FILL
			3.0	1.0		D			1.20m: Increase in shale gravel fragments				
				1.40									
AS			2.5	1.5	SPT 3, 4, 6 N=10	SPT			FILL: Sandy CLAY; high plasticity, light brown, fine grained sand, with fine grained gravel.	MC<PL			
			2.0	2.0					2.00m: Becoming dark brown				
			1.5	2.5		D							
			1.0	3.0	SPT 2, 1, 1 N=2	SPT		CI	Silty CLAY; medium plasticity, dark brown and orange.	MC=PL		=60 - =70	ALLUVIAL SOIL
			0.5	3.5		D		CH	Silty CLAY; high plasticity, dark brown, trace fine to medium grained gravel.				RESIDUAL SOIL
			0.0	4.0									
			-0.5	4.5	SPT 15, 30, 3/50mm N=R	SPT						=150 - =300	
		26/7/18		4.70					SHALE; grey brown, inferred highly weathered to moderately weathered, inferred very low to medium strength				WEATHERED ROCK

This Borehole log should be read in conjunction with WSP's accompanying explanatory notes.

BOREHOLE ENGINEERING LOG

BOREHOLE NO.

BH44

SHEET : 2 OF 3

Client:	**Eloura Holdings**	Date Commenced:	**19/7/18**
Project:	**176-184 George Street**	Date Completed:	**20/7/18**
Borehole Location:	**Inside warehouse, north eastern corner**	Recorded By:	**GW**
Project Number:	**PS109581**	Log Checked By:	**DW**

Drill Model/Mounting:	**Comacchio Geo 205/ Track**	Hole Angle:	**-90°**	Surface RL:	**4 m AHD**
Borehole Diameter:	**75/120/300 mm**	Bearing:	**---**	Co-ords:	**E 322704.1 N 6252928.5 MGA94 56**

Borehole Information							Field Material Description						
METHOD	SUPPORT	WATER	RL (m AHD)	DEPTH (m)	FIELD TEST	SAMPLE	GRAPHIC LOG	GROUP SYMBOL	SOIL/ROCK MATERIAL FIELD DESCRIPTION	MOISTURE	RELATIVE DENSITY / CONSISTENCY (VS S F ST VST H / FB VL L MD D VD)	POCKET PENETROMETER (kPa)	STRUCTURE AND ADDITIONAL OBSERVATIONS
AS	Nil												WEATHERED ROCK
									REFER TO CORED BOREHOLE LOG				
			-1.5	5.5									
			-2.0	6.0									
			-2.5	6.5									
			-3.0	7.0									
			-3.5	7.5									
			-4.0	8.0									
			-4.5	8.5									
			-5.0	9.0									
			-5.5	9.5									

This Borehole log should be read in conjunction with WSP's accompanying explanatory notes.

CORED BOREHOLE ENGINEERING LOG

BOREHOLE NO.

BH44

SHEET : 3 OF 3

Client:	**Eloura Holdings**	Date Commenced:	**19/7/18**
Project:	**176-184 George Street**	Date Completed:	**20/7/18**
Borehole Location:	**Inside warehouse, north eastern corner**	Recorded By:	**GW**
Project Number:	**PS109581**	Log Checked By:	**DW**

Drill Model/Mounting:	**Comacchio Geo 205/ Track**	Hole Angle:	**-90°**	Surface RL:	**4 m AHD**
Borehole Diameter:	**75/120/300 mm**	Bearing:	**---**	Co-ords:	**E 322704.1 N 6252928.5 MGA94 56**

Borehole Information | **Field Material Description**

METHOD	SUPPORT	WATER	TOTAL CORE RECOVERY (TCR)	RQD	RL (m AHD)	DEPTH (m)	GRAPHIC LOG	SOIL/ROCK MATERIAL FIELD DESCRIPTION	WEATHERING	INFERRED STRENGTH MPa ($Is_{(50)}$/UCS) VL 0.03 / 0.6, L 0.1 / 2, M 0.3 / 6, H 1 / 20, VH 3 / 60, EH 10 / 200	AVERAGE DEFECT SPACING (mm) <20, 20-60, 60-200, 200-600, 600-2000, >2000	STRUCTURE AND ADDITIONAL OBSERVATIONS
								START CORING AT 5.15m				
HMLC	C	(Nil)	100	6	~~5.15~~			SHALE; laminated, 60% black and 40% dark brown laminae, bedding 0-5°, iron staining	MW			~~5.15: drilling slow through first core run~~ 5.19m: Se, In Cl 5.25m: CZ 5.29m: Se, In Cl
					-1.5	5.5						5.55m: Jt, 40°, Pl, Ro, Cln
												5.66m: SZ, 50°, St
					-2.0	6.0						5.89m: Se, In Cl
												6.05m: CZ
												6.22m: Jt, 85°, Ir, Ro, Cln 6.2m: CZ
								as above, brown laminae becoming light grey, laminations becoming less dominant, 90% black	FR			6.32m: Bg, 0°, Pl, Sm, Sn Fe
					-2.5	6.5						6m: DB x5 6.53m: Jt, 30°, Pl, Sm, Cln
					-3.0	7.0						
					-3.5	7.5						
			100	100	-4.0	8.0						
					-4.5	8.5						8m: DB x2
					-5.0	9.0						
					-5.5	9.5						9.5m: DB
			100	100				END OF BOREHOLE AT 10.00 m Target depth achieved				

This Borehole log should be read in conjunction with WSP's accompanying explanatory notes.

PointID : BH44 Depth Range: 5.15 - 10.00 m

	TITLE: Eloura Holdings Concord West 176-184 George Street Core Photo - BH44	DRAWN: GW	DATE: 30/07/2018
		CHECKED: DW	DATE: 30/07/2018
		SCALE: Not To Scale	A4
		PROJECT No: PS109581	FIGURE No: 1/1

BOREHOLE ENGINEERING LOG

BOREHOLE NO.

BH30

SHEET : 1 OF 3

Client:	**Eloura Holdings**	Date Commenced:	**19/7/18**
Project:	**176-184 George Street**	Date Completed:	**19/7/18**
Borehole Location:	**Car Park**	Recorded By:	**GW**
Project Number:	**PS109581**	Log Checked By:	**DW**

Drill Model/Mounting:	**Comacchio Geo 205/ Track**	Hole Angle:	**-90°**	Surface RL:	**4 m AHD**
Borehole Diameter:	**75/120/300 mm**	Bearing:	**---**	Co-ords:	**E 322670 N 6252761 MGA94 56**

Borehole Information							Field Material Description						
METHOD	SUPPORT	WATER	RL (m AHD)	DEPTH (m)	FIELD TEST	SAMPLE	GRAPHIC LOG	GROUP SYMBOL	SOIL/ROCK MATERIAL FIELD DESCRIPTION	MOISTURE	RELATIVE DENSITY / CONSISTENCY (VS S F ST VST H / FB VL L MD D VD)	POCKET PENETROMETER (kPa)	STRUCTURE AND ADDITIONAL OBSERVATIONS
DT	Nil			0.14					CONCRETE; brown grey, max aggregate 25mm, poorly graded, sub-rounded to angular, trace minor voids, 5mm reinforcement at 45mm.				PAVEMENT MATERIAL
HA				0.30					FILL: Clayey SAND; fine grained, dark brown, low plasticity, trace fine grained gravel.	D			FILL
			3.5	0.5		D			FILL: Gravelly SAND; fine to medium grained, dark brown, medium to coarse grained, sub rounded to sub angular, poorly graded gravel.				
				0.90									0.8m: Possible piece(s) suspect Asbestos/ACM encountered
			3.0	1.0		D			FILL: Gravelly SAND; fine grained, light yellow, coarse grained, well graded, sub rounded gravel.				
AS			2.5	1.5									
				1.70	SPT 5, 10, 6 N=16	SPT			FILL: Gravelly Clayey SAND; fine to medium grained, variable colour, black-brown/white, fine grained, angular gravel, low plasticity clay, trace plastics and glass.				1.7m: Possible ashy material observed
			2.0	2.0									
			1.5	2.5									
			1.0	3.0								>600	
				3.10	SPT 9, 15, 19 N=34	SPT			SHALE; grey, laminated, inferred highly weathered to moderately weathered, inferred strength very low to medium, some high strength fragments				WEATHERED ROCK
			0.5	3.5									
			0.0	4.0									
			-0.5	4.5		D							

This Borehole log should be read in conjunction with WSP's accompanying explanatory notes.

BOREHOLE ENGINEERING LOG

BOREHOLE NO.

BH30

SHEET : 2 OF 3

Client:	**Eloura Holdings**	Date Commenced:	**19/7/18**
Project:	**176-184 George Street**	Date Completed:	**19/7/18**
Borehole Location:	**Car Park**	Recorded By:	**GW**
Project Number:	**PS109581**	Log Checked By:	**DW**

Drill Model/Mounting:	**Comacchio Geo 205/ Track**	Hole Angle:	**-90°**	Surface RL:	**4 m AHD**
Borehole Diameter:	**75/120/300 mm**	Bearing:	**---**	Co-ords:	**E 322670 N 6252761 MGA94 56**

Borehole Information							Field Material Description						
METHOD	SUPPORT	WATER	RL (m AHD)	DEPTH (m)	FIELD TEST	SAMPLE	GRAPHIC LOG	GROUP SYMBOL	SOIL/ROCK MATERIAL FIELD DESCRIPTION	MOISTURE	RELATIVE DENSITY / CONSISTENCY (VS S F ST VST H / FB VL L MD D VD)	POCKET PENETROMETER (kPa)	STRUCTURE AND ADDITIONAL OBSERVATIONS
AS	Nil	26/07/18 ▽											WEATHERED ROCK
			-1.5	5.5					REFER TO CORED BOREHOLE LOG				
			-2.0	6.0									
			-2.5	6.5									
			-3.0	7.0									
			-3.5	7.5									
			-4.0	8.0									
			-4.5	8.5									
			-5.0	9.0									
			-5.5	9.5									

This Borehole log should be read in conjunction with WSP's accompanying explanatory notes.

CORED BOREHOLE ENGINEERING LOG

BOREHOLE NO.

BH30

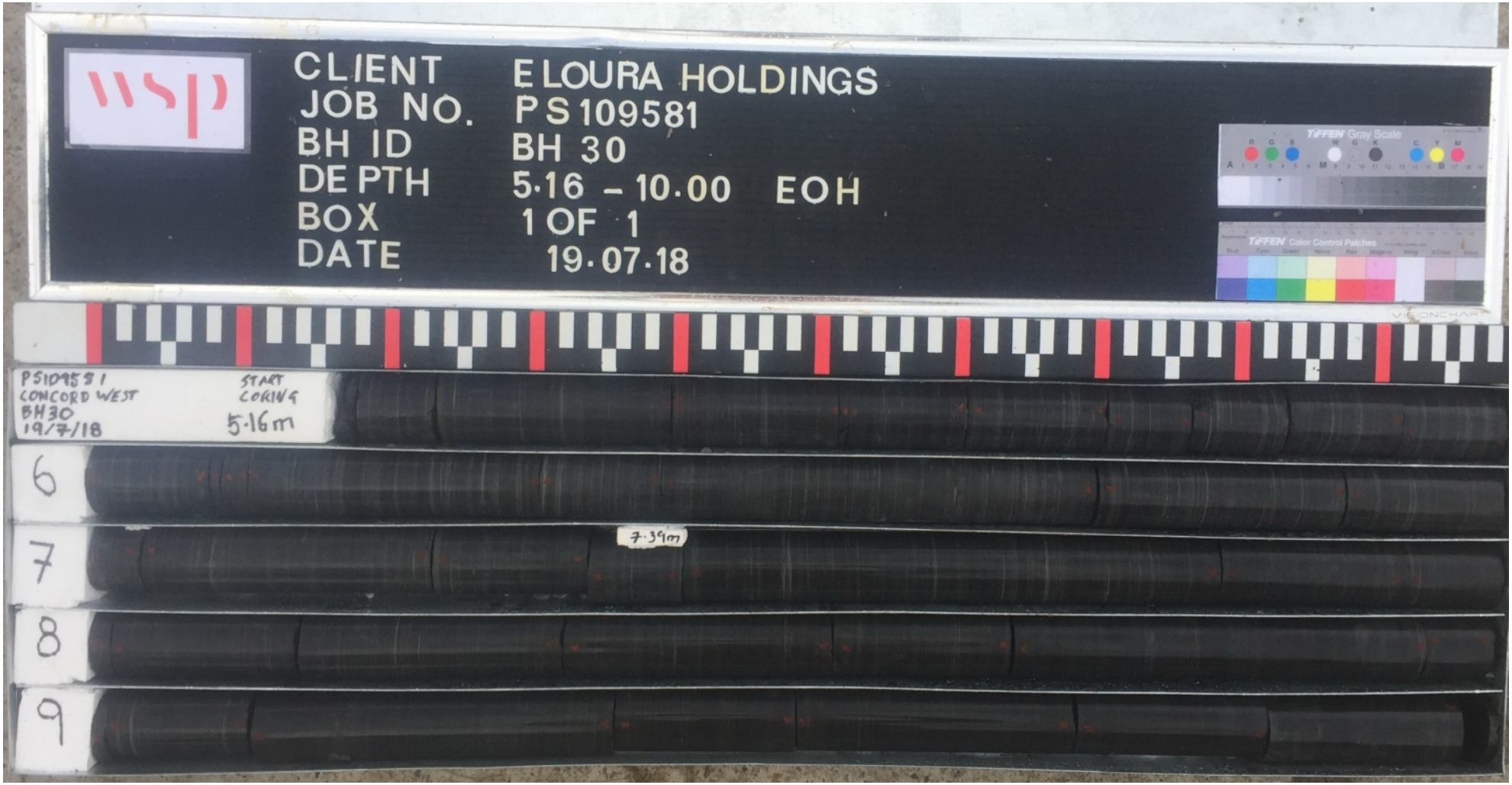
SHEET : 3 OF 3

Client:	**Eloura Holdings**	Date Commenced:	**19/7/18**
Project:	**176-184 George Street**	Date Completed:	**19/7/18**
Borehole Location:	**Car Park**	Recorded By:	**GW**
Project Number:	**PS109581**	Log Checked By:	**DW**

Drill Model/Mounting:	**Comacchio Geo 205/ Track**	Hole Angle:	**-90°**	Surface RL:	**4 m AHD**
Borehole Diameter:	**75/120/300 mm**	Bearing:	**---**	Co-ords:	**E 322670 N 6252761 MGA94 56**

Borehole Information							Field Material Description					
METHOD	SUPPORT	WATER	TOTAL CORE RECOVERY (TCR)	RQD	RL (m AHD)	DEPTH (m)	GRAPHIC LOG	SOIL/ROCK MATERIAL FIELD DESCRIPTION	WEATHERING	INFERRED STRENGTH MPa ($Is_{(50)}$/UCS) VL 0.03 / 0.6, L 0.1 / 2, M 0.3 / 6, H 1 / 20, VH 3 / 60, EH 10 / 200	AVERAGE DEFECT SPACING (mm) <20, 20-60, 60-200, 200-600, 600-2000, >2000	STRUCTURE AND ADDITIONAL OBSERVATIONS
								START CORING AT 5.16m				
HMLC	C	(Nil)	100	100	~~5.16~~ -1.5	5.5		SHALE; laminated dark grey (70%) and light grey (30%), bedding 0-5deg	FR			5.21m: Bg, 0 - 5°, Pl, Sm, Sn Fe
					-2.0	6.0						5.16m: DB x 6
					-2.5	6.5						5.82m: Bg, 0 - 5°, Pl, Sm, Cln
					-3.0	7.0						6m: DB x 7
					-3.5	7.5						7m: DB x 3
			100	100	-4.0	8.0		8.80m: black laminae more dominant, 90% black, 10% light grey.				7.77m: DB
					-4.5	8.5						8.14m: Bg, 0 - 5°, Pl, Sm, Cln
					-5.0	9.0						8m: DB x 5
					-5.5	9.5						9m: DB x 3
								END OF BOREHOLE AT 10.00 m Target depth achieved				

This Borehole log should be read in conjunction with WSP's accompanying explanatory notes.

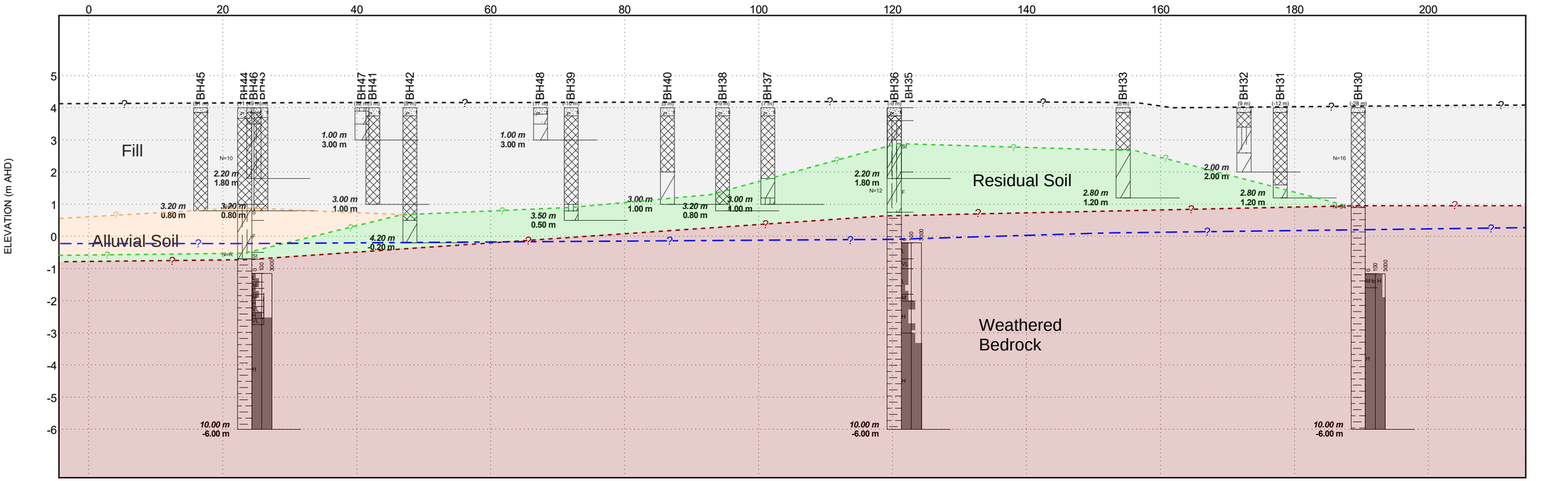


PointID : BH30 Depth Range: 5.16 - 10.00 m

	TITLE: Eloura Holdings Concord West 176-184 George Street Core Photo - BH30	DRAWN: GW	DATE: 30/07/2018
		CHECKED: DW	DATE: 30/07/2018
		SCALE: Not To Scale	A4
		PROJECT No: PS109581	FIGURE No: 1/1

APPENDIX D

GEOTECHNICAL LONG SECTION



Concrete
FILL
Shale
CLAY
Silty CLAY
Silty SAND
Sandy CLAY
Inferred Ground Level
Groundwater Table
Geotechnical Borehole

Note: All elevation data is indicative due to inaccuracies in handheld GPS

REV	DATE	DESCRIPTION	DRN.	APPR.

NCSI certified Quality System to ISO 9001

Scale: A3 ORIGINAL

Horizontal Scale (metres) 1:600
Vertical Scale (metres) 1:125

RL Datum: AHD Coord. Sys.: MGA94 Zone 56

Drawn	Date	22/08/2018
Designed	Date	
Drawing Check	Date	
Design Check	Date	
Project Approval	Date	

NOTES

1. The subsurface conditions shown on this figure are considered accurate only at exploration locations. The subsurface conditions between these locations represents Parsons Brinckerhoff's preliminary assessment based on available data. The boundary between the various units has been inferred and should be confirmed for final design and construction.
2. 0 Times Vertical Exaggeration

Telephone:
Facsimile:
Email:

Client	Eloura Holdings
Project	176-184 GEORGE STREET CONCORD WEST SUB SURFACE SECTION
Project No.	PS109581
File No	
Drawing No	
Rev	

APPENDIX E

LABORATORY RESULTS

resource laboratories
AGGREGATE, ROCK, AND SOIL TESTING
ABN: 25 131 532 020
Sydney: 12/1 Boden Road Seven Hills NSW 2147 | PO Box 45 Pendle Hill NSW 2145
Ph: (02) 9674 7711 **| Fax:** (02) 9674 7755 **| Email:** info@resourcelab.com.au

Test Report

Customer: WSP Australia Pty Limited
Job number: 18-0104
Project: PS109581
Report number: 1
Location: 176-184 George Street, Concord West
Page: 1 of 1

Moisture Content

Sampling method: Samples tested as received
Test method(s): AS 1289.1.1, 2.1.1

	Results				
Laboratory sample no.	15821	15822	15824		
Customer sample no.	BH44 3.0-3.45m	BH44 3.5-4.0m	BH35 1.0-1.8m		
Date sampled	19/07/2018	19/07/2018	20/07/2018		
Material description	silty CLAY, trace of sand and gravel, dark brown/grey/ pale grey	silty CLAY, trace of gravel, brown	silty CLAY, trace of gravel, dark grey/pale grey/ red		
Moisture content (%)	27.3	19.3	27.9		

Laboratory sample no.					
Customer sample no.					
Date sampled					
Material description					
Moisture content (%)					

Approved Signatory:  E. Maldonado **Date:** 13/08/2018

NATA ACCREDITED FOR TECHNICAL COMPETENCE

Accredited for compliance with ISO/IEC 17025.

NATA Accredited Laboratory Number: **17062**

resource laboratories
AGGREGATE, ROCK, AND SOIL TESTING
ABN: 25 131 532 020
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Test Report

Customer: WSP Australia Pty Limited
Project: PS109581
Location: 176-184 George Street, Concord West

Job number: 18-0104
Report number: 2
Page: 1 of 1

Soil Index Properties

Sampling method: Samples tested as received

Test method(s): AS 1289.1.1, 2.1.1, 3.1.2, 3.2.1, 3.3.1 .3.4.1

	Results				
Laboratory sample no.	15821	15822	15824		
Customer sample no.	BH44 3.0-3.45m	BH44 3.5-4.0m	BH35 1.0-1.8m		
Date sampled	19/07/2018	19/07/2018	20/07/2018		
Material description	silty CLAY, trace of sand and gravel, dark brown/grey/ pale grey	silty CLAY, trace of gravel, brown	silty CLAY, trace of gravel, dark grey/pale grey/ red		
Liquid limit (%)	48	50	59		
Plastic limit (%)	20	19	22		
Plasticity index (%)	28	31	37		
Linear shrinkage (%)	13.0	12.5	15.0		
Cracking / Curling / Crumbling	-	Curling	Cracking and curling		
Sample history	Air dried	Air dried	Air dried		
Preparation	Dry sieved	Dry sieved	Dry sieved		

Approved Signatory:  E. Maldonado **Date:** 13/08/2018

NATA ACCREDITED FOR TECHNICAL COMPETENCE

Accredited for compliance with ISO/IEC 17025.

NATA Accredited Laboratory Number: **17062**

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Test Report

Customer: WSP Australia Pty Limited
Job number: 18-0104
Project: PS109581
Report number: 3
Location: 176-184 George Street, Concord West
Page: 1 of 1

Soil Aggressivity

Sampling method: Samples tested as received
Test method(s): AS 1289.1.1, EA002, ED040S ED045G

	Results				
Laboratory sample no.	15819	15821	15824		
Customer sample no.	BH30 4.5-5.0m	BH44 3.0-3.45m	BH35 1.0-1.8m		
Date sampled	19/07/2018	19/07/2018	20/07/2018		
Material description	silty CLAY, trace of sand and gravel, brown	silty CLAY, trace of sand and gravel, dark brown/grey/ pale grey	silty CLAY, trace of gravel, dark grey/pale grey/ red		
pH	8.7	5.2	5.8		
Electrical conductivity (µS/cm)	194	174	64		
Sulfate as SO_4^{2-} (mg/kg)	110	180	60		
Chloride (mg/kg)	310	160	<50		

Notes: Tested by Australian Laboratory Services, NATA Accredited Laboratory Number 825: EA002: pH, ED040S: Soluble Sulfate as S04 2-, ED045G: Chloride by Discrete Analyser, Report reference ES1823109.

Approved By:  E. Maldonado
Date: 13/08/2018

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Test Report

Customer: WSP Australia Pty Limited
Job number: 18-0104
Project: PS109581
Report number: 4
Location: 176-184 George Street, Concord West

Uniaxial Compressive Strength of Rock Core

Sampling method: Samples tested as received
Test method(s): AS 4133.1.1.1, 4.2.2

	Results			
Laboratory sample no.	15820	15823	15825	
Customer sample no.	BH30 8.65-8.94m	BH44 6.65-6.96m	BH35 9.0-9.23m	
Sample depth	8.65-8.94m	6.65-6.96m	9.0-9.23m	
Date sampled	19/07/2018	19/07/2018	20/07/2018	
Date tested	10/08/2018	10/08/2018	10/08/2018	
Lithological description	SHALE	SHALE	SHALE	
Storage history, curing and environment	Sealed, moist, moisture condition as received	Sealed, moist, moisture condition as received	Sealed, moist, moisture condition as received	
Type of test machine used	Matest 1500kN - Grade A	Matest 1500kN - Grade A	Matest 1500kN - Grade A	
Description of failure	Mixed mode	Mixed mode	Mixed mode	
Specimen average length (mm)	133.5	153.7	115.5	
Specimen average diameter (mm)	51.8	51.9	51.6	
Moisture content at time of test (%)	1.8	1.9	2.8	
Test duration (mins)	19	13	9	
Rate of displacement (mm/min)	0.1	0.1	0.1	
Uniaxial Compressive Strength (MPa)	**47**	**40**	**27**	

Notes: 15825 - Length to diameter ratio less than 2.5.

Approved Signatory:  E. Maldonado **Date:** 13/08/2018

resource laboratories
AGGREGATE, ROCK, AND SOIL TESTING
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Test Report

Customer: WSP Australia Pty Limited
Job number: 18-0104
Project: PS109581
Report number: 4
Location: 176-184 George Street, Concord West

Uniaxial Compressive Strength of Rock Core

Specimen prior to testing

Laboratory sample no. 15820
Customer sample no. BH30 8.65-8.94m

Specimen after failure

Laboratory sample no. 15820
Customer sample no. BH30 8.65-8.94m

Laboratory sample no. 15823
Customer sample no. BH44 6.65-6.96m

Laboratory sample no. 15823
Customer sample no. BH44 6.65-6.96m

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Test Report

Customer: WSP Australia Pty Limited
Job number: 18-0104
Project: PS109581
Report number: 4
Location: 176-184 George Street, Concord West
Page: 3 of 3

Uniaxial Compressive Strength of Rock Core

Specimen prior to testing

Laboratory sample no. 15825
Customer sample no. BH35 9.0-9.23m

Specimen after failure

Laboratory sample no. 15825
Customer sample no. BH35 9.0-9.23m

Laboratory sample no.

Customer sample no.

Laboratory sample no.

Customer sample no.