Geotechnical Investigation and Geotechnical Design Advice

Western Sydney University Richmond Agricultural Centre - NEW SITE

PSM5353-006R REV2 23 April 2025

RICHARD CROOKES CONSTRUCTIONS

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1. Introduction

This geotechnical investigation report has been prepared by PSM on behalf of the Department of Education (DoE) (the Proponent) to assess the potential environmental impacts that could arise from the activities associated with the new Richmond Agricultural Centre Development at 2 College Street Richmond (Part Lot 2 DP1051797) (the Site).

We have previously completed an investigation in 2024 at the proposed development for the previous design. (Ref. PSM5353-002R, dated 5 July 2024).

This report has been prepared to present the results of geotechnical investigations undertaken between 2 April and 3 April 2025 and geotechnical advice for the proposed Western Sydney University (WSU) Richmond Agricultural Centre located at **NEW SITE** within the WSU Hawkesbury campus on Londondery Road and College Street, herein referred to as the **Site**. The work was undertaken in accordance with the PSM proposal (ref. PSM5353-004L REV 0, dated 01 November 2024).

This report accompanies a Review of Environmental Factors (REF) that seeks approval for the construction and operation of a new secondary school with a specialist agricultural curriculum at the site. The activities associated with establishing the Richmond Agricultural Centre involves the following works:

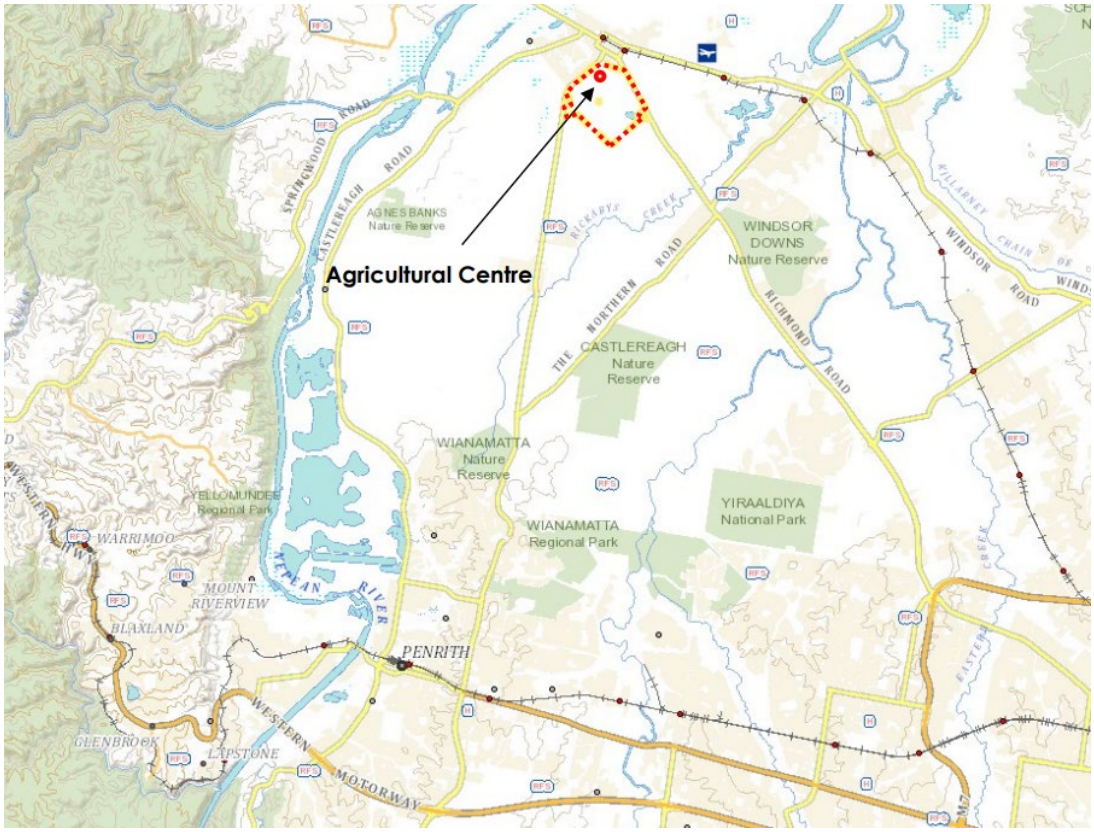
- The removal of trees and fencing
- Construction of a general learning hub
- Construction of a science hub
- Construction of a multipurpose hall
- Construction of an administration building
- Construction of canteen and amenities building
- Construction of a new parking area (including accessible spaces) driveway and kids and drop facilities
- The provision of outdoor agricultural learning areas comprising:
  - Agricultural plots
  - Aboriginal enterprise
  - Agricultural shed and greenhouse
  - Animal plots with associated stock yard, animal shelters, troughs and stock lane
  - Gravel access road with wash bay
- Landscaping including new trees, entry forecourt, village green and kitchen garden
- Ancillary services and infrastructure upgrades including new substation and HV Works, sewer pump station, water booster, dual carriage vehicle access and pedestrian paths
- Wayfinding and school identification signage.

For a detailed project description, please refer to the Review of Environmental Factors (REF) prepared by EPM Projects.

2. Site Description

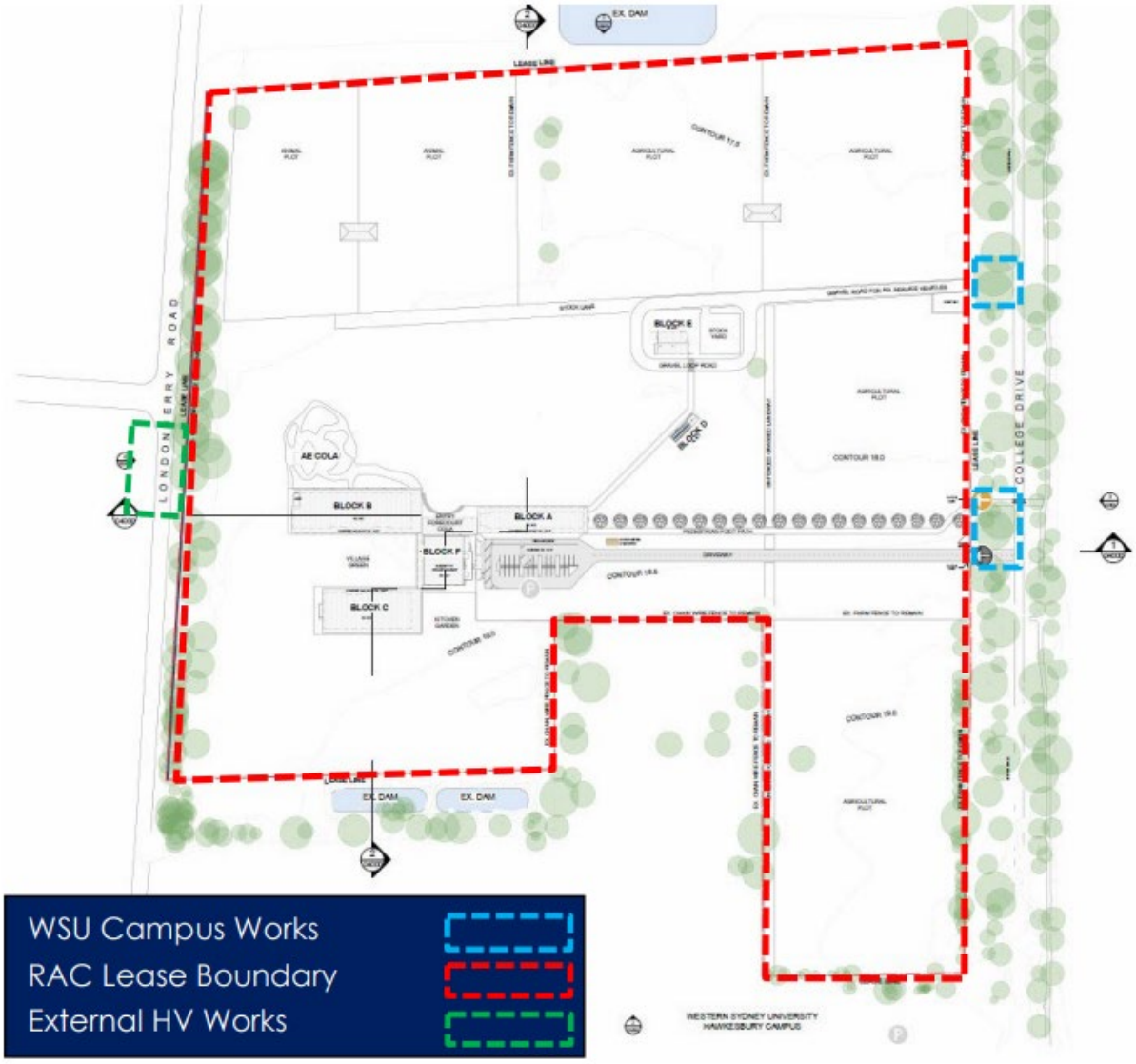
The Site is located on 2 College Street, Richmond (Part Lot 2 DP 1051798). The Site is located within the Hawkesbury City Council area and is zoned SP1 Special Activities (the SP1 zone) by the *Hawkesbury Local Environmental Plan 2012* (the LEP).

Inset 1 is a site plan showing the location of the proposed Richmond Agricultural Centre within its regional context. Inset 2 is an aerial image of the site and its immediate surrounds.



Inset 1: Location of the proposed Richmond Agricultural Centre (source: ePlanning Spatial Viewer)

Inset 2: Aerial image of the Site showing the location of proposed Richmond Agricultural Centre (source: Nearmap, dated 27 October 2024)



Inset 3: Extent of proposed works at Richmond Agricultural Centre (source: NBRS Architecture)

The boundary of the REF works is shown in Inset 3 and comprises:

- Leased area: This is the area of land leased by the Department of Education from Western Sydney University (WSU) for the proposed Richmond Agricultural Centre. This area comprises 14.25 ha of land with frontage to College Drive of 480 meters. The future school site comprises existing agricultural land within the WSU campus bound by College Drive to the east, Londonderry Road to the west, WSU facilities to the south and vacant WSU agricultural land to the north.
- WSU Campus: This is the area of land between the leased area and College Drive.

3. Background

PSM has been provided with the following documents:

- Proposed Site Plan Drawing by NBRS (ref. RAC-NBRS-ZZ-ZZ-DR-A-00101 REV 5, dated 27 March 2025)
- Structural Drawings by Northrop (ref. RAC-NRE-ZZ-DR-S-0001 to RAC-NRE-ZZ-DR-S-0421 REV1, dated 31 March 2025)
- Civil Drawings by Northrop (ref. RAC-NRE-ZZ-ZZ-DR-C-0000 to RAC-NRE-ZZ-ZZ-DR-C-6001 REV04, dated 24 March 2025)

Based on the provided documents, we understand the following:

- The development will predominantly comprise agricultural plots

- Up to five buildings will be located on the northwestern portion of the site, comprising teaching spaces and accommodation
- Carparks and minor landscaping areas will also be included in the development
- Minor earthworks proposed including up to:
  - 1.09m of FILL
  - 0.5m of CUT.

4. Geotechnical Investigation – April 2025

4.1 Fieldwork

The fieldwork was undertaken on 2 April 2025 and 3 April 2025 in the full-time presence of a PSM geotechnical engineer who undertook the following tasks:

- Direct excavation of test pits
- Logging of nine (9) test pits
- Logging the profile of existing profile of the two (2) CBR locations on College Drive
- Retrieval of five (5) bulk samples for California Bearing Ratio (CBR) tests
- Retrieval of two (2) samples for shrink-swell index test
- Retrieval of five (5) samples for salinity and aggressivity tests
- Conducting Dynamic Cone Penetrometer (DCP) tests adjacent to the test pits
- Record the depth of water in six (6) existing groundwater monitoring wells (standpipes)
- Directing the Cone Penetrometer Test (CPT) locations.

Prior to the test pits and CPTs, the locations were “scanned” by a certified service locator under the supervision of a PSM geotechnical engineer to detect the presence of underground services. Richard Crookes Constructions were responsible for ensuring that the test pits were scanned by a certified service locator beforehand.

The test locations were recorded using a hand-held GPS device with a horizontal and vertical accuracy of approximately +/- 5 m.

Figure 1 presents the test locations. Figure2 to 8 present some selected site photographs.

4.1.1 Test Pits

A total of nine test pits were excavated using a 10-tonne excavator within two days of fieldwork. Test pits were excavated to a maximum depth of 2.4 m and terminated at one of two conditions:

- Refusal,
- Target depth (2 m).

Two test pits were excavated along the College Drive (CBR A and CBR B) to identify the existing pavement profile and recover CBR samples.

Engineering tabulated logs for the test pits are presented in Appendix A.

Samples were collected from the test pits for laboratory testing.

At the completion of the fieldwork, the test pits were backfilled with excavated spoil and lightly tamped with the excavator bucket.

4.1.2 Cone Penetration Tests

A total of three (3) cone penetration tests (CPTA to CPTC) were completed using a 15-tonne track mounted rig to a depth of 20 m.

CPT results are presented in Appendix C.

4.1.3 Laboratory Testing

Soil samples were recovered and sent to a geotechnical laboratory for the following testing:

- 5 x CBR tests (CBR A to CBR E)
- 2 x Shrink Swell Index tests (TP A and TP E).

Soil samples were also recovered and sent to a NATA accredited laboratory for the following testing:

- 5 x Aggressivity and salinity tests (TP A, TP B, TP C, TP F, TP I).

The results of the laboratory testing are presented in Section 5.

5. Laboratory Test Results

5.1 Laboratory Testing Results

5.1.1 California Bearing Ratio (CBR) Testing

Ten (10) bulk samples from the Site were recovered for CBR testing at a NATA accredited laboratory. Sampling locations are summarised in Table 1. The sampling locations are also presented in Figure 1.

The following sample preparation was undertaken for the CBR testing:

- Compact to 98% standard MDD, at optimum moisture content (OMC)
- Four (4) day-soaked sample
- 4.5kg surcharge.

Table 1 – CBR Test Results

Sample ID	Date	Depth [m bgl] [1]	Material Description	Soaked CBR[2] [%]	Optimum Moisture Content [%]	Standard Maximum Dry Denstiy [t/m^3]	Swell [%]
CBR01	June 2024 (Ref. PSM5353-002R)	0.5 – 1.0	CLAY	1.5	15.5	1.84	0.5
CBR02		1.0 – 1.5	Sandy CLAY	1.0	19.9	1.66	1.5
CBR03		1.0 – 1.5	Sandy CLAY	1.0	18.3	1.66	3.0
CBR04		0.5 – 1.0	CLAY	1.5	23.0	1.62	1.5
CBR05		0.5 – 1.0	CLAY	1.0	18.1	1.67	2.0
CBR A (College Dr)	April 2025	0.05 – 0.45	Sandy CLAY trace gravel	18*	9.0	2.04	0.0
CBR B (College Dr)		0.32 – 0.65	Sandy CLAY trace gravel	6	14.9	1.82	0.0
CBR C		0.2 – 0.5	CLAY	3.5	19.4	1.70	1.0
CBR D		0.7 – 0.9	CLAY	2.0*	18.4	1.69	2.0
CBR E		0.5 – 1.0	CLAY	1.5	14.3	1.84	1.5

Notes:
(1) m bgl – meters below existing ground level.
(2) * = CBR at 5.0 mm penetration.

5.1.2 Shrink Swell Index Testing

Four (4) soil samples were collected and sent to a NATA accredited laboratory to undergo shrink swell index testing.

Table 2 summarised the sampling locations and test results. Detailed results are provided in Appendix E.

Table 2 – Shrink Swell Index Test Results

Sample ID	Date	Depth (m BGL)	Material Description	Shrink Swell Index (%pF)
TP04	June 2024 (Ref. PSM5353-002R)	0.5	Sandy CLAY	1.44
TP08		1.0	Sandy CLAY	1.18
TP A	April 2025	1.0	CLAY	1.17
TP E		0.5	CLAY	1.15

5.1.3 Aggressivity Testing

Ten (10) disturbed soil samples were retrieved for aggressivity testing in a NATA accredited analytical laboratory. The following tests were undertaken:

- Cation Exchange Capacity (CEC)
- Exchange sodium percentage
- Salinity (EC 1:5, one part soil to five parts water)
- Soil pH
- Chlorides
- Sulphates
- Resistivity
- Moisture content.

Table 3 presents a summary of the results and location of the samples. The laboratory result sheets are presented in Appendix F.

Table 3 – Aggressivity Testing Results

Sample ID (depth)	Date	pH	Electrical Conductivity [µS/cm]	Resistivity [ohm.cm]	Moisture Content [%]	Chloride by discrete analyser [mg/kg]	Soluble Sulfate by icpaes [mg/kg]	ED007		ED008	
								CEC [meq/100g]	ESP [%]	CEC [meq/100g]	ESP [%]
TP03 (0.5 m)	June 2024 (Ref. PSM5353-002R)	7.2	85	11800	16.7	160	30	12.8	14.9	-	-
TP04 (0.5 m)		6.7	169	5920	19.5	210	170	6.4	16.6	-	-
TP05 (1.0 m)		5.5	351	2850	13.9	3040	130	-	-	7.3	20.0
TP06 (1.0 m)		5.5	726	1380	15.1	1600	<10	-	-	5.6	29.1
TP08 (1.5 m)		7	112	8930	11.7	390	<10	10.5	16.7	-	-
TP A (1.0 m)	April 2025	5.5	170	5880	15.1	110	160	9.4	10.1	-	-
TP B (0.5 m)		7.2	65	15400	8.5	190	40	10.5	9.7	-	-
TP C (1.5 m)		8.6	497	2010	9.4	710	70	-	-	8.2*	47.6*
TP F (1.0 m)		7.2	153	6540	10.7	100	80	11.0	20.9		
TP I (0.5 m)		5.8	27	37000	4.6	<10	10	2.6	1.3	-	-

Notes:
(1) * = ED006: Exchangeable Cations on Alkaline Soils.

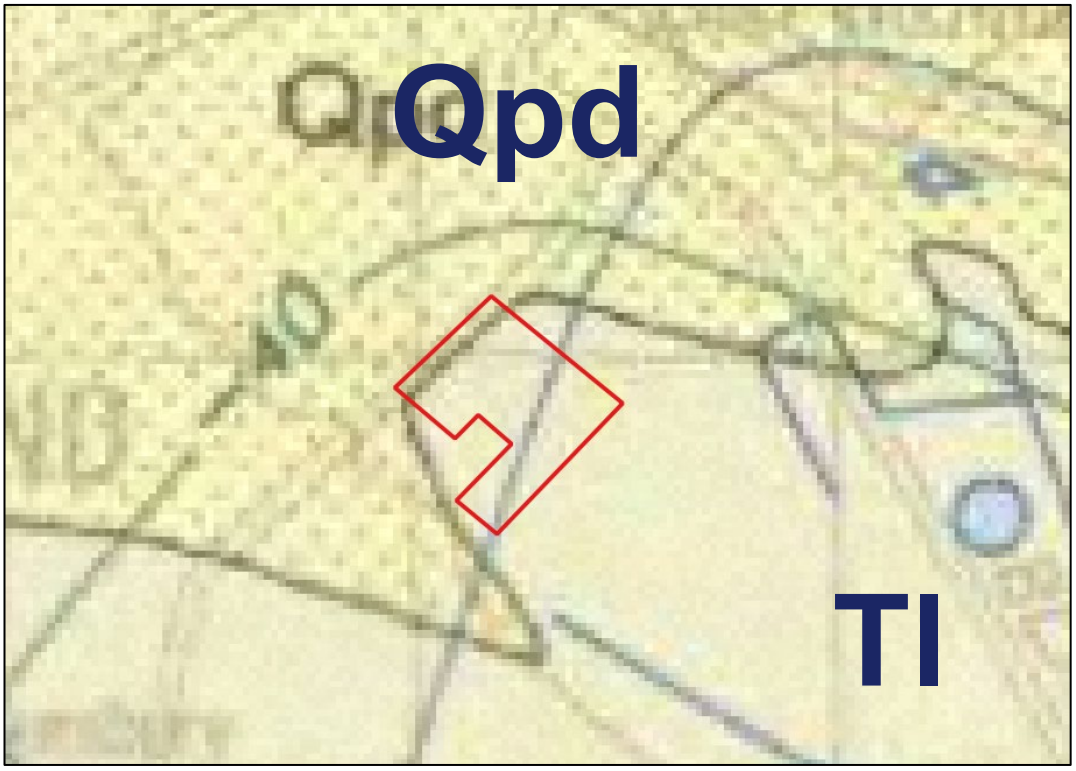
6. Site Conditions

6.1 Geological Setting

The 1:100,000 Penrith geological map indicates that the site is underlain by:

- (Tl) Londonderry Clay comprising medium to high plasticity clay with patches of consolidated sand:
- (Qpd) Clarendon Formation comprising of fine to coarse grain, pale brown to red-brown clayey sand or clayey silt overlying a grey mottled brown plastic clay.

Inset 4 presents the site location with regards to the geological settings.



Inset 4: Penrith 1:100,000 geological map (site boundary in red)

6.2 Surface Conditions

The Site is located south of Londonderry Road and has been utilized as a grazing land for livestock with no significant changes over the past 15 years.

At the time of the site investigation the site typically comprised the following:

- A generally flat site with minimal elevation changes
- Heavily vegetated surface comprising long grasses
- The south-eastern portion of the site has been used for agriculture with irrigation lines present
- The surface was muddy and wet from the recent inclement weather.

Inset 5 to Inset 12 presents a series of aerial photographs of the Site in 1947, 1965, 1975, 1986,1998, 2009, 2015 and 2024.

Inset 5: **Historical Aerial Imagery of the site in 1947 sourced from portal.spatial.nsw.gov.au (site boundary in red)**

Inset 6: **Historical Aerial Imagery of the site in 1965 sourced from portal.spatial.nsw.gov.au (site boundary in red)**

Inset 7: **Historical Aerial Imagery of the site in 1975 sourced from portal.spatial.nsw.gov.au (site boundary in red)**

Inset 8: **Historical Aerial Imagery of the site in 1986 sourced from portal.spatial.nsw.gov.au (site boundary in red)**

Inset 9: **Historical Aerial Imagery of the site in 1998 sourced from portal.spatial.nsw.gov.au (site boundary in red)**

Inset 10: **Historical Aerial Imagery of the site in 2009 sourced from nearmap.com (site boundary in red)**

Inset 11: Historical Aerial Imagery of the site in 2015 sourced from nearmap.com (site boundary in red)

Inset 12: Recent Aerial Imagery of the site in 2025 sourced from nearmap.com (site boundary in red)

6.3 Subsurface Conditions

6.3.1 New Site

The subsurface conditions encountered within the test pits are summarised in Table 4.

The encountered subsurface conditions were generally consistent with the published information (Geological map).

The thickness of each geotechnical unit encountered in the testpits and CPTs are summarised in Table 5.

Table 4 – Summary of Inferred Geotechnical Units Encountered during Geotechnical Investigation 2025 – New Site

Unit Name	Approximate Depth to Top of Unit (m)	Description
TOPSOIL	0	Silty SAND: brown, fine to medium-grained, low plasticity silt, loose, moist, rootlets observed.
SURFICIAL MATERIAL	0.18 – 0.3	Sandy CLAY to CLAY: yellow-brown to yellow-brown mottled grey, medium plasticity, fine to medium-grained sand, stiff to very stiff, moist.
UPPER INTERBEDDED SAND/CLAY LAYER	0.7 – 1.9	Sandy CLAY to CLAY: yellow-brown mottled grey to red-brown mottled grey, medium plasticity, fine to medium-grained sand, very stiff to hard, moist to dry.
MIDDLE CLAY LAYER	5.5 – 8.0	Silty CLAY to CLAY: stiff to very stiff. Inferred from CPT results only.
LOWER INTERBEDDED SAND/CLAY LAYER	15.0 - 16.3	Silty SAND to SAND with layers of Silty CLAY: medium dense, hard. Inferred from CPT results only.
BEDROCK	19.55 – 19.74	Inferred from CPT refusal at CPT A, and CPT B.

Table 5 – Depth to the Top of Inferred Geotechnical Units Encountered during Geotechnical Investigation 2025 – New Site

ID	Date	Reduced Level at Top of Inferred Geotechnical Units (m AHD)						
		TOPSOIL	SURFICIAL MATERIAL	UPPER INTERBEDDED SAND/CLAY LAYER	MIDDLE CLAY LAYER	LOWER INTERBEDDED SAND/CLAY LAYER	BEDROCK	EOH
TP A	April 2025 (new site)	18.1	17.9	17.1	NE	NE	NE	16.0
TP B		18.1	17.8	17.1	NE	NE	NE	16.1
TP C		18.2	18.0	17.2	NE	NE	NE	16.1
TP D		18.0	17.8	17.1	NE	NE	NE	16.0
TP E		18.5	18.3	17.5	NE	NE	NE	16.2
TP F		18.5	18.3	17.6	NE	NE	NE	16.5
TP G		18.3	18.1	17.3	NE	NE	NE	16.3
TP H		18.6	18.4	17.9	NE	NE	NE	16.2
TP I		19.1	18.9	18.3	NE	NE	NE	17.1
CPT A		18.6	18.4	17.7	10.6	2.3	-1.0*	-1.0*
CPT B		18.3	18.1	17.4	10.8	2.8	-1.4*	-1.4*
CPT C		18.2	18.0	16.3	12.7	3.2	NE	-2.9

Notes:
(1) EOH = End of Hole.
(2) NE = Not Encountered.
(3) *= Refusal (Inferred as top of BEDROCK).
(4) RL's inferred from CMS Survey (Ref.: 22430detail).
(5) Horizontal positions were recorded using a handheld GPS unit with an accuracy of +/- 5 m.

Top of inferred BEDROCK unit was assessed from CPT A and CPT B refusal depth. Further investigation (eg. with boreholes) should be undertaken to confirm the top of BEDROCK unit, if foundation is designed to be founded on BEDROCK.

6.3.2 College Drive Pavement

The subsurface conditions / profiles encountered within the auger holes on the road (College Drive) are summarised in Table 6.

Table 6 – Summary of Inferred Units Encountered on the Road (College Drive)

Unit Name	Description
WEARING COURSE	ASPHALT: 60 -140 mm thick.
ROADBASE	Gravelly SAND: grey and brown, fine to medium grained sand, gravel sub-angular up to 20 mm; some crushed sandstone pieces up to 30 mm observed. It is inferred to be at least 180 mm thick
FILL SUBGRADE	Sandy CLAY trace gravel: brown, low to medium plasticity, fine grained sand, gravel sub-angular up to 8 mm.
NATURAL SUBGRADE	CLAY: yellowish brown, medium plasticity.

6.4 Groundwater

During the site investigation, existing groundwater monitoring water wells were measured and the groundwater level was recorded. This information is summarised in Table 7 below. Details of the constructed wells are not known to PSM.

Table 7 – Depth of Water in Standpipes

Well ID	Date	Depth below Collar (m)	Collar Height (m)	Groundwater Level (m bgl) [1]
MW33	June 2024 (Ref. PSM5353-002R)	10.3	1.0	9.3
MW35		8.7	1.1	7.6
MW36		7.9	1.1	6.8
MW37		9.3	1.0	8.3
MW38		10.7	1.1	9.6
MW31	April 2025	NE	1.0	NE
MW32		9.3	1.0	8.3
MW33		8.9	1.0	7.9
MW34		9.4	1.0	8.4
MW35		8.7	1.1	7.6
MW37		9.5	1.0	8.5

Notes:
(1) m bgl – meters below existing grown level.
(2) NE = Not Encountered.

7. Salinity and Aggresivity / Corrosivity Assessment

7.1 Soil Chemistry

The laboratory test results summarised in Table 3 indicate the following:

- pH of the soil samples analysed was in the range of 5.5 to 8.6, with an average of 6.9
- The 1:5 soil to water extraction and subsequent electrical conductivity (EC1:5) of the soil samples analysed to be in the range of 27 µS/cm to 497 µS/cm
- Concentrations of chlorides in samples analysed was in the range of 0 mg/kg to 710 mg/kg
- Concentrations of soluble sulphate in samples analysed was in the range of 10 mg/kg to 160 mg/kg
- Cation Exchange Capacity (CEC) in samples analysed was in the range 2.6 meq/100g to 11 meq/100g
- Exchange Sodium Percentage (ESP) in samples analysed was in the range of 1.3% to 47.6%.

7.2 Salinity

Site Investigations for Urban Salinity (DLWC 2002) classify soil salinity based on electrical conductivity (EC_e). The method of conversion from $EC_{1:5}$ to EC_e (electrical conductivity of saturated extract) is based on DLWC (2002) and given by $EC_e = EC_{1:5} \times M$, where M is the multiplication factor based on "Soil Texture Group".

The "Soil Texture Group" of the samples tested were assessed during our investigation. The salinity classification for the soil samples that were tested are presented in Table 8.

Table 8 – Salinity Classification

SAMPLE ID	Date	$EC_{1:5}$ (dS/m)	SOIL TYPE	M	EC_e (dS/m)	SALINITY CLASS
TP03 (0.5m)	June 2024 (Ref. PSM5353-002R)	0.085	Light Clays	8.5	0.7225	Non-Saline
TP04 (0.5m)		0.169	Light Clays	8.5	1.4365	Non-Saline
TP05 (1.0m)		0.351	Light Clays	8.5	2.9835	Slightly Saline
TP06 (1.0m)		0.726	Light Clays	8.5	6.171	Moderately Saline
TP08 (1.5m)		0.112	Light Clays	8.5	0.952	Non-Saline
TP A (1.0m)	April 2025	0.027	Light Clays	8.5	0.2295	Non-Saline
TP B (0.5m)		0.153	Light Clays	8.5	1.3005	Non-Saline
TP C (1.5m)		0.170	Light Clays	8.5	1.445	Non-Saline
TP F (1.0m)		0.497	Light Clays	8.5	4.2245	Moderately Saline
TP I (0.5m)		0.065	Light Clays	8.5	0.5525	Non-Saline

It is assessed that the soils on site are classified as "Non-Saline to Moderately Saline". The findings are consistent with previous investigation in June 2024.

We have referred to Clause 4.8.2 of Australian Standard AS3600-2018 "Concrete Structures" and note that the assessed soil electrical conductivity (EC_e) is within the "A2" exposure classification.

7.3 Aggressivity / Corrosivity

Table 4.8.1 of AS3600-2018 "Concrete Structures" provides criteria for exposure classification for concrete in sulphate soils based on sulphates in soil and groundwater, and pH of soil. On the basis of the sulphate and pH testing completed we assess the exposure classification for concrete in sulphate soils to be "A2".

Table 6.4.2(C) of Australian Standard AS2159:2009, Piling – Design and Installation provides criteria for exposure classification for concrete piles based on sulfates in the soil and groundwater, soil and groundwater pH, and chlorides in groundwater. On the basis of the soil sulfates and pH testing completed we assess the exposure classification for concrete piles in the soil to be mild.

Table 6.5.2(C) of Australian Standard AS2159:2009, Piling – Design and Installation provides criteria for exposure classification for steel piles based on resistivity, soil and groundwater pH, and chlorides in soil and groundwater. On the basis of the soil chlorides and pH testing completed we assess the exposure classification for steel piles in the soil to be non-aggressive.

7.4 Sodicity

Sodicity provides a measure of the likely soil dispersion on wetting. Soil sodicity is classified based on the Exchangeable Sodium Percentage (ESP) which is the amount of exchangeable sodium as a percentage of the Cation Exchange Capacity (DLWC, 2002).

The Exchangeable Sodium Percentages calculated from these laboratory results, ranging from 1.3% to 47.6%, indicates that the soils on site are non-sodic to highly sodic when compared to criteria listed in DLWC (2002).

8. Discussion

8.1 General

The design advice in the following sections is provided on the basis that:

- The subsurface conditions are as those encountered in the geotechnical investigation reported in Section 6.3 of this letter.
- PSM have prepared an earthworks specification (Appendix G) for the proposed development. Any earthworks shall be prepared in accordance with PSM specification in Appendix G. Topsoil will need to be removed. Any existing fill shall be removed and replaced in accordance with PSM Specification.

If any of those bases are not applicable, PSM should be requested to confirm that the design advice below is still applicable.

8.2 Site Classification

Based on the laboratory testing, field observations and the inferred geotechnical units, we have classified the site in accordance with AS2870-2011 “Residential slabs and footings”.

Structures that are within the scope of AS2870-2011 and founded on the following units shall be designed for a site classification of Class “H1” in accordance with Table 2.1 of AS2870-2011.

- Natural soil (SURFICIAL MATERIAL (with no soft layer), UPPER INTERBEDDED SAND/CLAY units) or
- ENGINEERED FILL that is placed in accordance with PSM Specification (Appendix G). Any existing fill shall be removed and replaced in accordance with PSM Specification.

The civil and structural engineers should consider likely heave / settlement due to the effect of climatic factors in their design.

We recommend that all structures and services be detailed such that they preclude any local wetting up or drying out of the subgrade after initial equilibrium is reached following construction of the slab and that the subgrade be within specification at the time of construction of the slab. We note that normal mounding or sagging away from the perimeter of covered areas will still occur and perimeters, or open joints, will still respond to environmental changes.

8.3 Permanent and Temporary Batters

The batter slope angles shown in Table 9 are recommended for the design of batters up to 2 m height and above groundwater: subject to the following recommendations:

1. The batters shall be protected from erosion.
2. Permanent batters shall be drained.
3. Temporary batters shall not be left unsupported for more than 1 month without further advice, and inspection by a geotechnical engineer should be undertaken following significant rain events.
4. Where loads are imposed or structures/services are located within one batter height of the crest of the batter, further advice should be sought.

Table 9 – Batter Slope Angles

Unit	Temporary	Permanent
ENGINEERED FILL / SURFICIAL MATERIAL / UPPER INTERBEDDED SAND/CLAY LAYER	2.0H : 1V	2.5H : 1V

Steeper batters may be possible subject to further advice, probably including inspection during construction.

The batters should be inspected by an experienced geotechnical engineer or engineering geologist during excavation to confirm the batter advice provided and assess the need for localised support.

8.4 Excavation Support

Any retaining structure or excavation support should be designed based on the following:

- Effective soil strength parameters in Table 10
- Water pressure (depending on the type of structure)
- Surcharge loads.

Note that design of retention systems may be based on either K_a or K_o earth pressures. Design using active earth pressures provides the minimum lateral earth pressure that must be supported to avoid failure and requires a wall that can rotate or translate to allow the pressures to reduce to these values (vertical and lateral movements up to 2% of height may occur, typical movements will be much less).

Where the design is based on K_o pressures, construction should be carefully controlled to avoid unwanted effects. It should be noted that designing for K_o pressures does not, of itself, ensure that movement does not occur. Movements are controlled by the construction method, especially sequence.

Both surface and sub-surface drainage needs to be designed and constructed properly to prevent pore water pressures from building up behind the retaining walls or appropriate water pressures must be included in the design.

8.5 Foundation

8.5.1 Shallow Footings

Pad footings may be proportioned on the basis of an allowable bearing pressure (ABP) for centric vertical loads provided in Table 10. Settlements of shallow footings should be assessed and can be estimated using the elastic parameters provided in Table 10.

Table 10 - Engineering Parameters of Inferred Geotechnical Units

Inferred Unit	Bulk Unit Weight (kN/m^3)	Soil Effective Strength Parameters		Ultimate Bearing Pressure (UBP) under Vertical Centric Loading (kPa)	Allowable Bearing Pressure (ABP) under Vertical Centric Loading (kPa)	Elastic Parameters	
		c' (kPa)	*ϕ'* (deg)			Long Term Young's Modulus (MPa)	Poisson's Ratio
ENGINEERED FILL / SURFICIAL MATERIAL*	18	0	30	420(1)	150(1)	10	0.3
UPPER INTERBEDDED SAND/CLAY LAYER	18	0	32	420(1)	150(1)	20	0.3
MIDDLE CLAY LAYER	18	0	30	N/A		10	0.3
LOWER INTERBEDDED SAND/CLAY LAYER	18	0	34			30	0.3

Notes:
(1) Shallow footings (for ABP of 150kPa) should have a minimum horizontal dimension of 1.0m and an embedment depth of 0.5 m.
(2) N/A – The shallow footings are not expected to be founded in MIDDLE CLAY LAYER and LOWER SAND units. Further advice should be sought if footings are to be founded within the units.
(3) * SURFICIAL MATERIAL unit shall be treated by removing and replacing material that is soft on the upper formation (in accordance with PSM Specifciation).

8.6 Slabs

The design of slabs on ground can be based on a subgrade with a long-term Young's Modulus (E) presented in Table 10.

We recommend that the exposed subgrade is inspected by a suitably qualified geotechnical engineer prior to the pouring of concrete. Softened/ loose areas will need to be boxed out and backfilled with engineered fill.

8.7 Pavements

The following CBR testing were undertaken:

1. Current new site (Section 4.1.1 of this report).

   A total of three (3) CBR tests were undertaken in the geotechnical investigations. The test results indicate a soaked CBR value of between 1.5% and 3.0%.

2. At previous proposed location (PSM5353-002R dated June 2024).

   A total of five (5) CBR tests were undertaken in the geotechnical investigation. The test results indicate a soaked CBR value of between 1.0% and 1.5%.

The low soaked CBR values are associated to high swell of samples when they are fully soaked.

A design subgrade CBR of 1.5% can be adopted for pavement founded on the site won material for the new site. However, please note that lower CBR values could be encountered based on CBR testing on previous location. The site material (eg. Surficial Material unit) is similar; that is Sandy CLAY to CLAY.

Further testing will be required to confirm the design value if the pavement will be constructed on new imported fill or if significant cut and fill will be carried out.

We recommend that specific CBR testing be undertaken at subgrade level when pavement layouts are finalised.

Should you have further queries, please do not hesitate to contact us.

Yours Sincerely

TSZ IN WONG
GEOTECHNICAL ENGINEER

HUGO THANG
GEOTECHNICAL ENGINEER

AGUSTRIA SALIM
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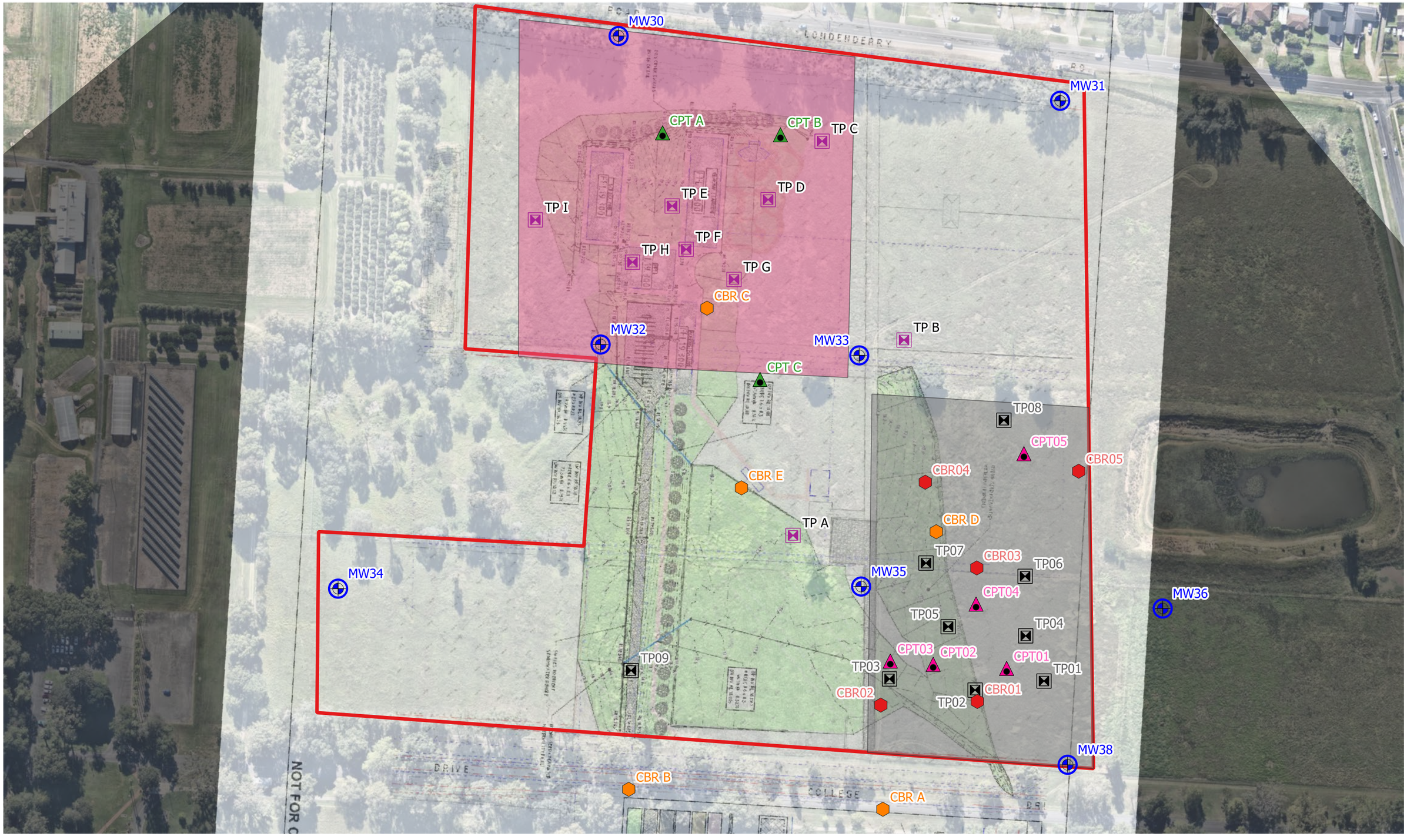

Legend

- Test Pits - June 2024
- Cone Penetrometer Tests - June 2024
- California Bearing Ratio (CBR) Tests - June 2024
- New Building Site
- Old Building Site
- Test Pits - April 2025
- Cone Penetrometer Tests - April 2025
- California Bearing Ratio (CBR) Tests - April 2025
- Groundwater Monitoring Wells
- Site Extent

Notes:
1. Aerial image sourced from Nearmaps.com dated 15 March 2025.
2. Grey area indicates the old building site investigation. For details, refer to PSM5353-002R.
3. Overlain drawing (ref. RAC-NRE-ZZ-ZZ-DR-C-3001 REV5 dated 24 March 2025).

Scale 1:2,000

20 0 20 40 60 80 m

GDA2020 / MGA zone 56

Created By: PSM	Revision: B	Richard Crookes Constructions Western Sydney University Richmond Agricultural Centre	
Date: 23 Apr 2025	Paper Size: A3	Geotechnical Investigation Locality Plan	
		PSM5353-006R	Figure 1

M:\PSM5353\Eng\QGIS\02. Workspace\01_MXDs\PSM5353 - Master.qgz Layout: PSM5353-006R Figure 1

Photo 1 - General Site Photo facing North

Photo 2 - General Site Photo facing South

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Western Sydney University

Richmond Agricultural Centre

SELECTED SITE PHOTOGRAPHS (1 OF 7)

PSM5353-006R	Figure 2

Photo 3 - Typical Surface Conditions near CBR A

Photo 4 - Completion of Backfill (CBR A)

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Richmond Agricultural Centre

SELECTED SITE PHOTOGRAPHS (2 OF 7)

PSM5353-006R	Figure 3

Photo 5 - Pavement Profile Encountered in CBR B

Photo 6 - Typical Surface Conditions near CBR B

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Richmond Agricultural Centre

SELECTED SITE PHOTOGRAPHS (3 OF 7)

PSM5353-006R	Figure 4

Photo 7 - 10t Excavator used to Excavate Test Pits

Photo 8 - CPT Rig

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Western Sydney University
Richmond Agricultural Centre

SELECTED SITE PHOTOGRAPHS (4 OF 7)

PSM5353-006R	Figure 5

Photo 9 - CLAY unit encountered under the pavement -CBR B

Photo 10 - Typical Ground Monitoring Well

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Western Sydney University

Richmond Agricultural Centre

SELECTED SITE PHOTOGRAPHS (5 OF 7)

PSM5353-006R	Figure 6

Photo 11 - Typical TOPSOIL unit - brown Silty SAND (TP I)

Photo 12 - Typical SURFICAL MATERIAL unit - Yellow Brown CLAY (TP E)

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Richmond Agricultural Centre

SELECTED SITE PHOTOGRAPHS (6 OF 7)

PSM5353-006R	Figure 7

Photo 13 - Typical UPPER INTERBEDDED CLAY unit - Red Brown mottled Grey CLAY (TP H)

Photo 14 - Clayey SAND observed 2.2m below ground surface (TP E)

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Western Sydney University

Richmond Agricultural Centre

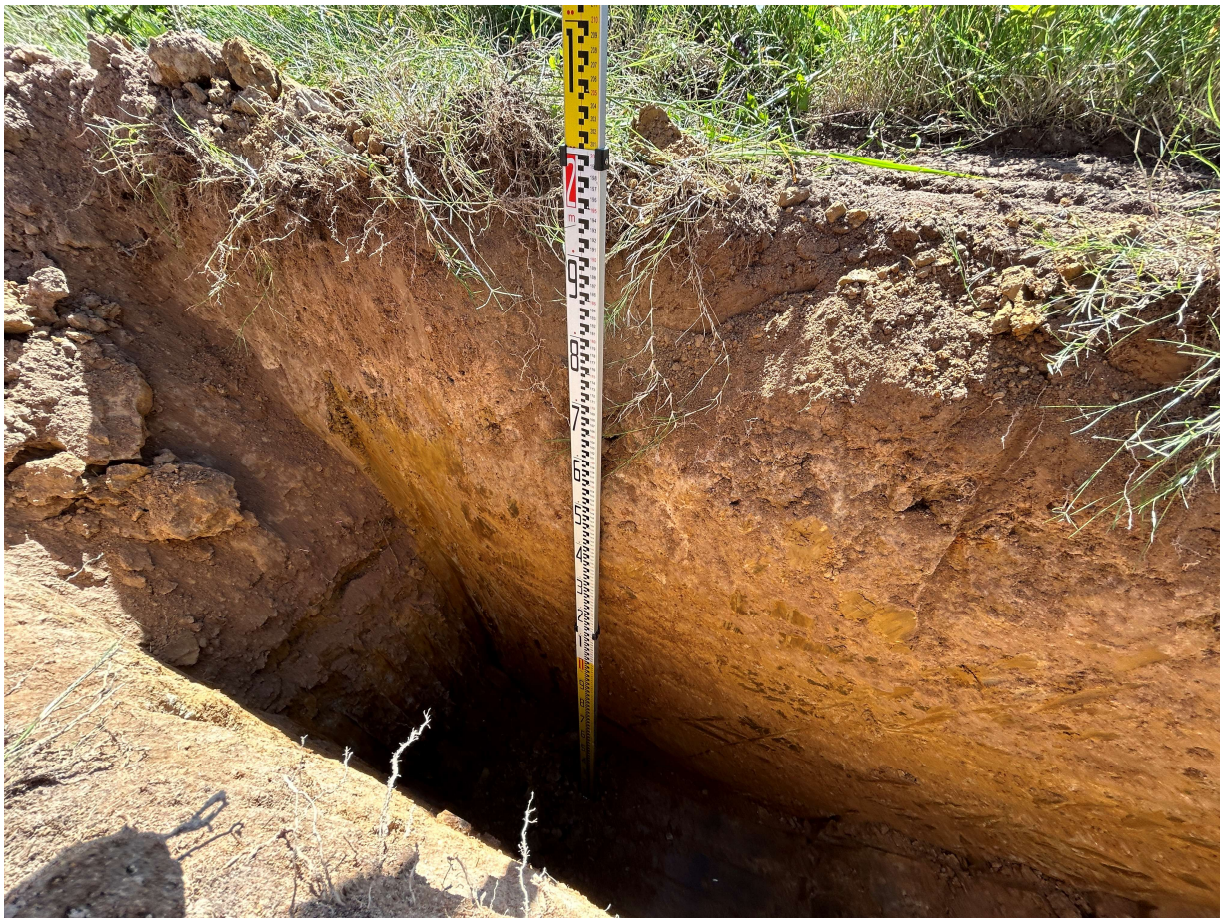
SELECTED SITE PHOTOGRAPHS (7 OF 7)

PSM5353-006R	Figure 8

Appendix A
Tabulated Testpit and Pavement Logs

Test Pit ID (Easting, Northing)	Approximate Depth (m)	Material Encountered	Notes
TP A (291388.4, 6279057.8)	0.0 – 0.2	Silty SAND: brown, fine to medium grained, loose, low plasticity, moist; rootlets observed.	TOPSOIL
	0.2 – 0.4	Sandy CLAY: pale grey mottled yellow brown, medium plasticity, fine to medium grained, stiff, moist (W < PL).	Inferred NATURAL SOIL
	0.4 – 1.0	CLAY: yellow brown mottled grey, medium plasticity, stiff to very stiff, moist (W > PL).	NATURAL SOIL
	1.0 – 1.5	CLAY: yellow brown mottled grey, medium plasticity, very stiff, dry (W < PL).	Aggressivity Testing @1.0m Shrink Swell Index Test @1.0m NATURAL SOIL
	1.5 – 2.1	CLAY: red brown mottled grey, medium plasticity, very stiff, dry (W < PL).	NATURAL SOIL
	2.1	Test pit terminated.	Target Depth

Test Pit ID (Easting, Northing)	Approximate Depth (m)	Material Encountered	Notes
TP B (291344.9, 6279174.6)	0.0 – 0.3	Silty SAND: brown, fine to medium grained, loose, low plasticity, moist; rootlets observed.	TOPSOIL
	0.3 – 0.6	Sandy CLAY: pale grey mottled yellow brown, medium plasticity, fine to medium grained, stiff, moist (W < PL).	Aggressivity Testing @0.5m Inferred NATURAL SOIL
	0.6 – 1.0	CLAY: yellow brown mottled grey, medium plasticity, stiff to very stiff, moist (W > PL).	NATURAL SOIL
	1.0 – 1.5	CLAY: yellow brown mottled grey, medium plasticity, very stiff, dry (W < PL).	NATURAL SOIL
	1.5 – 2.0	CLAY: red brown mottled grey, medium plasticity, very stiff, dry (W < PL).	NATURAL SOIL
	2.0	Test pit terminated.	Target Depth

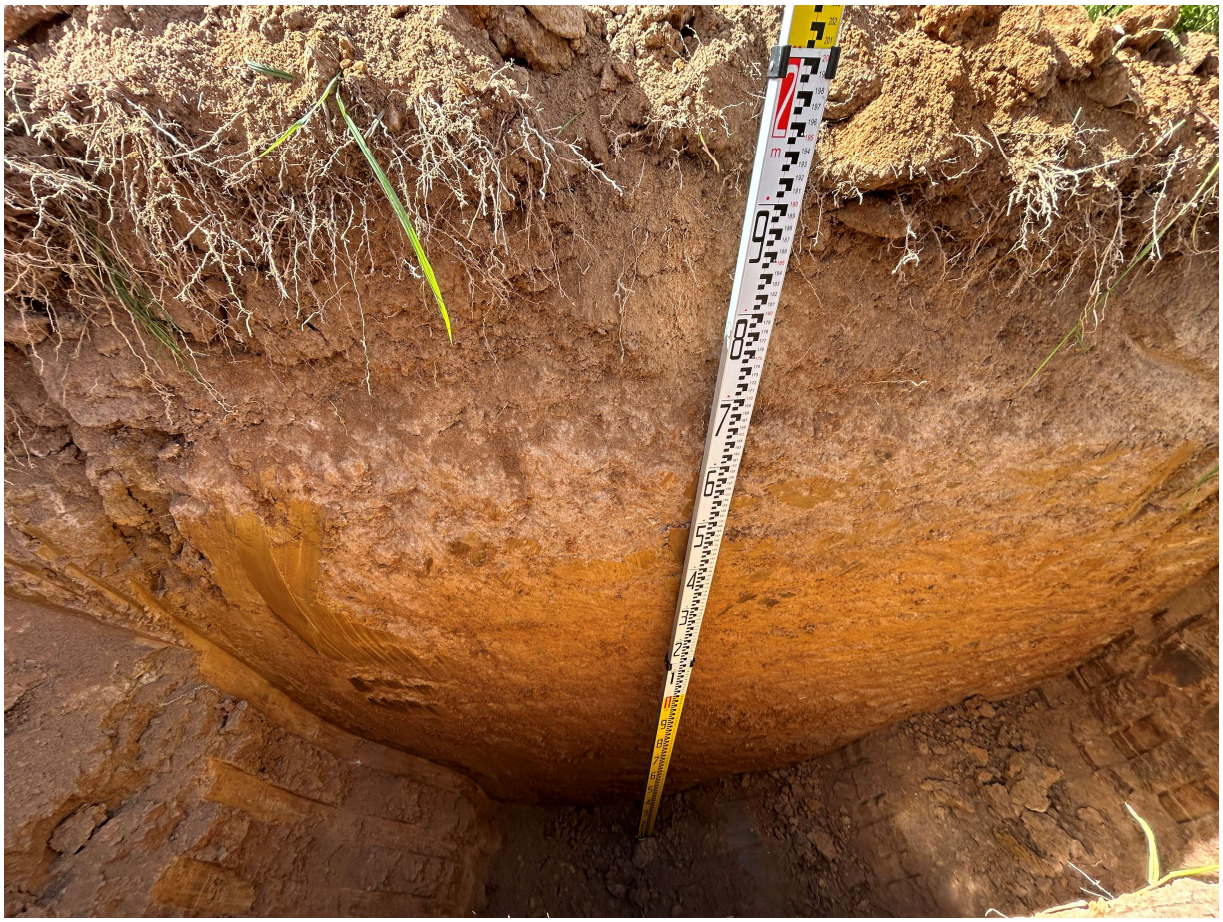


Test Pit ID (Easting, Northing)	Approximate Depth (m)	Material Encountered	Notes
TP C (291231.2, 6279210.7)	0.0 – 0.2	Silty SAND: brown, fine to medium grained, loose, low plasticity, moist; rootlets observed.	TOPSOIL
	0.2 – 0.4	Sandy CLAY: pale grey mottled yellow brown, medium plasticity, fine to medium grained, firm to stiff, moist (W < PL).	Inferred NATURAL SOIL
	0.4 – 1.0	CLAY: yellow brown mottled grey, medium plasticity, stiff to very stiff, moist (W > PL).	NATURAL SOIL
	1.0 – 1.5	CLAY: yellow brown mottled grey, medium plasticity, stiff to very stiff, dry (W < PL).	NATURAL SOIL
	1.5 – 2.1	CLAY: red brown mottled grey, medium plasticity, very stiff, dry (W < PL).	Aggressivity Testing @1.5m NATURAL SOIL
	2.1	Test pit terminated.	Target Depth

Test Pit ID (Easting, Northing)	Approximate Depth (m)	Material Encountered	Notes
TP D (291236.8, 6279166.9)	0.0 – 0.2	Silty SAND: brown, fine to medium grained, loose, low plasticity, moist; rootlets observed.	TOPSOIL
	0.2 – 0.4	Sandy CLAY: pale grey mottled yellow brown, medium plasticity, fine to medium grained, stiff, moist (W < PL).	Inferred NATURAL SOIL
	0.4 – 0.9	CLAY: yellow brown mottled grey, medium plasticity, stiff, moist (W > PL).	NATURAL SOIL
	0.9 – 1.5	CLAY: yellow brown mottled grey, medium plasticity, stiff to very stiff, dry (W < PL).	NATURAL SOIL
	1.5 – 2.0	CLAY: red brown mottled grey, medium plasticity, very stiff, dry (W < PL).	NATURAL SOIL
	2.0	Test pit terminated.	Target Depth

Test Pit ID (Easting, Northing)	Approximate Depth (m)	Material Encountered	Notes
TP E (291205.3, 6279123.9)	0.0 – 0.25	Silty SAND: brown, fine to medium grained, loose, low plasticity, moist; rootlets observed.	TOPSOIL
	0.25 – 0.5	Sandy CLAY: pale grey mottled yellow brown, medium plasticity, fine to medium grained, stiff to very stiff, moist (W < PL).	Inferred NATURAL SOIL
	0.5 – 1.0	CLAY: yellow brown mottled grey, medium plasticity, stiff to very stiff, moist (W > PL).	Shrink Swell Index Test @0.5m NATURAL SOIL
	1.0 – 1.5	CLAY: yellow brown mottled grey, medium plasticity, stiff to hard, dry (W < PL).	NATURAL SOIL
	1.5 – 2.2	CLAY: red brown mottled grey, medium plasticity, dry (W < PL).	NATURAL SOIL
	2.2 – 2.3	Clayey SAND: yellow brown, fine to medium grained, dense, medium plasticity, moist.	NATURAL SOIL
	2.3	Test pit terminated.	Target depth

Test Pit ID (Easting, Northing)	Approximate Depth (m)	Material Encountered	Notes
TP F (291228.7, 6279114.4)	0.0 – 0.2	Silty SAND: brown, fine to medium grained, loose, low plasticity, moist; rootlets observed.	TOPSOIL
	0.2 – 0.5	Sandy CLAY: pale grey mottled yellow brown, medium plasticity, fine to medium grained, stiff, moist (W < PL).	Inferred NATURAL SOIL
	0.5 – 0.9	CLAY: yellow brown mottled grey, medium plasticity, stiff to very stiff, moist (W > PL).	NATURAL SOIL
	0.9 – 1.5	CLAY: yellow brown mottled grey, medium plasticity, very stiff, dry (W < PL).	Aggressivity Testing @1.0m NATURAL SOIL
	1.5 – 2.0	CLAY: red brown mottled grey, medium plasticity, stiff to hard, dry (W < PL).	NATURAL SOIL
	2.0	Test pit terminated.	Target Depth



Test Pit ID (Easting, Northing)	Approximate Depth (m)	Material Encountered	Notes
TP G (291258.6, 6279124.0)	0.0 – 0.18	Silty SAND: brown, fine to medium grained, loose, low plasticity, moist; rootlets observed.	TOPSOIL
	0.18 – 0.4	Sandy CLAY: pale grey mottled yellow brown, medium plasticity, fine to medium grained, firm, moist (W < PL).	Inferred NATURAL SOIL
	0.4 – 1.0	CLAY: yellow brown mottled grey, medium plasticity, stiff to very stiff, moist (W > PL).	NATURAL SOIL
	1.0 – 1.5	CLAY: yellow brown mottled grey, medium plasticity, stiff to very stiff, dry (W < PL).	NATURAL SOIL
	1.5 – 2.0	CLAY: red brown mottled grey, medium plasticity, very stiff, dry (W < PL).	NATURAL SOIL
	2.0	Test pit terminated.	Target Depth

Test Pit ID (Easting, Northing)	Approximate Depth (m)	Material Encountered	Notes
TP H (291215.0, 6279087.0)	0.0 – 0.2	Silty SAND: brown, fine to medium grained, loose, low plasticity, moist; rootlets observed.	TOPSOIL
	0.2 – 0.4	Sandy CLAY: pale grey, medium plasticity, fine to medium grained, stiff, moist (W < PL).	Inferred NATURAL SOIL
	0.4 – 0.7	CLAY: yellow brown mottled grey, medium plasticity, stiff to very stiff, moist (W > PL).	NATURAL SOIL
	0.7 – 1.4	CLAY: yellow brown mottled grey, medium plasticity, stiff to very stiff, dry (W < PL).	NATURAL SOIL
	1.4 – 2.4	CLAY: red brown mottled grey, medium plasticity, very stiff to hard, dry (W < PL).	NATURAL SOIL
	2.4	Test pit terminated.	Target Depth

Test Pit ID (Easting, Northing)	Approximate Depth (m)	Material Encountered	Notes
TP I (291162.4, 6279060.8)	0.0 – 0.2	Silty SAND: brown, fine to medium grained, loose, low plasticity, moist; rootlets observed.	TOPSOIL
	0.2 – 0.4	Sandy CLAY: pale grey mottled yellow brown, medium plasticity, firm, fine to medium grained, moist (W > PL).	Inferred NATURAL SOIL
	0.4 – 0.8	CLAY: yellow brown mottled grey, medium plasticity, stiff to very stiff, moist (W > PL).	Aggressivity Testing @0.5m NATURAL SOIL
	0.8 – 1.4	CLAY: yellow brown mottled grey, medium plasticity, stiff to very stiff, dry (W < PL).	NATURAL SOIL
	1.4 – 2.0	CLAY: red brown mottled grey, medium plasticity, very stiff, dry (W < PL).	NATURAL SOIL
	2.0	Test pit terminated.	Target Depth

Borehole ID (Easting, Northing)	Approximate Depth (m)	Material Encountered	Notes
CBR A (291536.7, 6278998.3) College Drive (Pavement Shoulder)	0.0 – 0.05	ASPHALT: 50mm thick.	WEARING COURSE
	0.05 – 0.45	Sandy CLAY trace gravel: brown, low to medium plasticity, fine grained sand, gravel sub-angular up to 8mm, moist; some crushed sandstone pieces up to 20mm observed.	CBR sample @0.05 – 0.45 m FILL
	0.45	Borehole terminated.	Target depth

Borehole ID (Easting, Northing)	Approximate Depth (m)	Material Encountered	Notes
CBR B (291437.7, 6278897.5) College Drive Pavement	0.0 – 0.14	ASPHALT: 140 mm thick.	WEARING COURSE
	0.14 – 0.32	Gravelly SAND: brown and grey, fine to medium grained, loose, gravel sub-angular up to 20mm; some crushed sandstone pieces up to 30mm observed.	BASE COURSE
	0.32 – 0.65	Sandy CLAY trace gravel; brown, low to medium plasticity, fine grained sand, gravel sub-angular up to 5mm, moist.	CBR sample @0.32 – 0.65 m FILL
	0.65 – 0.7	CLAY: yellowish brown, medium plasticity, moist	
	0.7	Borehole terminated.	Target depth

Appendix B
Dynamic Cone Penetrometer Results

DYNAMIC CONE PENETROMETER TEST RESULTS

Job No.	PSM5353	**Sheet**	1 **of** 2
Project	Western Sydney University Richmond Agricultural Centre	**Date**	3-Apr-25

Test Method	*AS 1289.6.3.2. - 1997 Methods of Testing Soils for Engineering Purposes - 9 kg Dynamic Cone Penetrometer Test*	Drop Height	*510 mm*
		Hammer Mass	*9 kg*
Tested by	*AL*	Tip Type	*CONICAL*

Location / Test Depth	TP A	TP B	TP C	TP D	TP E	TP F
0.10	5	3	1	2	4	4
0.20	5	4	2	3	4	4
0.30	5	5	3	5	7	6
0.40	4	6	3	6	14	7
0.50	4	6	3	7	7	8
0.60	4	5	4	10	7	8
0.70	8	6	9	11	8	7
0.80	13	10	10	14	11	10
0.90	16	12	8	12	11	13
1.00	10	12	7	16	12	14
1.10	10	8	7	15	17	15
1.20	11	11	5	12	22	13
1.30	13	10	6	8	16	15
1.40	12	10	7	5	21	13
1.50	10	8	7	8	36/HB	12
1.60	14	11	8	12		13
1.70	14	13	9	14		12
1.80	11	16	8	12		17
1.90	10	17	8	14		22
2.00	12	12	11	10		19
2.10	13	8	11	11		26
2.20		14				
2.30		14				
2.40						
2.50						
2.60						
2.70						
2.80						
2.90						
3.00						
3.10						
3.20						
3.30						
3.40						
3.50						
3.60						
3.70						
3.80						
3.90						
4.00						

Comments:

DYNAMIC CONE PENETROMETER TEST RESULTS

Job No.	PSM5353	**Sheet**	2 **of** 2
Project	Western Sydney University Richmond Agricultural Centre	**Date**	3-Apr-25

Test Method	*AS 1289.6.3.2. - 1997 Methods of Testing Soils for Engineering Purposes - 9 kg Dynamic Cone Penetrometer Test*	Drop Height	*510 mm*
		Hammer Mass	*9 kg*
Tested by	*AL*	Tip Type	*CONICAL*

Location / Test Depth	*TP G*	*TP H*	*TP I*			
0.10	5	3	1			
0.20	4	3	4			
0.30	2	4	2			
0.40	3	10	3			
0.50	3	6	6			
0.60	4	4	10			
0.70	5	5	10			
0.80	8	4	7			
0.90	8	4	7			
1.00	8	6	14			
1.10	7	7	13			
1.20	7	7	10			
1.30	7	6	13			
1.40	10	7	12			
1.50	11	8	13			
1.60	10	13	12			
1.70	10	11	8			
1.80	13	7	13			
1.90	12	14	12			
2.00	11	23	13			
2.10	15	22				
2.20	16	16				
2.30						
2.40						
2.50						
2.60						
2.70						
2.80						
2.90						
3.00						
3.10						
3.20						
3.30						
3.40						
3.50						
3.60						
3.70						
3.80						
3.90						
4.00						

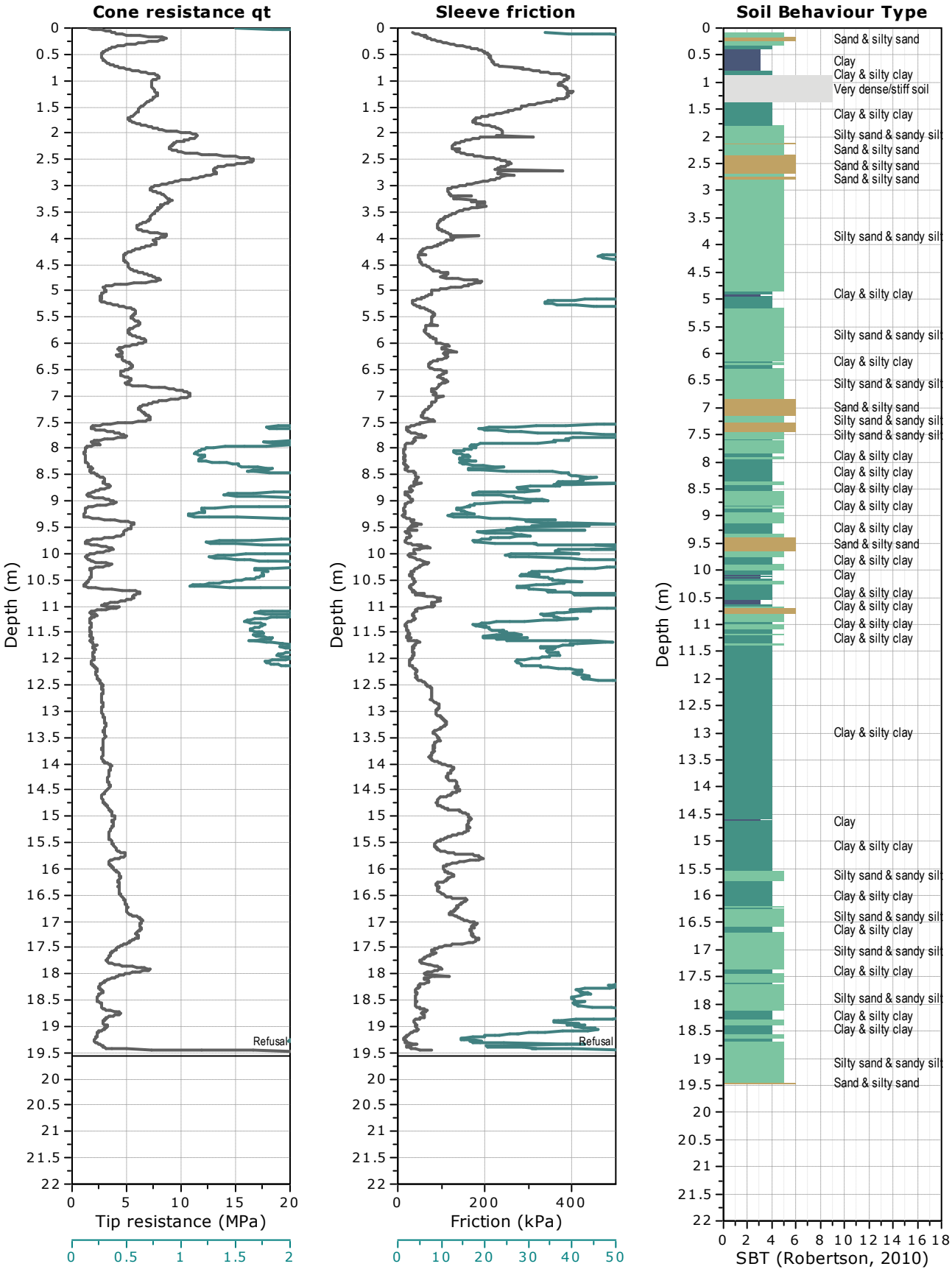
Comments:

Appendix C
Cone Penetrometer Test Results

PSM
PSM Consult

CPT: CPT A
Total depth: 19.55 m, Date: 3/04/2025
Surface Elevation: 18.30 m
Coords: X:291170.80, Y:6279145.90
Cone Type:
Cone Operator: Insitu Geotech Services

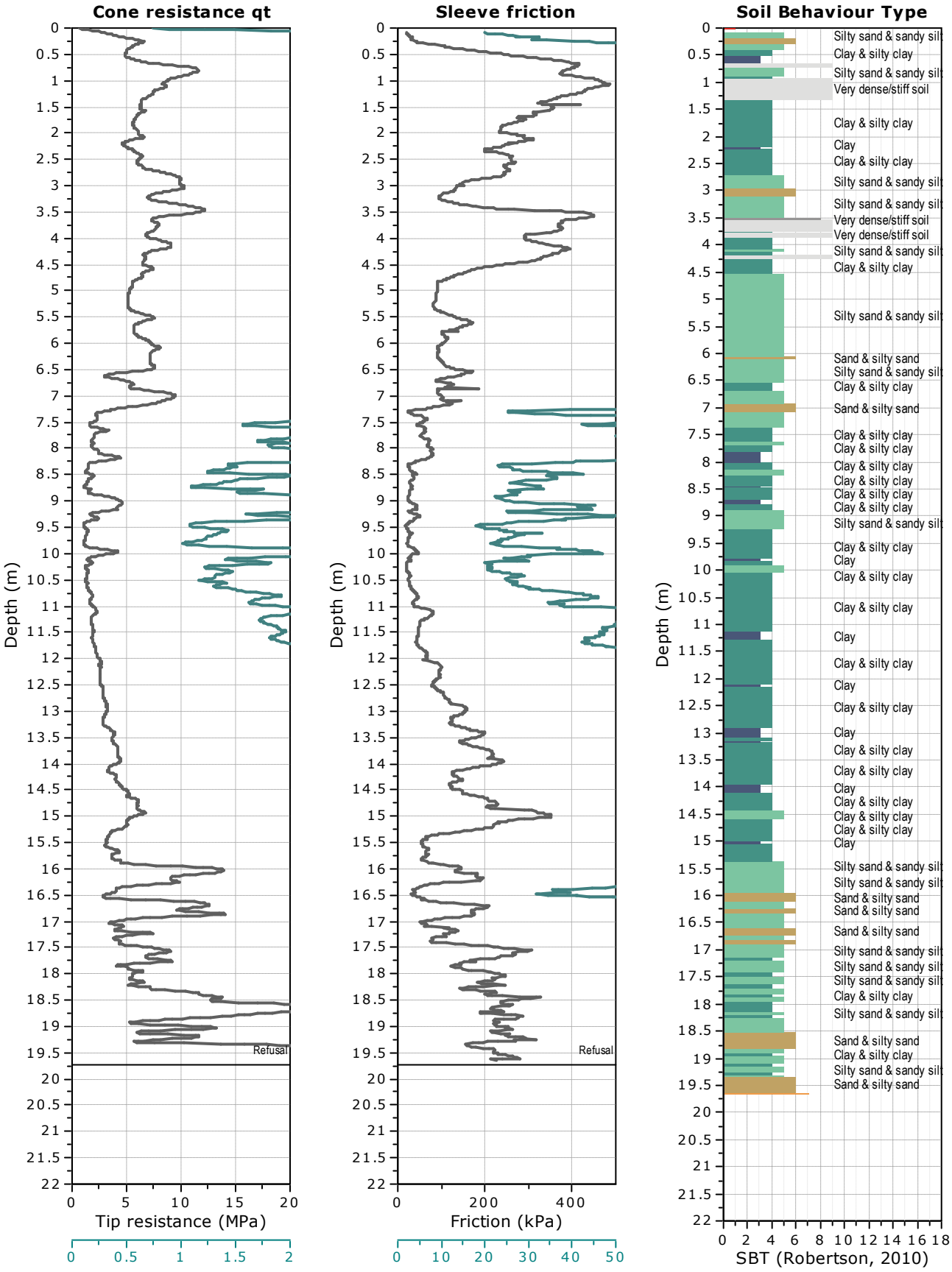
Project: Western Sydney University Richmond Agricultural Centre
Location: 2 College Street, Richmond

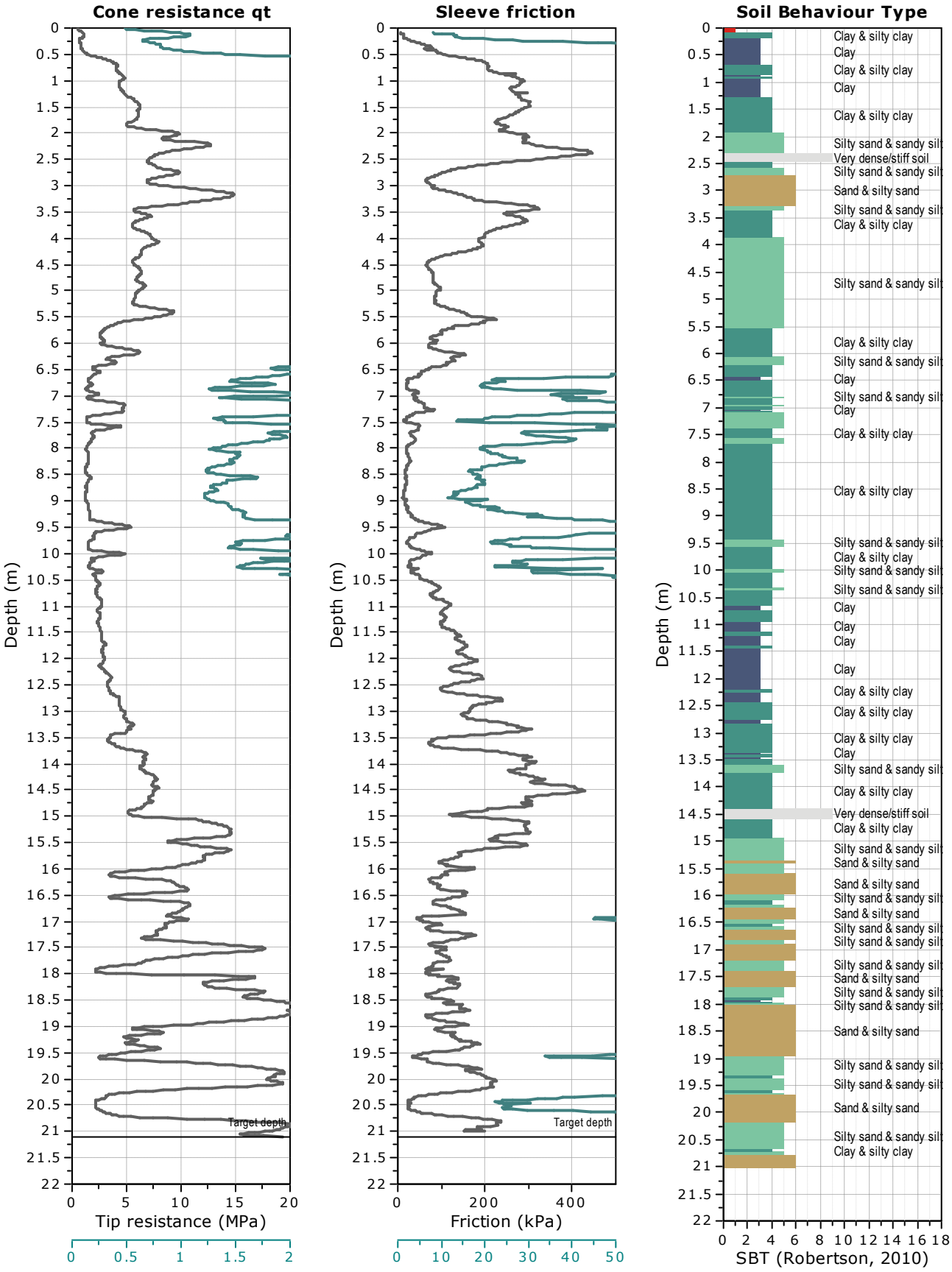


PSM
PSM Consult

CPT: CPT B
Total depth: 19.74 m, Date: 3/04/2025
Surface Elevation: 18.30 m
Coords: X:291213.60, Y:6279195.30
Cone Type:
Cone Operator: Insitu Geotech Services

Project: Western Sydney University Richmond Agricultural Centre
Location: 2 College Street, Richmond




Cone resistance qt
Depth (m)
Tip resistance (MPa)
Target depth
Sleeve friction
Friction (kPa)
Target depth
Soil Behaviour Type
SBT (Robertson, 2010)
Clay & silty clay
Clay
Silty sand & sandy silt
Very dense/stiff soil
Sand & silty sand

Appendix D
California Bearing Ratio (CBR)Test Results

115 Wicks Road
Macquarie Park, NSW 2113
Telephone: 02 9888 5000
Facsimile: 02 9888 5001

SOIL TEST SERVICES
ABN 43 002 145 173

FOUR DAY SOAKED CALIFORNIA BEARING RATIO TEST REPORT

Client: PSM Holdings Aust. Pty Limited
PSM Job No.: PSM5353 - Richmond

Report No.: L5106 - 1A
Report Date: 10/04/2025
Page 1 of 1

SAMPLE NUMBER	CBR A	CBR B	CBR C	CBR D	CBR E
DEPTH (m)	0.05 - 0.45	0.32 - 0.65	0.20 - 0.50	0.70 - 0.90	0.50 - 1.00
Surcharge (kg)	4.5	4.5	4.5	4.5	4.5
Maximum Dry Density (t/m^3)	2.04 STD	1.82 STD	1.70 STD	1.69 STD	1.84 STD
Optimum Moisture Content (%)	9.0	14.9	19.4	18.4	14.3
Moulded Dry Density (t/m^3)	2.01	1.78	1.67	1.64	1.81
Sample Density Ratio (%)	98	98	98	98	98
Sample Moisture Ratio (%)	92	101	100	101	96
Moisture Contents					
Insitu (%)	8.7	11.9	19.5	15.2	14.3
Moulded (%)	8.3	15.0	19.4	18.6	13.7
After soaking and					
After Test, Top 30mm(%)	11.3	20.0	25.3	28.8	25.2
Remaining Depth (%)	10.1	17.3	20.0	21.6	15.6
Material Retained on 19mm Sieve (%)	1*	1*	0	0	0
Swell (%)	0.0	0.0	1.0	2.0	1.5
C.B.R. value: @2.5mm penetration		6	3.5		1.5
@5.0mm penetration	18			2.0	

NOTES: Sampled and supplied by client. Samples tested as received.
- Refer to appropriate notes for soil descriptions
- Test Methods : AS 1289 6.1.1, 5.1.1 & 2.1.1.
- This report supersedes the previously issued report L5106 - 1.
- Demotes not used in test sample.
- Date of receipt of sample: 03/04/2025.

NATA Accredited Laboratory Number:1327

10/04/2025
Authorised Signature / Date
(D. Treweek)

Appendix E
Shrink Swell Test Results

115 Wicks Road
Macquarie Park, NSW 2113
PO Box 976
North Ryde, Bc 1670
Telephone: 02 9888 5000
Facsimile: 02 9888 5001

SOIL TEST SERVICES

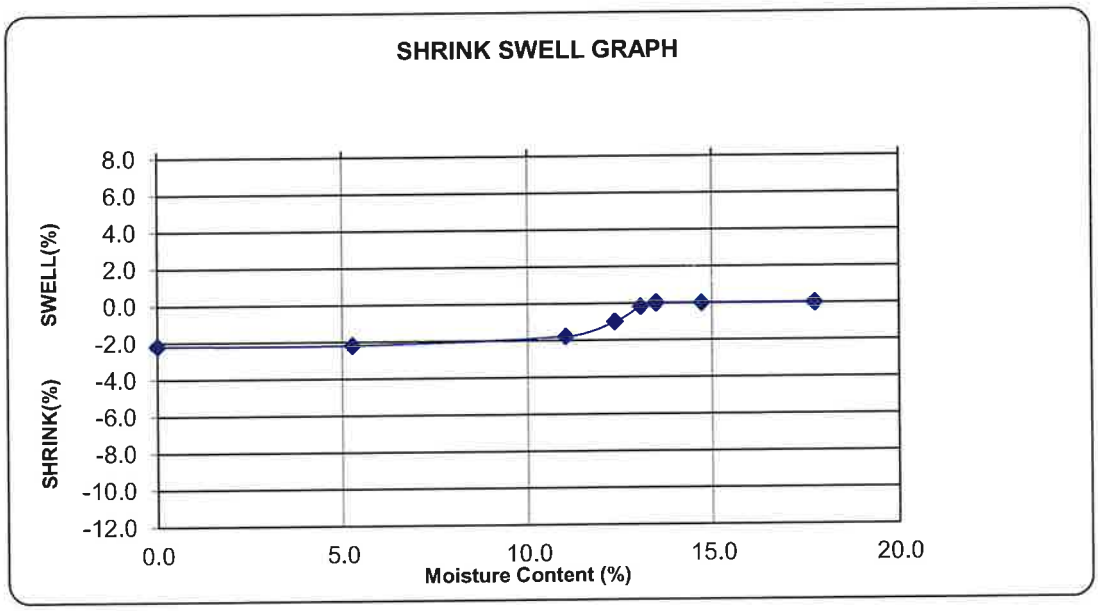
ABN 43 002 145 173

SHRINK - SWELL TEST REPORT
TEST METHOD: AS1289 7.1.1

Client: PSM Holdings Aust. Pty Limited
PSM Job No.: PSM5353 - Richmond

Report No.: L5106 - 2A
Report Date: 15/04/2025
Page 1 of 2

Testpit No.: TP A		Depth: 1.0m			
MOISTURE CONTENT (SWELL)		ESTIMATED UNCONFINED COMPRESSIVE STRENGTH			
BEFORE TEST	AFTER TEST	BEFORE TEST		AFTER TEST	
14.7%	17.7%	400	kPa	230,280	kPa
LOAD	SETTLEMENT UNDER LOAD BEFORE SATURATION			SWELL ON SATURATION	SHRINKAGE
25	-1.8%			0.0%	2.1%



SHRINK SWELL INDEX
1.17 %/pF

This report supersedes the previously issued report L5106 - 2.

Notes: Sampled and supplied by client. Sample tested as received.

- Suction Value used in calculation = 1.8pF
- Volume Change Coefficient (α) was assumed = 2
- Visually estimated inclusions by volume = 0-5%
- Shrinkage Cracking = Moderate
- Soil Crumbling = none
- Date of receipt of sample: 03/04/2025.

NATA
NATA Accredited Laboratory Number:1327

Accredited for compliance with ISO/IEC 17025 - Testing.
This document shall not be reproduced except in full without approval of the laboratory. Results relate only to the items tested or sampled.

Authorised Signature / Date (D. Treweek) 15/4/25

115 Wicks Road
Macquarie Park, NSW 2113
PO Box 976
North Ryde, Bc 1670
Telephone: 02 9888 5000
Facsimile: 02 9888 5001

SOIL TEST SERVICES

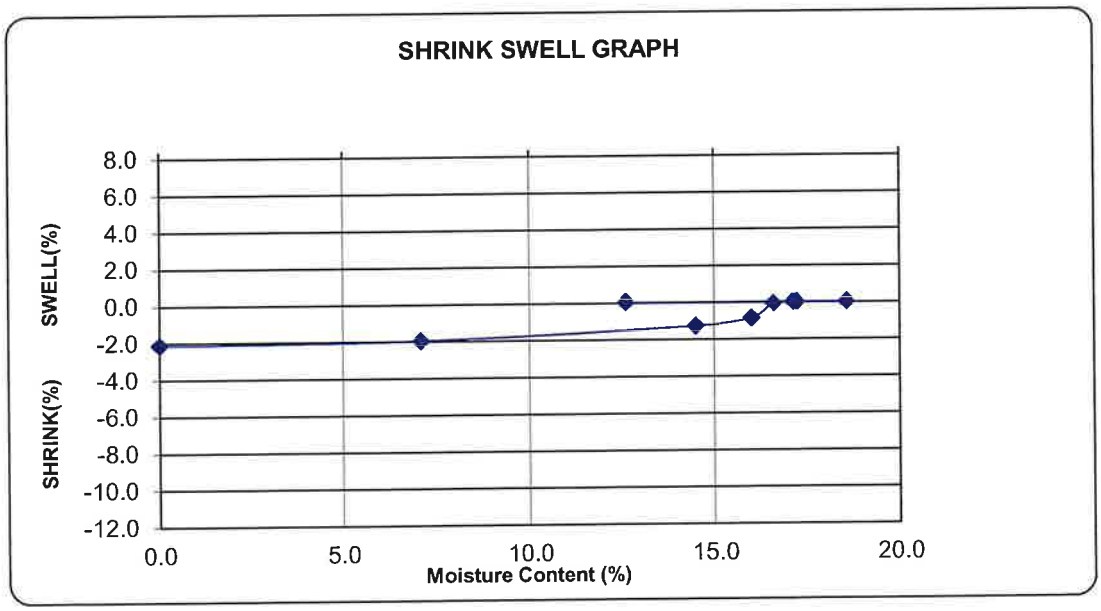
ABN 43 002 145 173

SHRINK - SWELL TEST REPORT
TEST METHOD: AS1289 7.1.1

Client: PSM Holdings Aust. Pty Limited
PSM Job No.: PSM5353 - Richmond

Report No.: L5106 - 2A
Report Date: 15/04/2025
Page 2 of 2

Testpit No.: TP E		Depth: 0.5m	
MOISTURE CONTENT (SWELL)		ESTIMATED UNCONFINED COMPRESSIVE STRENGTH	
BEFORE TEST	AFTER TEST	BEFORE TEST	AFTER TEST
12.6%	18.5%	>450 kPa	320,370 kPa
LOAD	SETTLEMENT UNDER LOAD BEFORE SATURATION	SWELL ON SATURATION	SHRINKAGE
25	2.0%	0.0%	2.1%



SHRINK SWELL INDEX
1.15 %/pF

This report supersedes the previously issued report L5106 - 2.

Notes: Sampled and supplied by client. Sample tested as received.

- Suction Value used in calculation = 1.8pF
- Volume Change Coefficient (α) was assumed = 2
- Visually estimated inclusions by volume = 0-5%
- Shrinkage Cracking = Moderate
- Soil Crumbling = none
- Date of receipt of sample: 03/04/2025.

NATA

NATA Accredited Laboratory Number:1327

Authorised Signature / Date
(D. Treweek)
15/4/25

Appendix F
Aggressivity and Salinity Laboratory Certificates

CERTIFICATE OF ANALYSIS

Work Order	: **ES2509772**	Page	: 1 of 3
Amendment	: **1**		
Client	: **PSM Holdings Aust Pty Limited**	Laboratory	: Environmental Division Sydney
Contact	: Hugo Thang	Contact	: Customer Services ES
Address	: G3, 56 Delhi Road North Ryde 2113	Address	: 277-289 Woodpark Road Smithfield NSW Australia 2164
Telephone	: ----	Telephone	: +61-2-8784 8555
Project	: PSM5353	Date Samples Received	: 03-Apr-2025 16:35
Order number	: ----	Date Analysis Commenced	: 08-Apr-2025
C-O-C number	: ----	Issue Date	: 15-Apr-2025 10:57
Sampler	: TSZ IN WONG		
Site	: ----		
Quote number	: EN/333		
No. of samples received	: 5		
No. of samples analysed	: 5		

Accreditation No. 825
Accredited for compliance with
ISO/IEC 17025 - Testing

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted, unless the sampling was conducted by ALS. This document shall not be reproduced, except in full.

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results

Additional information pertinent to this report will be found in the following separate attachments: Quality Control Report, QA/QC Compliance Assessment to assist with Quality Review and Sample Receipt Notification.

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is carried out in compliance with procedures specified in 21 CFR Part 11.

Signatories	*Position*	*Accreditation Category*
Ankit Joshi	Senior Chemist - Inorganics	Sydney Inorganics, Smithfield, NSW
Dian Dao	Senior Chemist - Inorganics	Sydney Inorganics, Smithfield, NSW

General Comments

The analytical procedures used by ALS have been developed from established internationally recognised procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are fully validated and are often at the client request.

Where moisture determination has been performed, results are reported on a dry weight basis.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis.

Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

When sampling time information is not provided by the client, sampling dates are shown without a time component. In these instances, the time component has been assumed by the laboratory for processing purposes.

Where a result is required to meet compliance limits the associated uncertainty must be considered. Refer to the ALS Contract for details.

Key : CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.
LOR = Limit of reporting
^ = This result is computed from individual analyte detections at or above the level of reporting
ø = ALS is not NATA accredited for these tests.
~ = Indicates an estimated value.

- ALS is not NATA accredited for the analysis of Exchangeable Cations on Alkaline Soils when performed under ALS Method ED006.
- Amendment (15/04/2025): This report has been amended as a result of a request to change sample identification numbers (IDs) as requested by client on 14/04/2025 for all samples. All analysis results are as per the previous report.
- ED007 and ED008: When Exchangeable Al is reported from these methods, it should be noted that Rayment & Lyons (2011) suggests Exchange Acidity by 1M KCl - Method 15G1 (ED005) is a more suitable method for the determination of exchange acidity (H+ + Al3+).
- ED045G: The presence of Thiocyanate, Thiosulfate and Sulfite can positively contribute to the chloride result, thereby may bias results higher than expected. Results should be scrutinised accordingly.

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Sample ID	TP I @ 0.5m	TP F @ 1.0m	TP A @ 1.0m	TP C @ 1.5m	TP B @ 0.5m
			Sampling date / time	02-Apr-2025 00:00	02-Apr-2025 00:00	02-Apr-2025 00:00	02-Apr-2025 00:00	02-Apr-2025 00:00
Compound	CAS Number	LOR	Unit	ES2509772-001	ES2509772-002	ES2509772-003	ES2509772-004	ES2509772-005
				Result	Result	Result	Result	Result
EA002: pH 1:5 (Soils)								
pH Value	----	0.1	pH Unit	5.8	7.2	5.5	8.6	7.2
EA010: Conductivity (1:5)								
Electrical Conductivity @ 25°C	----	1	µS/cm	27	153	170	497	65
EA055: Moisture Content (Dried @ 105-110°C)								
Moisture Content	----	1.0	%	4.6	10.7	15.1	9.4	8.5
EA080: Resistivity								
Resistivity at 25°C	----	1	ohm cm	37000	6540	5880	2010	15400
ED006: Exchangeable Cations on Alkaline Soils								
ø Exchangeable Calcium	----	0.2	meq/100g	----	----	----	0.5	----
ø Exchangeable Magnesium	----	0.2	meq/100g	----	----	----	3.8	----
ø Exchangeable Potassium	----	0.2	meq/100g	----	----	----	<0.2	----
ø Exchangeable Sodium	----	0.2	meq/100g	----	----	----	3.9	----
ø Cation Exchange Capacity	----	0.2	meq/100g	----	----	----	8.2	----
ø Exchangeable Sodium Percent	----	0.2	%	----	----	----	47.6	----
ED007: Exchangeable Cations								
Exchangeable Calcium	----	0.1	meq/100g	2.0	1.0	4.6	----	3.1
Exchangeable Magnesium	----	0.1	meq/100g	0.3	7.7	3.8	----	5.6
Exchangeable Potassium	----	0.1	meq/100g	0.2	<0.1	<0.1	----	0.8
Exchangeable Sodium	----	0.1	meq/100g	<0.1	2.3	0.9	----	1.0
Cation Exchange Capacity	----	0.1	meq/100g	2.6	11.0	9.4	----	10.5
Exchangeable Sodium Percent	----	0.1	%	1.3	20.9	10.1	----	9.7
ED040S : Soluble Sulfate by ICPAES								
Sulfate as SO4 2-	14808-79-8	10	mg/kg	10	80	160	70	40
ED045G: Chloride by Discrete Analyser								
Chloride	16887-00-6	10	mg/kg	<10	100	110	710	190

Appendix G
Bulk Earthworks Specification (PSM5353-003S REV1)

Western Sydney University - Richmond Agricultural Centre

Bulk Earthworks Specification - Filling, Cutting and Testing

PSM5353-003S REV 1 16 April 2025

Richard Crookes Constructions

Table of Contents

List of Appendices

1. Scope

This specification details the requirements for the bulk earthworks to be undertaken at 2 College Street, Richmond, herein referred to as the **Site**. The area where this specification is applicable is shown in Appendix A.

This includes areas where material is filled to bulk earthworks level (BEL) within the site.

Fill placed in accordance with this specification is denoted as Engineered Fill.

This specification does not address any environmental, contamination or erosion issues or additional regulatory/approval requirements (e.g. Council Consent Conditions) associated with the earthworks.

There is a HOLD POINT on placing fill in Section 2.4 of this specification.

2. Filling Works

The following tasks shall be undertaken as part of the Site Preparation Works:

1. To prepare the site for the earthworks:
    a. Clearing of the area including removal and disposal of all trees, stumps, roots, bush, other organic material, all vegetation both living and dead, all minor man-made structures (e.g. fences) and all rubbish.
    b. Grubbing operations shall be carried out to a minimum depth of 0.3 m below the surface, where grubbing is required.
    c. Decommissioning of the services from any pre-existing infrastructure. This is to include backfilling any voids such that they do not collapse or undergo excessive settlement under the weight of the filling and building loads. Backfilling is to be undertaken with one of the following materials:
        i. Cement stabilised sand (min. 3% cement) placed in accordance with the supplier requirements or
        ii. Mass concrete or grout as approved by PSM
        iii. Engineered fill placed in accordance with Clauses 2.5 and 2.6 of the Specification.

Where any excavation is required to complete the above tasks, the surface exposed at completion of the excavation shall be treated in accordance with the Subgrade Preparation requirements in Clause 2.1.

2.1 Subgrade Preparation

The condition of the subgrade should be assessed immediately prior to the commencement of filling.

All Engineered Fill is to be placed on one of the following materials:

1. Bedrock.
2. Natural insitu material of at least stiff consistency.
3. Engineered compacted fill placed in accordance with this or other approved specifications for which the Geotechnical Inspection and Testing Authority (GITA) has a Level 1 certificate certifying compliance with that approved specification AND of at least stiff consistency.
4. Existing fill and other materials as approved by PSM.

Proof rolling shall only be undertaken under the direction of PSM. PSM may also direct a bridging layer of Engineered Fill be placed and compacted to a Dry or Hilf Density Ratio (Standard Compaction) of between 98% and 102%. Any such layer shall be a Lot under Clause 5.3. The GITA should satisfy itself that the subgrade has not been desiccated, affected by rain, or disturbed. If the GITA cannot so satisfy itself, then the subgrade should be moisture conditioned and compacted to be in accordance with Clauses 2.5 and 2.6 of this specification.

Engineered Fill shall be placed only on subgrade approved by the GITA as being in accordance with this specification.

2.2 Base Geometry and Permanent Batters

The slope of any buried batter shall be less than 2H:1V unless otherwise directed by PSM.

The contractor shall remove or flatten any geometrical obstructions (e.g., protrusions or holes) such that subsequent Engineered Fill can be placed to achieve the requirements of this specification.

Engineered Fill shall be placed only on areas where the base geometry has been approved by the GITA.

Permanent batters in fill shall be built by overfilling then cut back to the final slopes as shown in the bulk earthworks drawings, e.g., 2H:1V, or other method as approved by PSM.

2.3 Material

2.3.1 Imported Fill

Imported Engineered Fill is to conform to one of the following definitions:

1. "Virgin excavated natural material" (**VENM**) as defined by the Protection of the Environment Operations Act 1997 No 156, Schedule 1, on Page 209:

   "Virgin excavated natural material (e.g., clay, gravel, sand, soil and rock) that is not mixed with any other waste and that:

   a. *has been excavated from areas that are not contaminated, as a result of industrial, commercial, mining, or agricultural activities, with manufactured chemicals and that does not contain sulphide ores or soils, or.*
   b. *consists of excavated natural materials that meet such criteria as may be approved by the EPA".*

2. "Excavated natural material" (**ENM**) as defined under Clause 93 of the Protection of the Environment Operations (Waste) Regulation 2014:

   "Excavated natural material is naturally occurring rock and soil (including but not limited to materials such as sandstone, shale, clay and soil) that has:

   a. *been excavated from the ground, and.*
   b. *contains at least 98% (by weight) natural material, and.*
   c. *does not meet the definition of Virgin Excavated Natural Material in the Act.*

   Excavated Natural Material does not include material that has been located in a hotspot; that has been processed; or that contains asbestos, Acid Sulphate Soils (ASS), Potential Acid Sulphate soils (PASS) or sulfidic ores."

2.3.2 Site Won Material

Site won material shall comprise material won from excavations on site including natural, existing fill and bedrock. Material needs to satisfy Clause 2.3.3.

2.3.3 All Fill

The Engineered Fill shall be approved by the GITA as suitable for use in a structural fill.

Engineered Fill shall not comprise unsuitable material that includes:

- Organic soils, such as many topsoils, severely root-affected subsoils and peat
- Silts, or materials that have the deleterious engineering properties of silt
- Other materials with properties that are unsuitable for the forming of structural fill; unless it is approved by PSM.

The GITA shall assess that the proportion of deleterious material in each Lot is not greater than 0.5% by weight. Deleterious material is defined by Table 3015.6 of the RMS QA Specification 3051 (Edition 7 June 2020) as:

"Rubber, Plastic, Bitumen, Paper, Cloth, Paint, Wood and Other Vegetable Matter".

If the GITA is not able to visually assess the above criterion, the GITA shall arrange appropriate testing.

All Engineered Fill particles shall be able to be incorporated within a single layer. Further, less than 30% of particles shall be retained on the 37.5 mm sieve.

Engineered Fill shall be able to be tested in accordance with the Standard Compaction method (AS1289.5.4.1) or Hilf test method (AS1289.5.7.1). These methods require less than 20% retained on the 37.5 mm sieve. Where between 20% and 30% of particles are retained on the 37.5 mm sieve the above test methods shall still be adopted and test reports annotated appropriately.

These requirements should be met by the material after placement and compaction.

Only material approved by the GITA shall be placed as Engineered Fill.

2.4 Fill Zonation and Placement

HOLD POINT	
Process Held	Placement of Fill
Submission detail	The Contractor / GITA submit to PSM a Weekly Certificate as defined in Clause 6.2.1 of this specification for the earthworks completed to the previous Saturday no later than 5 pm of the subsequent Wednesday.
Release of Hold Point	PSM to confirm receipt of Weekly Certificate and recommend release of Hold Point if initial assessment of the Weekly Certificate indicates it complies with requirements of this specification. The contract superintendent should then release the Hold Point if it considers appropriate.

Engineered Fill shall be placed in accordance with the following requirements:

1. In near horizontal, laterally extensive layers of uniform material and thickness, deposited systematically across the work area as determined by the GITA.
2. The compacted thickness of each layer shall be equal to or less than 300 mm.

Engineered Fill shall only be placed on subgrade in accordance with this specification and approved by the GITA.

2.5 Compaction

Engineered Fill shall be placed and compacted to a Dry or Hilf Density Ratios (Standard Compaction) of between 98% and 102%.

The insitu density shall be measured over the full depth of each layer placed.

2.6 Moisture Control

The placement moisture variation or Hilf moisture variation shall be controlled to be between 2% dry of optimum and 2% wet of optimum.

Placement moisture content of the Engineered Fill shall be measured.

3. Cutting

3.1 Subgrade Condition

The subgrade is to comprise one of the following materials:

1. Bedrock.
2. Natural insitu material of at least stiff consistency.
3. Existing fill and other materials as approved by PSM.

Proof rolling shall only be undertaken under the direction of PSM.

The GITA should satisfy itself that the subgrade has not been desiccated, affected by rain or disturbed. If the GITA cannot so satisfy itself, then the subgrade should be excavated and filled to the BEL in accordance with this specification.

4. Survey

4.1 Filling Areas

The survey requirements are as follows:

1. Any approved subgrade shall be surveyed prior to first filling such that subgrade levels are established to within ± 0.1 m. The area subject to approval shall be assessed and shown on a plan drawing to an accuracy of at least +/- 5 m in plan.
2. The Lot boundaries shall be assessed and shown on a plan drawing to an accuracy of at least +/- 5 m in plan.
3. The location of the field density tests shall be assessed and shown on the Lot boundary plan drawing to an accuracy of at least +/-5 m in plan.
4. The elevation of the field density tests shall be surveyed to an accuracy of +/-0.05 m.

The plan drawing shall show at the boundaries of the site and other identifiable site features, so as to allow the location of the lots and the test to be recoverable.

4.2 Cutting Areas

Any approved subgrade for cut areas shall be surveyed such that subgrade levels are established to within ± 0.1 m.

5. Inspection and Testing

5.1 Role of the GITA

A NATA accredited Geotechnical Inspection and Testing Authority (GITA) shall be contracted to document and certify that the works undertaken by the contractor has been completed in accordance with the relevant design and specifications.

5.2 Level 1 Control

The GITA shall adopt Level 1 responsibility as described in Section 8.2 of AS 3798-2007 "Guidelines on earthworks for commercial and residential developments":

"The primary objective of Level 1 Inspection and Testing is for the geotechnical inspection and testing authority (GITA) to be able to express an opinion on the compliance of the work. The GITA is responsible for ensuring that the inspection and testing are sufficient for this purpose.

The geotechnical inspection and testing authority need to have competent personnel on site at all times while earthwork operations are undertaken. Such operations include:

- Completion of removal of topsoil
- Placing of imported or cut material
- Compaction and adding/removal of moisture
- Trenching and backfilling
- Test rolling
- Testing.

The superintendent should agree a suitable inspection and testing plan prior to commencement of the works.

On completion of the earthworks, the GITA will usually be required to provide a report setting out the inspections, sampling and testing it has carried out, and the locations and results thereof. Unless very unusual conditions apply,

the GITA should also be able to express an opinion that the works (as far as it has been able to determine) comply with the requirements of the specification and drawings."

For this particular contract, Level 1 responsibility includes:

1. Lot testing as per Clause 5.3 of this specification.
2. A frequency of compaction testing not less than that specified in Clause 5.4 of this specification.
3. The GITA documenting and reporting its activity in the terms required by Clause 6 of this specification.
4. The GITA undertaking adequate inspections and testing to comply with the above requirements and to be able to certify the fill in the terms required by Clause 6 of this specification.

5.3 Lot Testing

This specification requires lot testing to be undertaken.

A Lot is defined as a single layer of Engineered Fill consisting of uniform material which has undergone similar treatment (both moisture conditioning and compaction) and that represents no more than one day's work.

Lot testing comprises the following:

1. A Lot shall be identified by the Contractor or the GITA with a Lot Number and presented for testing.
2. A Lot shall be deemed to be in accordance with the specification if all the tests undertaken within the Lot are in accordance with the specification, i.e., "a none to fail basis".
3. If any one test undertaken within a Lot fails, the whole of the Lot shall be reworked and retested.

Any portion of the placed Engineered Fill must be part of a single lot and all Lots will require approval by the GITA.

5.4 Testing Frequency (Compaction Testing)

The frequency of compaction testing for each lot shall not be less than the greater of:

1. 1 test per 500 m^3 of material placed.
2. 3 tests per lot.

A laboratory moisture content test shall be undertaken for each field density test.

5.5 Proof Rolling

Proof rolling, together with minor boxing out and refilling, of the upper surface of the bulk earthworks will be undertaken as directed by PSM. Any remediation of soft spots identified during proof rolling shall be undertaken in accordance with this Specification (Cl 2.5 and 2.6).

5.6 Inspection and Testing

The GITA shall at least undertake the following tasks:

Cut areas

1. Identify the subgrade as one of the three (3) subgrade types listed in Clause 3.1 of this specification and assess that the subgrade condition of cut areas is in accordance with the subgrade condition requirements of Clause 3.1 of this specification. If the cut subgrade has been approved by PSM, the GITA will be required to reference the approval in its weekly report.
2. Should Engineered Fill be required to fill overcut areas, assess that filling has been placed in accordance with this specification.

Fill areas

3. For fill areas, identify the subgrade as one of the four (4) subgrade types listed in Clause 2.1of this specification and assess that the subgrade condition of any area prior to placement of fill material is in accordance with the subgrade preparation requirements of Clause 2.1 of this specification. For the following subgrade types, GITA needs to include / refer to PSM approval in its weekly report:
    a. Existing fill and other materials as approved by PSM.

4. Assess that the base geometry of any area prior to placement of fill material is in accordance with the base geometry requirements of Clause 2.2 of this specification.
5. For each Lot, identify the material as either Site Won or Imported fill as defined in Clause 2.3 of this specification and assess that the material placed is in accordance with the fill material requirements of Clause 2.3 of this Specification.
6. Assess the proportion of deleterious material is in accordance with the requirements of Clause 2.3.3 of this Specification.
7. Assess that the Engineered Fill has been placed in accordance with the requirements for fill zonation and placement of Clause 2.4 of this specification.
8. Assess that each Lot as presented for approval by the contractor is in accordance with the requirements for Lot definition of Clause 5.3 of this specification.
9. Ensure that the survey requirements in Clause 4 of this specification have been completed.
10. Estimate the approximate volume of Engineered Fill placed in each Lot presented for approval.
11. Conduct Lot testing in accordance with the construction control testing requirements of Clauses 5.3 and 5.4 of this specification.
12. Assess that the compaction of each Lot is in accordance with the requirements of Clause 2.5 of this specification. The GITA shall select a depth of insitu density tests that allows the density of the full layer to be assessed.
13. Assess that the moisture variation of each Lot is in accordance with the requirements for moisture control in Clause 2.6 of this specification.
14. Conduct material property testing in accordance with the material testing requirements in this specification.

6. Reporting and Certification

6.1 Reporting

The GITA shall produce at least the following reports:

1. *VENM / ENM Validation Reports*. Such a report shall transmit the VENM or ENM validation certificates for the fill imported to site.
2. *Subgrade Approval Reports* (a sample is attached). Such a report shall:
   - Document assessments undertaken for tasks 1 and task 3 of Clause 5.6 including reporting the subgrade type
   - Document the subgrade survey that has been undertaken
   - Approve or reject the subgrade condition and base geometry for filling, based on tasks 3 and 4 of Clause 5.6
   - Approve or reject the subgrade condition for cut areas based on task 1.
3. *Lot Approval Reports* (a sample is attached). Such a report shall:
   - Document assessments, testing and survey undertaken for tasks 3 to 14 of Clause 5.6
   - Report material identification undertaken for task 5 of Clause 5.6
   - Report the assessed proportion of deleterious material for task 6 of Clause 5.6
   - Report the results of testing undertaken for task 11 of Clause 5.6
   - Approve or reject lots based on tasks 12 and 13 of Clause 5.6.
4. Material Testing Reports. Such a report shall:
   - Report the results of material property testing undertaken for task 14 of Clause 5.6.

5. *Daily Reports* (a sample is attached). Such a report shall be completed daily and shall:
   - Document time spent on site by the GITA personnel
   - List subgrade assessments and approvals undertaken each day with reference to relevant Subgrade Approval Report(s)
   - List Lots presented, accepted, and approved or rejected each day, with reference to relevant Lot Approval Report(s)
   - List survey undertaken each day as for task 9 of Clause 5.6 and not already documented in the Subgrade or Lot Approval Reports
   - Document other relevant activities undertaken on site that day (site instructions, breakdowns, compaction equipment used, etc.).

6.2 Certification

6.2.1 Weekly Certificate

The GITA shall produce a Weekly Certificate for any week in which earthworks are undertaken in accordance with this specification. The Weekly Certificate will cover all works from the previous Weekly Certificate until the end of work on a Saturday.

The Weekly Certificate shall transmit the following:

- Copy or reference to the complete specification document(s)
- Subgrade Approval Reports
- Lot Approval Reports
- Material property testing reports
- Daily Reports
- Survey of subgrade geometry prior to filling or in cut areas
- Plan survey drawing showing lot boundaries and location of density tests
- Survey documenting filling undertaken to date and showing location of testing
- Provide an Excel spreadsheet presenting the results of the week's acceptance testing completed by the GITA.

And certify that:

"All the earthworks undertaken and the subgrade condition in the cut areas [in the stated period] are documented in the above reports and have been undertaken in accordance with the Specification (Ref. PSM5353-003S Rev 1 dated 16 April 2025)."

6.2.2 Interim or Final Filling Certificate

At the completion of the bulk earthworks, or as requested by the Client, the GITA shall provide an Interim or Final Filling Certificate which shall:

1. Transmit a reference list of the Weekly Certificates.
2. Provide an Excel spreadsheet presenting the results of all the acceptance testing completed by the GITA.
3. Certify that "All the earthworks undertaken and the subgrade condition in the cut areas [in the stated period] are documented in the above reports and have been undertaken in accordance with the Specification (Ref. PSM5353-003S Rev 1 dated 16 April 2025)."

Brisbane

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Geelong VIC 3220
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Perth

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West Perth WA 6005
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Appendix A
Locality Plan

290750 291000 291250 291500 291750 292000

6279500

6279250

6279000

6278750

Legend

Site Extent

Notes:
1. Aerial image sourced from Nearmaps.com dated 25 March 2024.

Scale 1:4,000

N

40 0 40 80 120 160 m

GDA2020 / MGA zone 56

P S M

Created By:	Revision:
PSM	A
Date: 16 Apr 2025	Paper Size: A3

Richard Crookes Constructions
Western Sydney University
Richmond Agricultural Centre

Locality Plan

PSM5353-003S | Appendix A

M:\PSM5353\Eng\QGIS\02. Workspace\01_MXDs\PSM5353 - Master.qgz Layout: PSM5353-003S Appendix A

Appendix B
Subgrade Approval Report

GEOTECHNICAL INSPECTION AND TESTING AUTHORITY

NATA accreditation number

SUBGRADE APPROVAL REPORT

Client:	Contractor:
Job number:	Report number:
Project:	Technician:

Subgrade areas assessed:

Area ID	Date	Approximate extent	Subgrade description	Geometry summary	Specification reference	Compliance (Pass/Fail)	Survey reference	Approved (Yes/No)

COMMENTS:

Signed: Date:

Appendix C
Lot Approval Report

GEOTECHNICAL INSPECTION AND TESTING AUTHORITY

NATA accreditation number

LOT APPROVAL REPORT

Client:	Report number:
Job number:	Report date:
Project:	Technician:
Contractor:	Test methods:

LOT ID:			**Sheet**	**of**
Retest (Yes/No)			Original test report number:	
Specification reference				
Location:				
Lot boundary survey reference/location:				
Materials description:	*(MATERIAL TYPE, colour, minor components, maximum particle size)*			
Material identification:	*(Identify the material as defined in Clause 2.3.1, Clause 2.3.2 or Clause 2.3.3 of the Specification)*			
Deleterious material assessment:	*(Report proportion of deleterious material)*			
Layer thickness:				
Accepted as Lot: (Yes/No)			Date:	
Approximate volume (m3)			Number of tests required:	

Test ID No.				
Test soil description				
Date tested:				
Grid reference				
Surveyed test locations (RL,E,N)				
Test depth (mm)				
Max size (mm)				
% Oversize material (wet)				
Field wet density (t/m^3)				
Field moisture content (%)				
PWCD (t/m^3)				
Compactive effort				
Moisture variation (%)				
HILF density ratio (%)				
TEST (Pass/Fail)				

LOT APPROVAL	(Pass/Fail)	Signed:	Date:

Appendix D
Daily Report

GEOTECHNICAL INSPECTION AND TESTING AUTHORITY

NATA accreditation number

DAILY REPORT

Client:	Report number:
Job number:	Report date:
Project:	
Location:	Level of testing: Level 1
Contractor	Technician:
Time on site:	
Time off site:	

1. Subgrade Approval

Areas ID	Subgrade Approval Report No:	Comments

2. Lot Approval

Lot ID	Lot Approval Report No:	Comments

3. Survey

Type of survey	Survey undertaken by:	Reference

4. Instructions received on site

5. Instructions given on site

COMMENTS:

Signed: Date:

Appendix E
Certification Letter (Sample Only)

Our Ref:

Date:

Addressed to: Earthwork Contractor

Attention: Earthwork Contractor Representative

Dear

RE: SAMPLE INTERIM (OR FINAL) FILLING CERTIFICATE
INDUSTRIAL DEVELOPMENT, BULK EARTHWORKS
CERTIFICATION OF EARTHWORKS
BETWEEN [DATE OF COMMENCEMENT] AND [DATE OF COMPLETION]

In the period between [date start] and [date finish] the contractor has undertaken earthworks in areas XXX and XXX.

During the above period:

- The GITA has prepared the following Subgrade Approval Reports:

1. Subgrade Approval Report No 1
2. ……

- The GITA has prepared the following Lot Approval Reports:

1. Lot Approval Report No 1
2. ……

- The GITA has prepared the following Daily Reports:

1. Daily Report No 1……
2. ……

- The following subgrade survey was undertaken:

1. Subgrade Survey reference……
2. ……

- The following weekly survey was undertaken:

1. Weekly survey of week ending …….reference……..
2. ……

Copies of all the above documents are attached.

The GITA certifies that all the earthworks undertaken in the above stated period are documented in the above reports and have been undertaken in accordance with the Specifications (ref. PSM1541-00xS, dated XXX) a copy of which is attached, with the exception of:

1. List outstanding issues (not approved subgrade, lots, unsuitable material, failed tests etc.)
2. ……..

Signed

GITA