Pavement Investigation & Design

East Seaham Road, East Seaham

Report Ref: G0558-R-001-Rev0

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Report Register

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We confirm that the following report has been produced for Port Stephens Shire Council, based on the described methods and conditions within.

For and on behalf of Hunter Civilab,

[redacted]

Nathan Roberts
Geotechnical Engineering Manager

Executive Summary

The following report details the geotechnical investigation undertaken by Hunter Civilab (HC) under the request of Port Stephens Shire Council. The investigation was undertaken at the proposed East Seaham Road Stage 6 Reconstruction located at East Seaham Road, East Seaham NSW. The field investigation was undertaken between the 28th and 29th May 2024 and consisted of a desktop study, a visual site assessment, intrusive excavations and testing.

The desktop study indicated that the site lies within an area of no known occurrences of acid sulfate soils. The desktop study also indicated that the site does not lie within a mine subsidence district.

The site was located at East Seaham Road Stage 6 between 873 East Seaham Road & Boundary Trail (Dungog Council Boundary). The site boundary is between 873 East Seaham Road and Boundary Trail over a total length of 1,920 m. The site was bordered by sparse rural residential dwellings on open farmlands on the western side of the road. The eastern side of the road was bored by undeveloped thick dense bush land.

The subsurface profile within existing pavement areas generally consisted of a two-coat bitumen seal (BH23 only) and pavement fill consisting of sandy gravel up to 1.1m, which was underlain by natural subgrades consisting of either residual clays or rock.

Within realignment areas alluvial and residual clays, and rock natural subgrades were encountered.

Natural subgrades consisted generally of silty to sandy clays and sandy gravel between BH1, BH3, BH9, BH12 to BH17, BH19, BH21 up to 1.2m depth. Natural subgrades at BH8 and BH23 consisted of silty clay up to 1.2m. Extremely to highly weathered rock subgrades were encountered at BH2, BH6 and BH18.

A detailed pavement investigation and design was undertaken in accordance with Port Stephen Council engineering guidelines, Austroads Design Guide 2017 and APRG21 "A Guide to the Design of New Pavements for Light Traffic", 2006. Based on the test results a soaked subgrade CBR of 2.0 and 4% was adopted for clay subgrades, and CBR of 10% was adopted for rock subgrades, for design purposes.

For the reconstruction pavement designs a 5.14 x 10^5 DESA's traffic loading was adopted over a 30-year design life based on recommendations and data provided by Port Stephens Council guidelines.

The recommended reconstruction pavement design for Stage 6 is presented in the table below.

Pavement	Min Thickness (mm)		
14/7 Two Coat Bituminous Seal	(21)	(21)	(21)
Base course (DGB20 or equiv.)	150	150	150
Subbase (DGS40 or equiv.)	290	290	150
Select Fill (existing material)	200	-	-
Total thickness (mm)	640	440	300
Subgrade CBR	2.0%	4.0%	10.0%

Refer to **Section 7.3** for the detailed pavement design including material and compaction requirements.

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1 Introduction

At the request of Port Stephens Shire Council, Hunter Civilab (HC) have undertaken a limited geotechnical investigation for the purpose of proposed East Seaham Road Stage 6 Reconstruction located at East Seaham Road, East Seaham NSW.

It is understood that the proposed reconstruction is to consist in upgrades within an existing unsealed 1,920 m section of East Seaham Road, including partial 370 m realignment.

The investigation works were undertaken in accordance with standing agreement *T001-2021 - Geotechnical Consulting Services extension*, and with HC services agreement Q2633, dated the 17th of May 2024.

The sections as investigated are summarised in **Table 1.1** below.

Table 1.1 – Proposed pavement Upgrades - East Seaham Road, Seaham

Road ID / Segment	Approx. Length (m)	Chainage (m)
East Seaham Rd Stage 6 Road Reconstruction - between 873 East Seaham Road & Boundary Trail	1,920	0 – 1,920
Existing Pavement Areas	1,550	0 – 140 510 – 1,920
Potential Realignment of the road	370	140 – 510
Proposed Retaining Wall	20	815 – 845

The purpose of the investigation was to provide recommendations on the following:

- Field observations
- Borehole location plan and detailed borehole logs (to AS1726:2017 and Austroads standards)
- NATA Accredited laboratory reports
- Summary on all lab tests including explanatory notes on results
- Design Traffic based on Traffic Data supplied by Port Stephens Council
- Pavement design sheet including ESA calculation and CIRCLY output report (if used)
- General construction recommendations (realignment, widening and filling)
- Retaining wall design parameters

2 Site Description

The site was located at East Seaham Road Stage 6. The site boundary is between 873 East Seaham Road and Boundary Trail a total length of 1,920 m. The site was bordered by sparse rural residential dwellings on open farmlands on the western side of the road. The eastern side of the road was bored by undeveloped thick dense bush land.

At the time of investigation, existing development consisted of culvert crossings along East Seaham Road, gravel driveway leading to residential properties, overhead powerlines, and underground telecommunication services along existing boundary fence lines.

Existing vegetation consisted of thick growing to mature trees on both sides of the road, with sparse to thick shrubs.

Topographically the road runs through undulating hills and low-lying areas.

Rock outcrops were not visibly noted on the surface due to the overgrown, thick shrubs and dense tree growth.

Cut and fill was noted across the profile of the existing road, with cuts noted at hill sections and filling noted at low sections.

3 Preliminary Site Investigation

3.1 Geological and Soil Landscape Setting

Reference to the 1:250,000 Newcastle Geological Map indicates that the site is underlain by the Quaternary consisting of gravel, sand, silt, clay, waterloo rock, marine and freshwater deposits.

Reference to the 1:100,000 Newcasle Soil Landscape Sheet indicates that the site is underlain by the Glen William Landscape. The Glen William Landscape is characterized by —undulating low hills to gently undulating rises on Carboniferous volcanics and sediments, level plain to gently undulating rises on alluvial terrace deposits of undetermined age in the Clarencetown Hills region. Slopes 1–15%, local relief up to 50 m, elevation to 60 m. Cleared open-forest and tall open-forest. The soils is characterized by shallow to moderately deep (70–>130 cm), well to imperfectly drained Yellow Podzolic Soils (Dy3.41, Dy2.41) on footslopes, shallow (50 cm), welldrained Bleached Loams (Um2.12) on volcanics and sediments, shallow to deep (50–>250 cm), moderately well-drained Brown Podzolic Soils (Db1.11, Db2.21) and some imperfectly drained Yellow Podzolic Soils (Dy3.21, Dy2.11) on alluvial terraces.

3.2 Acid Sulfate Soils Risk Maps

Reference to the NSW Office of Environment and Heritage's online database 'ESPADE' indicates that the site lies in an area of no known occurences of acid sulfate soils.

3.3 Mine Subsidence

Reference to Subsidence Advisory NSW Mine District Maps indicates that the site does not lie within a Mine Subsidence District.

4 Fieldwork Methodology

Fieldwork was undertaken between the 28th and 29th of May 2024 and consisted of:

- underground utility service clearances using a Telstra accredited locator
- locating borehole and Dynamic Cone Penetrometer locations using a handheld GPS with +/-5m accuracy and by approximate measurements from existing site features and chainages
- the drilling of 28 x boreholes to depths of up to 1.2m
- the driving of 33 x Dynamic Cone Penetrometer (DCP) probes to depths of up to 1.5m
- recovery of 19 x bulk soil samples for laboratory testing

Laboratory testing consisted of:

- 7 x Atterberg Limits tests
- 7 x Particle Size Distribution tests
- 12 x California Bearing Ratio tests

5 Subsurface Conditions

The subsurface soil conditions encountered at the site have been summarised into the following units:

UNIT 1A – FILL (WEARING COURSE):

- Two Coat Bituminous Seal

UNIT 1B – PAVEMENT FILL:

- Silty Sandy GRAVEL, grey
- Silty Sandy GRAVEL, brown

UNIT 2 – GENERAL FILL:

- Silty Sandy GRAVEL, brown, with clay, trace cobbles / with boulders
- Sandy GRAVEL, brown, with sandstone boulders
- SAND, grey / brown
- Clayey Gravelly SAND, grey / brown
- Clayey Silty Sandy GRAVEL, brown

UNIT 3 – TOPSOIL:

- Silty CLAY, brown, with organics
- Silty Sandy CLAY, brown, with organics

UNIT 4 – RESIDUAL:

- Silty Sandy CLAY, brown / orange, stiff to very stiff
- Clayey Silty SAND, brown, medium dense to dense
- Silty Gravelly SAND, brown, dense
- Clayey Silty Gravelly SAND, brown, medium dense to dense
- Silty Sandy Gravelly CLAY, grey / brown, stiff to very stiff / very stiff to hard

- Silty Sandy CLAY, grey / brown, stiff / stiff to very stiff
- Clayey SAND, grey / brown, medium dense
- SAND, grey / brown, medium dense
- Clayey Silty Sandy GRAVEL, brown, dense
- Clayey Gravelly SAND, brown / red, dense to very dense
- Sandy Gravelly CLAY, brown, stiff to very stiff

UNIT 5 – ALLUVIAL:

- Silty CLAY, black, soft
- Silty Sandy CLAY, black / brown, with organics, very soft / firm to stiff

UNIT 6 – ROCK:

- Extremely Weathered Gravelly SANDSTONE, pale brown / pale orange, inferred very low strength
- Extremely Weathered SANDSTONE, brown, inferred very low strength
- Highly Weathered SANDSTONE, brown / orange, inferred low strength

A summary of the soil unit depths encountered in each borehole is presented below in **Table 5.1**.

Table 5.1 – Summary of the soil unit depths encountered

Borehole	Chainage	Depth (m)	Depth (m)						
			UNIT 1A	UNIT 1B	UNIT 2	UNIT 3	UNIT 4	UNIT 5	UNIT 6
Exiting Pavement Areas (Ch 0 – 140 ; Ch 510 – 1,920)									
BH1	115	1.2	-	0.0 – 0.3	0.3 – 0.8	-	0.8 – 1.2	-	-
BH2	170	0.6	-	0.0 – 0.4	-	-	-	-	0.4 – 0.6
BH3	205	1.2	-	0.0 – 0.4	-	-	0.4 – 1.2	-	-
BH4	385	0.8	-	0.0 – 0.6	0.6 – 0.8	-	-	-	-
BH5	480	1.2	-	0.0 – 0.9	0.9 – 1.2	-	-	-	-
BH6	570	0.4	-	0.0 – 0.3	-	-	-	-	0.3 – 0.4
BH7	660	1.0	-	0.0 – 0.3	0.3 – 1.0	-	-	-	-
BH8	760	1.3	-	0.0 – 1.1	1.1 – 1.2	-	-	1.2 – 1.3	-
BH9	855	1.1	-	0.0 – 0.3	-	-	0.3 – 1.1	-	-
BH10	940	1.2	-	0.0 – 0.5	0.5 – 1.2	-	-	-	-
BH11	1005	1.0	-	0.0 – 0.3	0.3 – 1.0	-	-	-	-

BH12	1110	1.2	-	0.0 – 0.6	0.6 – 1.0	-	1.0 – 1.2	-	-
BH13	1205	1.2	-	0.0 – 0.5	-	-	0.5 – 1.2	-	-
BH14	1290	1.2	-	0.0 – 1.1	-	-	1.1 – 1.2	-	-
BH15	1380	1.2	-	0.0 – 0.2	-	-	0.2 – 1.2	-	-
BH16	1475	1.0	-	0.0 – 0.6	-	-	0.6 – 1.0	-	-
BH17	1570	1.2	-	0.0 – 0.3	-	-	0.3 – 1.2	-	-
BH18	1665	0.3	-	0.0 – 0.2	-	-	-	-	0.2 – 0.3
BH19	1755	1.0	-	0.0 – 0.3	-	-	0.3 – 1.0	-	-
BH20	1860	1.0	-	0.0 – 0.3	0.3 – 1.0	-	-	-	-
BH21	1960	1.2	-	0.0 – 0.3	-	-	0.3 – 1.2	-	-
BH22	2040	1.2	-	0.0 – 0.3	0.3 – 1.2	-	-	-	-
BH23	2070	1.2	0.0 – 0.02	0.02 – 0.4	-	-	-	0.4 – 1.2	-
Realignment (Ch 140 – 510)									
BH-N1	205	0.5	-	-	-	0.0 – 0.05	0.05 – 0.4	-	0.4 – 0.5
BH-N2	295	1.2	-	-	-	0.0 – 0.1	0.1 – 1.2	-	-
BH-N3	380	1.2	-	-	-	0.0 – 0.1		0.1 – 1.2	-
*DCP-N4	250	0.5	-	-	-	0.0 – 0.1	0.1 – 0.5	-	-
*DCP-N5	320	1.2	-	-	-	0.0- 0.1	0.1 – 1.2	-	-
*DCP-N6	405	1.2	-	-	0.1 – 0.7	0.0 – 0.1	-	0.7 – 1.2	-
Retaining Wall (Ch 815 – 845)									
BH-R1	830	0.6	-	0.0 – 0.3	0.3 – 0.5	-	0.5 – 0.6	-	-
BH-R2	840	1.1	-	0.0 – 0.3	-	-	0.3 – 1.0	-	1.0 – 1.1
*DCP-R3	830	1.3	-	-	-	0.0 – 0.1	0.1 – 1.3	-	-
*DCP -R4	840	0.7	-	-	-	0.0 – 0.1	0.1 – 0.7	-	-

*Soil units inferred from Dynamic Cone Penetrometer

Groundwater was encountered at the site only in borehole N3 at 1.0m from surface. It is noted that borehole N3 was located adjacent to existing creek line.

Surface water was encountered at the site within draining line / creek bed.

Refer to **Annex A** for the borehole location plan and **Annex B** for detailed borehole logs.

6 Laboratory Test Results

A total of 19x bulk selected representative soil samples were recovered from the boreholes. The samples were transported to Hunter Civilab's NATA accredited soil testing laboratory for analysis.

The laboratory test results are summarised below in **Table 6.1** to **Table 6.3**.

Table 6.1 – California Bearing Ratio test results

Borehole	Depth (m)	FMC (%)	OMC (%)	MDD (t/m^3)	CBR (%)
BH1	0.0 – 0.3	5.9	8	2.11	60
BH1	0.8 – 1.0	7.9	12.5	1.9	8
BH7	0.6 – 0.8	4.8	8.5	2.12	30
BH9	0.4 – 0.5	9.6	12.5	1.9	6
BH12	0.0 – 0.2	4.8	8.5	2.14	35
BH12	0.5 – 0.6	8.1	12.5	1.93	5
BH15	0.3 – 0.5	19.8	18.0	1.74	2.0
BH19	0.3 – 0.5	8.1	13.5	1.87	7
BH21	0.0 – 0.2	-	8.0	2.16	110
BH21	0.3 – 0.5	20.7	18.5	1.69	2.5
BH N1	0.1 – 0.3	21.8	21.0	1.68	2.5
BH N3	0.3 – 0.4	24.9	15.0	1.77	6

Table 6.2 – Particle Size Distribution test results

Percentage Passing (%)	Location						
	BH1 0.0 – 0.3	BH6 0.0 – 0.2	BH9 0.0 – 0.2	BH12 0.0 – 0.2	BH15 0.0 – 0.2	BH18 0.0 – 0.2	BH21 0.0 – 0.2
53mm	100	100	100	100	100	100	100
37.5mm	100	100	100	100	100	100	100
26.5mm	100	100	100	98	100	100	100
19mm	97	98	99	97	99	99	97
13.2mm	90	93	93	92	94	93	90
9.5mm	82	86	85	87	88	85	81
6.7mm	74	78	76	79	81	78	73
4.75mm	67	72	69	72	75	71	67
2.36mm	55	60	59	60	65	60	56
0.425mm	30	34	37	34	42	35	31
0.075mm	12	14	21	15	22	15	13

Table 6.3 – Atterberg Limit test results

Borehole	Depth (m)	Soil Description	Plasticity Index (%)	Linear Shrinkage (%)
BH1	0.0 – 0.3	Sandy GRAVEL	Non-Plastic	-
BH6	0.0 – 0.2	Sandy GRAVEL	Non-Plastic	-
BH9	0.0 – 0.2	Sandy GRAVEL	Non-Plastic	-
BH12	0.0 – 0.2	Sandy GRAVEL with Silt	1	2.5
BH15	0.0 – 0.2	Sandy GRAVEL with Silt	2	2.5
BH18	0.0 – 0.2	Sandy GRAVEL with Silt	1	2.5
BH21	0.0 – 0.2	Sandy GRAVEL	Non-Plastic	-

Laboratory test results from the soil sample can be found in **Annex C.**

7 Existing Granular Pavement Material Assessment

7.1 Assessing Against Material Specifications

An assessment of the quality of the existing granular material has been undertaken based on the results of the laboratory testing in **Section 6.** The quality of the existing material has been assessed against the following material specifications for lightly loaded pavements:

- AGPT04A-08 – Austroads Guide to Pavement Technology Part 4A – Granular Base and Subbase Materials, 2008;
- ARRB SR41 – Australian Road Research Board Special Report No. 41, 1989.

The results of the laboratory testing as represented in **Table 7.1** below (example for BH1) indicated that the granular material recovered from boreholes BH1, BH6, BH9, BH12, BH15, BH18 and BH21 in their current state indicated a material that is unsuitable for both base and subbase material as per AGPT and ARRB The material is suitable as a select fill in the widening areas.

Table 7.1 – Summary of Results - material specifications conformance of recovered granular material (example for BH1)

CBR	AGPT04A08 -Part 4A 20mm Base (Class 1)	AGPT04A08 - 20mm Rock Base (Class 2)	AGPT04A08 -Part 4A 20mm Subbase (Class 3)	AGPT04A08 -Part 4A 20mm Subbase (Class 3)	AGPT04A08- Part 4A 20mm Subbase (Class 4)	AGPT04A08- Part 4A 20mm Subbase (Class 4)	RMS 3051 Class 1 DGB (Category A, B)	RMS 3051 Class 2 DGB (Category C,D)	RMS 3051 DGS20 (Category A, B)	RMS 3051 DGS20 (Category C,D)	RMS 3051 DGS40 (Category A, B)	RMS 3051 DGS40 (Category C,D)	RMS 3071 SMZ (top 150mm)	RMS 3071 SMZ (beyond 150mm)	ARRB SR41 20mm (Base)	ARRB SR41 40mm (Base)	ARRB SR41 20mm (Subbase)	ARRB SR 40mm (Subbase)
Minimum	No	No	Yes	Yes	Yes	Yes	No	No	No	No	No	No	Yes	Yes	No	No	Yes	Yes
Atterberg Limits																		
Liquid Limits (%)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	N/A	N/A	N/A	N/A	N/A	N/A
Plastic Limit (%)	N/A	N/A	N/A	N/A	N/A	N/A	Yes	Yes	Yes	Yes	Yes	Yes	N/A	N/A	N/A	N/A	N/A	N/A
Plasticity Index (%)	No	Yes	Yes	Yes	Yes	Yes	No	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Grading	AGPT04A08 -Part 4A 20mm Base (Class 1)	AGPT04A08 - 20mm Rock Base (Class 2)	AGPT04A08 -Part 4A 20mm Subbase (Class 3)	AGPT04A08 -Part 4A 20mm Subbase (Class 3)	AGPT04A08- Part 4A 20mm Subbase (Class 4)	AGPT04A08- Part 4A 40mm Subbase (Class 4)	RMS 3051 Class 1 DGB (Category A, B)	RMS 3051 Class 2 DGB (Category C,D)	RMS 3051 DGS20 (Category A, B)	RMS 3051 DGS20 (Category C,D)	RMS 3051 DGS40 (Category A, B)	RMS 3051 DGS40 (Category C,D)	RMS 3071 SMZ (top 150mm)	RMS 3071 SMZ (beyond 150mm)	ARRB SR41 20mm (Base)	ARRB SR41 40mm (Base)	ARRB SR41 20mm (Subbase)	ARRB SR 40mm (Subbase)
53	N/A	N/A	N/A	Yes	N/A	N/A	N/A	N/A	N/A	N/A	Yes	Yes	Yes	Yes	N/A	Yes	N/A	Yes
37.5	N/A	N/A	N/A	Yes	N/A	N/A	N/A	N/A	N/A	N/A	Yes	Yes	Yes	Yes	N/A	Yes	N/A	Yes
26.5	Yes	Yes	Yes	No	N/A	N/A	Yes	Yes	Yes	Yes	No	No	No	No	Yes	No	Yes	No
19	Yes	Yes	Yes	No	N/A	N/A	Yes	Yes	Yes	Yes	No	No	No	No	Yes	No	Yes	No
13.2	Yes	Yes	Yes	N/A	N/A	N/A	Yes	Yes	Yes	Yes	No	No	N/A	N/A	No	No	No	No
9.5	Yes	Yes	Yes	No	N/A	N/A	Yes	Yes	No	No	No	No	N/A	N/A	Yes	No	No	Yes
6.7	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	Yes	Yes	N/A	N/A	N/A	N/A
4.75	No	No	Yes	No	Yes	No	No	No	No	No	No	No	N/A	N/A	No	No	No	Yes
2.36	No	No	Yes	No	N/A	N/A	No	No	Yes	Yes	No	No	Yes	Yes	No	No	No	Yes
0.425	No	No	No	No	No	No	No	No	Yes	Yes	No	No	N/A	N/A	No	No	No	Yes
0.075	No	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	N/A	N/A	No	No	Yes	Yes
0.0135	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

7.2 Austroads Material Assessment

An additional assessment was undertaken on the material based the Weighted Plasticity Index (WPI) as per AGPT04D-19 – Austroads Guide to Pavement Technology Part 4D – Stabilised Materials, 2019. The formula for the Weighted Plastic Index is; WPI = % passing 0.425mm x Plasticity Index (PI).

The WPI was then assessed off Table 6.1 from AGPT04D-19.

AGPT04D-19 – Table 6.1

Material	Weighted Plastic Index (WPI)
High quality basecourse	0 - 100
Standard quality basecourse	100 - 200
Subbase	200 - 400
Selected subgrade fill material	400 - 1500

The results of the assessment can be seen in **Table 7.2** below.

Table 7.2 – AGPT04D-19 Assessment of recovered granular material

Borehole	Depth (m)	% passing 0.425mm	PI (%)	Weighted Plasticity Index (WPI) = % passing 0.425 mm x Plasticity Index (PI)	Recovered Granular Material Quality Correlation
BH1	0-0.3	30	0	0	High quality basecourse
BH6	0-200	34	0	0	High quality basecourse
BH9	0-200	37	0	0	High quality basecourse
BH12	0-200	34	18	612	Selected subgrade fill
BH15	0-200	42	16	672	Selected subgrade fill
BH18	0-200	35	18	630	Selected subgrade fill
BH21	0-200	31	13	0	High quality basecourse

7.3 Recommendations for Reuse

In summary of results presented above in **Section 7.1** and **Section 7.2** it is recommended that the existing granular materials in their current state are unsuitable for both base and subbase material as per AGPT and ARRB specifications, and Recovered Granular Material Quality Correlation being variable; *however* the material is suitable as a select fill.

8 Pavement Thickness Design

8.1 Standards and Specifications Adopted for Design

Pavement design was completed in accordance with:

- Port Stephens Council Engineering Guidelines – Pavement Design
- ARRB Best Practice Guide 1 – Road materials
- AP-T36-06 Pavement Design for Light Traffic: A supplement to the Austroads Pavement Design Guide, 2006
- Austroads Design Guidelines 2017

CIRCLY 7 was further utilised for forward calculations to determine critical strains and pavement damage for recommended pavement design options. CIRCLY printouts can be found in **Annex D**.

Adopted design CBR:

Based on test results as described in **Section 6,** subgrade CBR values adopted were as follows:

- Soaked CBR of 2.0% for proposed reconstruction on Clay Subgrade
- Soaked CBR of 4.0% for proposed reconstruction on Residual silty Subgrade
- Soaked CBR of 10.0% for proposed reconstruction on Rock Subgrade

Adopted Traffic Loadings:

As per Port Stephens Council Engineering Guidelines / Austroads Design Guide 2017 the following traffic loadings were adopted for design:

AADT – 400 vehicles /day

Percentage heavy 9.0%

Design Period – 30 years

NHVAG – 2.5

Design Traffic - Flexible Pavements:

- 5.14×10^5 Design ESA's.

8.1.1 Flexible Pavement Thickness Design

A flexible pavement reconstruction design requires the removal of existing pavement and subgrade, where required, to the required pavement depth below the final design height.

The recommended flexible pavement thickness, pavement material and compaction specification are presented in **Table 8.1** and **Table 8.2** below.

Table 8.1 – Summary of flexible pavement minimum thickness design

Pavement	Min Thickness (mm)		
14/7 Two Coat Bituminous Seal (to Council spec)	(21)	(21)	(21)
Base course (DGB20 or equivalent)	150	150	150
Subbase (DGS40 or equivalent)	290	290	150
Select Fill (Re-use of existing material)	200	-	-
Total thickness (mm)	640	440	300
Subgrade CBR	2.0%	4.0%	10.0%
Design Traffic	5.14×10^5 DESA		

*a construction tolerance of 10mm should be allowed for above the minimum thickness

Table 8.2 – Flexible pavement compaction criteria

Pavement	Material Specification	Compaction criteria
14/7 Two Coat Bituminous Seal	to Council spec	NA
Base course (DGB20 or equivalent)	Complying with RMS QA Specification 3051	98% Modified (AS 1289.5.2.1)
Subbase (DGS40 or equivalent)	Complying with RMS QA Specification 3051	95% Modified (AS 1289.5.2.1)
Select Fill (Re-use of existing material)	CBR >= 10%	100% Standard (AS 1289.5.1.1)
Subgrade	Clay Subgrade minimum 2% or Silty Clayey SAND Subgrade minimum CBR 10%	100% Standard (AS 1289.5.1.1)

8.2 Construction considerations

8.2.1 Pavement Drainage and Pavement Interfaces

The pavement thickness is dependent on the provision of adequate surface and subsurface drainage as specified by a qualified civil or pavement engineer. It is recommended that an intra pavement subsoil drain be installed at the interfaces between pavement types.

Where new pavement construction abuts existing pavement, care shall be taken to create a clean vertical construction joint along with a benched transition zone. The transition zone should be across a 0.5m distance and benched to tie in with existing profiles.

It is recommended that all construction joints should be located outside of wheel paths, and where practical should be located in the centre of the lanes or along edge lines.

It should be noted that when variable pavements are abutted then the potential for localised failure is greater. Care should be exercised in the placement and compaction of the subgrade and pavements in this area to maximise the performance of the pavement.

Consideration should also be given to sealing any cracks that may develop between existing and new pavements, benching to tie in pavements. The use of a strain relieving membrane at the interface may be appropriate in some cases.

8.2.2 Inspections

Where reconstruction is undertaken, the subgrade will need to be inspected by an experienced geotechnical engineer after boxing out or filling to design subgrade level. The inspection is for purposes to confirm design parameters, assess the suitability of the subgrade and delineate areas which require subgrade replacement or remedial treatment prior to construction.

8.2.3 Site Preparation

New Pavement Construction:

It is recommended that the following be undertaken where controlled filling is to be undertaken:

1) remove all topsoil, root effected zones, material assessed as unsuitable and other deleterious zones (noting the stripped soil is not considered suitable as engineered fill but may be considered for landscaping purposes);
2) exposed suitable subgrade areas should then be ripped 300mm and re-compacted to 100% standard maximum dry density (SMDD) at ±2% of optimum moisture content (OMC);
3) the foundation area should then be proof rolled under the supervision of an experienced geotechnical consultant and any soft spots / heaving areas identified. If identified these areas should be over excavated under the direction of the geotechnical consultant and replaced with engineered fill.

Pavement Reconstruction:

It is recommended that for the pavement reconstruction, the following be undertaken where controlled filling is to be undertaken:

4) remove all existing pavement material and subgrade as required;
5) exposed suitable subgrade areas should then be ripped 300mm and re-compacted to 100% standard maximum dry density (SMDD) at ±2% of optimum moisture content (OMC);
6) the foundation area should then be proof rolled under the supervision of an experienced geotechnical consultant and any soft spots / heaving areas identified. If identified these areas should be over excavated under the direction of the geotechnical consultant and replaced with engineered fill.

Site preparation for the overlay options would require the milling of the existing pavement wearing course to a maximum of 20mm before overlay is placed.

8.3 Controlled Fill

Any earthworks conducted at the site should be controlled in accordance with AS3798-2007. Based on the soil profile shown above in **Section 5**, visual observations and in-situ Dynamic Cone Penetrometer (DCP) or Perth Sand Penetrometer (PSP) testing, the material encountered at the site is deemed suitable for controlled fill. If the sub-surface conditions encountered at the site during construction differ from those discussed in **Section 5**, VC should be consulted to determine if the material is suitable for controlled fill. Similarly, any won material imported from external sites should consult VC to determine if the fill is suitable for controlled fill.

8.3.1 Compaction Criteria

Fill material should be compacted in near-horizontal uniform layers with a maximum compacted thickness of 300mm. It is important to ensure layers are placed in such a way that provides adequate drainage and prevent ponding during construction. The thickness of fill placed during construction should take into account the compaction equipment available.

The moisture of the fill material should be controlled within a specified range of OMC in order to achieve the compaction criteria. In general, soils should be compacted within a moisture range of ±2% of OMC.

A suitably qualified geotechnical professional must be consulted to determine that the specified compaction has been achieved.

8.4 Excavations Conditions

Excavations within the fill, natural soils and extremely low to very low strength rock that was encountered during the investigations is thought to be achievable with conventional earthmoving equipment such excavators, backhoes and dozers. Very low to low strength rock may also require ripper tynes attached to excavator arms or dozers for effective excavation. Rock of low strength or greater may possibly require a 12 tonne excavator (or greater) with rock ripper or hydraulic rock hammer, depending on the degree of strength and fracturing in the rock. Excavations in rock would require minimising vibration to neighbouring residences and structures, else other methods may be required (for example

pre-drilling the rock, rock sawing using diamond wire saw equipment, grinding or engaging a rock breaking and removal specialist).

Excavations should be conducted in accordance with The Safe Work Australia "Excavation Work" Code of Practice October 2018.

https://www.safeworkaustralia.gov.au/doc/model-codes-practice/model-code-practice-excavation-work

Excavations can seriously affect the stability of adjacent buildings. Careful consideration must be taken in order to prevent the collapse of partial collapse of adjacent structures.

Construction material and equipment should not be placed within the zone of influence of an excavation unless a suitably qualified geotechnical engineer has designed ground support structures to withstand these loads. The zone of influence is dependent on the material encountered at the site and is the area in which possible failures can occur.

Refer to council development guidelines before conducting any excavation works.

9 Retaining Walls

Recommended parameters to be considered for retaining wall design at the site between Ch 815 – 845 are provided in **Table 9.1** below.

Table 9.1 - Recommended retaining wall design soil parameters

Parameter	Supported material			
	Silty SAND	Silty Sandy CLAY	Sandy CLAY	SANDSTONE
γ (kN/m^3)	18	19	20	25
Φ' (°)	30	24	24	40
C' (kPa)	0	20	20	NA
Cu (kPa)	-	100	100	NA
K_a	0.3	0.4	0.4	0.2
K_p	3.0	2.4	2.4	4.6
K_o	0.5	0.6	0.6	0.4
Allowable Bearing	100	100	100	600

Legend:

γ – unit weight; Φ' – angle of friction; C' – drained cohesion; Cu – undrained cohesion; Ka – coefficient of active earth pressure

Kp – coefficient of passive earth pressure; Ko – coefficient of at rest earth pressure; NA – Not Applicable

Parameters shown assume horizontal and free draining granular backfill behind the retaining wall.

10 Report Limitations

This report has been prepared by Hunter Civilab (HC) for the specific site and purposes described within this report. HC will accept no responsibility or liability for the use of this report by any third party, without the express consent of HC or the Client, or for use at any other site or purpose than that described in this report.

This report and the services provided have been completed in accordance with relevant professional and industry standards of interpretation and analysis. This report must be read in its entirety without separation of pages or sections and without any alterations, other than those provided by HC.

The scope of the investigation described in this report is based on information and plans provided to HC by the Client as well as any additional limitations imposed by either the Client and / or site restraints. Such limitations may include but are not limited to budget restraints, the presence of underground services or accessibility issues to a site. Where the report has been prepared for a specific design proposal the information and interpretation may not be relevant if the design proposal is changed. HC should be consulted if site plans or design proposal is changed as the recommendations and / or opinions presented may not be suitable for the new revisions or variations made.

The conclusions, recommendations and opinions expressed within this report are subject to the specific conditions encountered and the limited geotechnical data gathered at the site during the time of the current investigation. The sub-surface conditions and results presented in this report are indicative of the conditions encountered at the discrete sampling and testing locations within the site at the time of the investigation and within the depths investigated. Variations in ground conditions may exist between the locations that were investigated, and the subsurface profile cannot be inferred or extrapolated from the limited investigation conducted by HC. For this reason, the report must be regarded as interpretative, rather than a factual document.

Sub-surface conditions are subject to constant change and can vary abruptly as a result of human influences and /or natural geological and / or climatic processes and events. As such, conditions may exist at the site that could not be identified during or may develop after the current investigation has been conducted and as such, may impact the accuracy of this report. HC should be contacted for further consultation and site re-assessment should sub-surface conditions differ from those conditions identified in this report.

HCL recommends geotechnical reports older than 5 years from the date shown on the report, reports submitted for a previous (unrelated) development application on the site, or sites that have been altered by earthworks be reviewed by a qualified geotechnical consultant to confirm that the scope of the investigation undertaken for the report and the contents of the report are appropriate for the current development being proposed.

Any and all previous report versions for G0558-R-001 are superseded by this report.

We are pleased to present this report and trust that the recommendations provided are sufficient for your present requirements. If you have any further questions about this report, please contact the undersigned.

For and on behalf of

Valley Civilab Pty Ltd, trading as Hunter Civilab

Reported by:

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Annex A

HUNTER CIVILAB	**CLIENT:**	Port Stepens Council	**JOB NO:**	G0558	0 10 20 30 40 m
	PROJECT:	East Seaham Road Stage 6 Road Reconstruction	**DRAWN BY:**	MS	
	LOCATION:	East Seaham Road, Seaham (Ch 0m to 280m - Stage 6)	**DATE:**	20/06/2024	
			SCALE:	1:750	**SIZE:** A3
	TITLE:	Test Location Plan - Sheet 1 of 8	**FIGURE NO:**	Figure 1	**REVISION:** 0

Legend

- Borehole Locations
- DCP Locations
- chain_Chainage Line
- Chainage Line

HUNTER CIVILAB	**CLIENT:**	Port Stepens Council	**JOB NO:**	G0558
	PROJECT:	East Seaham Road Stage 6 Road Reconstruction	**DRAWN BY:**	MS
	LOCATION:	East Seaham Road, Seaham (Ch 170m to 470m - Stage 6)	**DATE:**	20/06/2024
			SCALE:	1:750
	TITLE:	Test Location Plan - Sheet 2 of 8	**FIGURE NO:**	Figure 2

0 10 20 30 40 m

SIZE: A3

REVISION: 0

Legend

- Borehole Locations
- DCP Locations
- chain_Chainage Line
- Chainage Line

HUNTER CIVILAB	**CLIENT:**	Port Stepens Council	**JOB NO:**	G0558	0 10 20 30 40 m
	PROJECT:	East Seaham Road Stage 6 Road Reconstruction	**DRAWN BY:**	MS	
	LOCATION:	East Seaham Road, Seaham (Ch 440m to 730m - Stage 6)	**DATE:**	20/06/2024	
			SCALE:	1:750	**SIZE:** A3
	TITLE:	Test Location Plan - Sheet 3 of 8	**FIGURE NO:**	Figure 3	**REVISION:** 0

Legend

- Borehole Locations
- chain_Chainage Line
- Chainage Line

HUNTER CIVILAB	**CLIENT:**	Port Stepens Council	**JOB NO:**	G0558	0 10 20 30 40 m
	PROJECT:	East Seaham Road Stage 6 Road Reconstruction	**DRAWN BY:**	MS	
	LOCATION:	East Seaham Road, Seaham (Ch 710m to 1010m - Stage 6)	**DATE:**	20/06/2024	
			SCALE:	1:750	**SIZE:** A3
	TITLE:	Test Location Plan - Sheet 4 of 8	**FIGURE NO:**	Figure 4	**REVISION:** 0

Legend

- Borehole Locations
- DCP Locations
- Retaining Wall Area
- chain_Chainage Line
- Chainage Line

HUNTER CIVILAB	**CLIENT:**	Port Stepens Council	**JOB NO:**	G0558
	PROJECT:	East Seaham Road Stage 6 Road Reconstruction	**DRAWN BY:**	MS
	LOCATION:	East Seaham Road, Seaham (Ch 1000m to 1290m - Stage 6)	**DATE:**	20/06/2024
			SCALE:	1:750
	TITLE:	Test Location Plan - Sheet 5 of 8	**FIGURE NO:**	Figure 5

0 10 20 30 40 m

SIZE: A3

REVISION: 0

Legend

- Borehole Locations
- DCP Locations
- chain_Chainage Line
- Chainage Line

HUNTER CIVILAB	**CLIENT:**	Port Stepens Council	**JOB NO:**	G0558
	PROJECT:	East Seaham Road Stage 6 Road Reconstruction	**DRAWN BY:**	MS
	LOCATION:	East Seaham Road, Seaham (Ch 1260m to 1560m - Stage 6)	**DATE:**	20/06/2024
			SCALE:	1:750
	TITLE:	Test Location Plan - Sheet 6 of 8	**FIGURE NO:**	Figure 6

0 10 20 30 40 m

SIZE: A3

REVISION: 0

Legend

- Borehole Locations
- DCP Locations
- chain_Chainage Line
- Chainage Line

HUNTER CIVILAB	**CLIENT:**	Port Stepens Council	**JOB NO:**	G0558
	PROJECT:	East Seaham Road Stage 6 Road Reconstruction	**DRAWN BY:**	MS
	LOCATION:	East Seaham Road, Seaham (Ch 1560m to 1850m - Stage 6)	**DATE:**	20/06/2024
			SCALE:	1:750
	TITLE:	Test Location Plan - Sheet 7 of 8	**FIGURE NO:**	Figure 7

0 10 20 30 40 m

SIZE: A3

REVISION: 0

Legend

- Borehole Locations
- DCP Locations
- chain_Chainage Line
- Chainage Line

HUNTER CIVILAB	**CLIENT:**	Port Stepens Council	**JOB NO:**	G0558
	PROJECT:	East Seaham Road Stage 6 Road Reconstruction	**DRAWN BY:**	MS
	LOCATION:	East Seaham Road, Seaham (Ch 1850m to 2130m - Stage 6)	**DATE:**	20/06/2024
			SCALE:	1:750
	TITLE:	Test Location Plan - Sheet 8 of 8	**FIGURE NO:**	Figure 8

0 10 20 30 40 m

SIZE: A3

REVISION: 0

Legend

- Borehole Locations
- DCP Locations
- chain_Chainage Line
- Chainage Line

Annex B

Hunter Civilab

Unit 3, 62 Sandringham Avenue Thornton NSW 2322

Phone: (02) 4966 1844

Geotechnical Log - Borehole

BH1

UTM	: 43Q	**Drill Rig**	: Ute Mounted Drill Rig	**Job Number**	: G0558
Easting (m)	: 0.00	**Driller Supplier**	: Hunter Civilab	**Client**	: Port Stephens Shire Council
Northing (m)	: 0.00	**Logged By**	: JT	**Project**	: East Seaham Road, East Seaham (stage 6 Road Reconstruction)
Ground Elevation	: Not Surveyed	**Reviewed By**	: NR	**Location**	: East Seaham Road, East Seaham
Total Depth	: 1.2 m BGL	**Date**	: 28/05/2024	**Loc Comment**	: CH: 115m (1m Left of CL)

Water	DCP graph	PSP	Testing	Samples: Bulk	Depth (m)	Graphic Log	Classification Code	Material Description	Moisture	Consistency/Density	Soil Origin	Remarks
					0.1		GM	FILL: Silty to sandy GRAVEL, fine to coarse sized, fine to coarse grained sand, grey.	M-D		Fill	
					0.3		GM	FILL: Silty to sandy GRAVEL, fine to coarse sized, fine to coarse grained sand, brown.	D		Fill	
				2 bulk			GM	FILL: Silty to sandy GRAVEL, fine to coarse sized, fine to coarse grained sand, with low plasticity clay, brown, trace cobbles .			Fill	
	3				0.8		CL-CI	Silty to sandy CLAY, low to medium plasticity, brown / orange, fine grained sand, trace fine sized gravel.	w > PL	St-VSt	Residual	
	4											
	3			2 bulk	1							
	5											
	6							**BH1 Terminated at 1.2m**				
	9											
	T											

Figure 1 – Showing Borehole 1

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Geotechnical Log - Borehole

BH2

UTM	: 43Q	**Drill Rig**	: Ute Mounted Drill Rig	**Job Number**	: G0558
Easting (m)	: 0.00	**Driller Supplier**	: Hunter Civilab	**Client**	: Port Stephens Shire Council
Northing (m)	: 0.00	**Logged By**	: JT	**Project**	: East Seaham Road, East Seaham (stage 6 Road Reconstruction)
Ground Elevation	: Not Surveyed	**Reviewed By**	: NR	**Location**	: East Seaham Road, East Seaham
Total Depth	: 0.6 m BGL	**Date**	: 28/05/2024	**Loc Comment**	: CH:170m (1m Right of CL)

Drilling Method	Water	DCP graph	Samples	Depth (m)	Graphic Log	Classification Code	Material Description	Moisture	Consistency/Density	Soil Origin	Remarks
				0.1		GM	FILL: Silty to sandy GRAVEL, fine to coarse sized, fine to coarse grained sand, grey.	M		Fill	
		15				GM	FILL: Silty to sandy GRAVEL, fine to coarse sized, fine to coarse grained sand, brown.	D		Fill	
		R		0.4		SST	Extremely Weathered Gravelly SANDSTONE, fine to medium grained, pale brown / pale orange, fine round to sub-rounded gravel, inferred very low strength			Rock	
				1			**BH2 refusal at 0.6m**				

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Geotechnical Log - Borehole

BH3

UTM	**: 43Q**	**Drill Rig**	**: Ute Mounted Drill Rig**	**Job Number**	**: G0558**
Easting (m)	**: 0.00**	**Driller Supplier**	**: Hunter Civilab**	**Client**	**: Port Stephens Shire Council**
Northing (m)	**: 0.00**	**Logged By**	**: JT**	**Project**	**: East Seaham Road, East Seaham (stage 6 Road Reconstruction)**
Ground Elevation	**: Not Surveyed**	**Reviewed By**	**: NR**	**Location**	**: East Seaham Road, East Seaham**
Total Depth	**: 1.2 m BGL**	**Date**	**: 28/05/2024**	**Loc Comment**	**: CH:290m(1.5m Left of CL)**

Drilling Method	Water	DCP graph	Samples	Depth (m)	Graphic Log	Classification Code	Material Description	Moisture	Consistency/Density	Soil Origin	Remarks
				0.1		GM	FILL: Silty to sandy GRAVEL, fine to coarse sized, fine to coarse grained sand, grey.	M-D		Fill	
						GM	FILL: Silty to sandy GRAVEL, fine to coarse sized, fine to coarse grained sand, brown.	D		Fill	
		2									
		6									
				0.4							
		7				CL-CI	Silty to sandy CLAY, low to medium plasticity, grey brown, fine grained sand, with roots.	w > PL	St-VSt	Residual	
		9									
		12									
		T									
				1							
							BH3 Terminated at 1.2m				

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Unit 3, 62 Sandringham Avenue Thornton NSW 2322

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Geotechnical Log - Borehole

BH4

UTM	: 56H	**Drill Rig**	: Ute Mounted Drill Rig	**Job Number**	: G0558
Easting (m)	: 385,535.43	**Driller Supplier**	: Hunter Civilab	**Client**	: Port Stephens Shire Council
Northing (m)	: 6,394,237.16	**Logged By**	: JT	**Project**	: East Seaham Road, East Seaham (stage 6 Road Reconstruction)
Ground Elevation	: Not Surveyed	**Reviewed By**	: NR	**Location**	: East Seaham Road, East Seaham
Total Depth	: 0.8 m BGL	**Date**	: 28/05/2024	**Loc Comment**	: CH: 385m (Right of CL)

Drilling Method	Water	DCP graph	Samples	Depth (m)	Graphic Log	Classification Code	Material Description	Moisture	Consistency/Density	Soil Origin	Remarks
						GM	FILL: Silty to sandy GRAVEL, fine to coarse sized, fine to coarse grained sand, grey.	M-D		Fill	
				0.1		GM	FILL: Silty to sandy GRAVEL, fine to coarse sized, fine to coarse grained sand, brown.	D		Fill	
				0.6		GM	FILL: Sandy GRAVEL, fine to coarse sized, brown, fine to coarse sand (Possible Sandstone Boulder)			Fill	
		20									
		R		1			**BH4 refusal at 0.8m (possible sandstone boulder)**				

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Geotechnical Log - Borehole

BH5

UTM	: 56H	**Drill Rig**	: Ute Mounted Drill Rig	**Job Number**	: G0558
Easting (m)	: 385,693.25	**Driller Supplier**	: Hunter Civilab	**Client**	: Port Stephens Shire Council
Northing (m)	: 6,391,122.79	**Logged By**	: JT	**Project**	: East Seaham Road, East Seaham (stage 6 Road Reconstruction)
Ground Elevation	: Not Surveyed	**Reviewed By**	: NR	**Location**	: East Seaham Road, East Seaham
Total Depth	: 1.2 m BGL	**Date**	: 28/05/2024	**Loc Comment**	: CH: 480m (1.5m Left of CL

Drilling Method	Water	DCP graph	Samples	Depth (m)	Graphic Log	Classification Code	Material Description	Moisture	Consistency/Density	Soil Origin	Remarks
				0.1		GM	FILL: Silty to sandy GRAVEL, fine to coarse sized, fine to coarse grained sand, grey.	D		Fill	
						GM	FILL: Silty to sandy GRAVEL, fine to coarse sized, fine to coarse grained sand, brown.			Fill	
		12									
		9		0.9		GM	As above, but increase in gravel size (becoming cobble sized)			Fill	
		18		1							
		T									
							BH5 Terminated at 1.2m				

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Geotechnical Log - Borehole

BH6

UTM	: 56H	**Drill Rig**	: Ute Mounted Drill Rig	**Job Number**	: G0558
Easting (m)	: 384,375.92	**Driller Supplier**	: Hunter Civilab	**Client**	: Port Stephens Shire Council
Northing (m)	: 6,393,622.85	**Logged By**	: JT	**Project**	: East Seaham Road, East Seaham (stage 6 Road Reconstruction)
Ground Elevation	: Not Surveyed	**Reviewed By**	: NR	**Location**	: East Seaham Road, East Seaham
Total Depth	: 0.4 m BGL	**Date**	: 28/05/2024	**Loc Comment**	: CH: 570m (1m Right of CL)

Drilling Method	Water	DCP graph	Samples: Bulk	Depth (m)	Graphic Log	Classification Code	Material Description	Moisture	Consistency/Density	Soil Origin	Remarks
				0.05		GM	FILL: Silty to sandy GRAVEL, fine to coarse sized, fine to coarse grained sand, grey.	D		Fill	
						GM	FILL: Silty to sandy GRAVEL, fine to coarse sized, fine to coarse grained sand, brown.			Fill	
			1 bulk								
				0.3							
		19/70mm				SST	Extremely Weathered Gravelly SANDSTONE, fine to medium grained, pale brown / pale orange, fine round to sub-rounded gravel, inferred very low strength			Rock	
		R					**BH6 refusal at 0.4m**				
				1							

Figure 2 – Showing Borehole 6

Hunter Civilab

Unit 3, 62 Sandringham Avenue Thornton NSW 2322

Phone: (02) 4966 1844

Geotechnical Log - Borehole

BH7

UTM	: 56H	**Drill Rig**	: Ute Mounted Drill Rig	**Job Number**	: G0558
Easting (m)	: 385,535.43	**Driller Supplier**	: Hunter Civilab	**Client**	: Port Stephens Shire Council
Northing (m)	: 6,394,237.16	**Logged By**	: JT	**Project**	: East Seaham Road, East Seaham (stage 6 Road Reconstruction)
Ground Elevation	: Not Surveyed	**Reviewed By**	: NR	**Location**	: East Seaham Road, East Seaham
Total Depth	: 1 m BGL	**Date**	: 28/05/2024	**Loc Comment**	: CH: 660m (Left of CL)

Drilling Method	Water	DCP graph	Samples: Bulk	Depth (m)	Graphic Log	Classification Code	Material Description	Moisture	Consistency/Density	Soil Origin	Remarks
				0.1		GM	FILL: Silty to sandy GRAVEL, fine to coarse sized, fine to coarse grained sand, grey.	D		Fill	
				0.3		GM	FILL: Silty to sandy GRAVEL, fine to coarse sized, fine to coarse grained sand, brown.			Fill	
		9				GM	FILL: Silty to sandy GRAVEL, fine to medium sized, fine to coarse grained sand, brown.	M-D		Fill	
		10									
		12									
		T									
			2 bulk (CBR)	1							
							BH7 refusal at 1m (Refused sandstone/ possible sandstone fill boulder)				

Figure 3 – Showing Borehole 7

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Geotechnical Log - Borehole

BH8

UTM	: 56H	**Drill Rig**	: Ute Mounted Drill Rig	**Job Number**	: G0558
Easting (m)	: 384,375.92	**Driller Supplier**	: Hunter Civilab	**Client**	: Port Stephens Shire Council
Northing (m)	: 6,393,622.85	**Logged By**	: JT	**Project**	: East Seaham Road, East Seaham (stage 6 Road Reconstruction)
Ground Elevation	: Not Surveyed	**Reviewed By**	: NR	**Location**	: East Seaham Road, East Seaham
Total Depth	: 1.3 m BGL	**Date**	: 28/05/2024	**Loc Comment**	: CH: 760m (1m Right of CL)

Drilling Method	Water	DCP graph	Samples	Depth (m)	Graphic Log	Classification Code	Material Description	Moisture	Consistency/Density	Soil Origin	Remarks
				0.1		GM	FILL: Silty to sandy GRAVEL, fine to coarse sized, fine to coarse grained sand, grey.	D		Fill	
				1		GM	FILL: Silty to sandy GRAVEL, fine to medium sized, fine to coarse grained sand, brown.			Fill	
				1.1		SW	FILL: SAND, fine to coarse grained, grey / brown, (existing culvert sand backfill).	M		Fill	
		1		1.2		CL	Silty CLAY, low plasticity, black.	w > PL	S	Alluvial	
		1					**BH8 Terminated at 1.3m**				
		4									
		3									
		2									
		T									

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Geotechnical Log - Borehole

BH9

UTM	: 56H	**Drill Rig**	: Ute Mounted Drill Rig	**Job Number**	: G0558
Easting (m)	: 385,501.01	**Driller Supplier**	: Hunter Civilab	**Client**	: Port Stephens Shire Council
Northing (m)	: 6,394,246.63	**Logged By**	: JT	**Project**	: East Seaham Road, East Seaham (stage 6 Road Reconstruction)
Ground Elevation	: Not Surveyed	**Reviewed By**	: NR	**Location**	: East Seaham Road, East Seaham
Total Depth	: 1.1 m BGL	**Date**	: 28/05/2024	**Loc Comment**	: CH: 855m (1m Left of CL)

Drilling Method	Water	DCP graph	Samples: Bulk	Depth (m)	Graphic Log	Classification Code	Material Description	Moisture	Consistency/Density	Soil Origin	Remarks
				0.1		GM	FILL: Silty to sandy GRAVEL, fine to coarse sized, fine to coarse grained sand, grey.	D		Fill	
		2				GM	FILL: Silty to sandy GRAVEL, fine to coarse sized, fine to coarse grained sand, brown.			Fill	
		9	1 bulk	0.3		SC	Clayey SAND, fine to coarse grained, grey / brown, low plasticity clay.	M-D	MD	Residual	
		19		0.4		SC	As above, but increased clay content, with fine to medium round / sub-rounded gravel			Residual	
		T									
			2 bulk	1							
							BH9 refusal at 1.1m				

Figure 4 – Showing Borehole 9

Hunter Civilab

Unit 3, 62 Sandringham Avenue Thornton NSW 2322

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Geotechnical Log - Borehole

BH10

UTM	: 56H	**Drill Rig**	: Ute Mounted Drill Rig	**Job Number**	: G0558
Easting (m)	: 385,501.01	**Driller Supplier**	: Hunter Environmental Consulting	**Client**	: Port Stephens Shire Council
Northing (m)	: 6,394,246.63	**Logged By**	: JT	**Project**	: East Seaham Road, East Seaham (stage 6 Road Reconstruction)
Ground Elevation	: Not Surveyed	**Reviewed By**	: NR	**Location**	: East Seaham Road, East Seaham
Total Depth	: 1.2 m BGL	**Date**	: 28/05/2024	**Loc Comment**	: CH: 940m (1m Right of CL)

Drilling Method	Water	DCP graph	Samples	Depth (m)	Graphic Log	Classification Code	Material Description	Moisture	Consistency/Density	Soil Origin	Remarks
				0.1		GM	FILL: Silty to sandy GRAVEL, fine to coarse sized, fine to coarse grained sand, grey.	D		Fill	
				0.5		GM	FILL: Silty to sandy GRAVEL, fine to coarse sized, fine to coarse grained sand, brown.			Fill	
		5				SC	Clayey to silty SAND, fine to medium grained, brown, low plasticity clay.		MD-D	Residual	
		5									
		5									
		6		1							
		6									
		T									
							BH10 Terminated at 1.2m				

Hunter Civilab

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Geotechnical Log - Borehole

BH11

UTM	: 56H	**Drill Rig**	: Ute Mounted Drill Rig	**Job Number**	: G0558
Easting (m)	: 385,501.01	**Driller Supplier**	: Hunter Civilab	**Client**	: Port Stephens Shire Council
Northing (m)	: 6,394,246.63	**Logged By**	: JT	**Project**	: East Seaham Road, East Seaham (stage 6 Road Reconstruction)
Ground Elevation	: Not Surveyed	**Reviewed By**	: NR	**Location**	: East Seaham Road, East Seaham
Total Depth	: 1 m BGL	**Date**	: 28/05/2024	**Loc Comment**	: CH:1005m (1m Left of CL)

Drilling Method	Water	DCP graph	Samples	Depth (m)	Graphic Log	Classification Code	Material Description	Moisture	Consistency/Density	Soil Origin	Remarks
				0.1		GM	FILL: Silty to sandy GRAVEL, fine to coarse sized, fine to coarse grained sand, grey.	D		Fill	
				0.3		GM	FILL: Silty to sandy GRAVEL, fine to coarse sized, fine to coarse grained sand, brown.	M-D		Fill	
		5				SM	Silty to gravelly SAND, fine to coarse grained, fine sized gravel, brown.	D	D	Residual	
		5									
		8									
		9									
		10									
		T									
				1			**BH11 refusal at 1m (refusal on sandstone)**				

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Geotechnical Log - Borehole

BH12

UTM	: 56H	**Drill Rig**	: Ute Mounted Drill Rig	**Job Number**	: G0558
Easting (m)	: 385,501.01	**Driller Supplier**	: Hunter Civilab	**Client**	: Port Stephens Shire Council
Northing (m)	: 6,394,246.63	**Logged By**	: JT	**Project**	: East Seaham Road, East Seaham (stage 6 Road Reconstruction)
Ground Elevation	: Not Surveyed	**Reviewed By**	: NR	**Location**	: East Seaham Road, East Seaham
Total Depth	: 1.2 m BGL	**Date**	: 28/05/2024	**Loc Comment**	: CH:1110m (1m Right of CL)

Drilling Method	Water	DCP graph	Samples: Bulk	Depth (m)	Graphic Log	Classification Code	Material Description	Moisture	Consistency/Density	Soil Origin	Remarks
				0.1		GM	FILL: Silty to sandy GRAVEL, fine to coarse sized, fine to coarse grained sand, grey.	D		Fill	
			2 bulk			GM	FILL: Silty to sandy GRAVEL, fine to coarse sized, fine to coarse grained sand, brown.			Fill	
				0.6		GM	FILL: Silty to sandy GRAVEL, fine to coarse sized, fine to coarse grained sand, with low plasticity clay, brown / pale brown, trace cobbles.	SLM		Fill	
			2 bulk								
		3		1							
		4				SC	Clayey to silty to gravelly SAND, fine to coarse grained, fine to medium sized gravel, brown, low plasticity clay.	D	MD-D	Residual	
		5									
		T					**BH12 Terminated at 1.2m**				

Figure 5 – Showing Borehole 12

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Geotechnical Log - Borehole

BH13

UTM	: 56H	**Drill Rig**	: Ute Mounted Drill Rig	**Job Number**	: G0558
Easting (m)	: 385,501.01	**Driller Supplier**	: Hunter Civilab	**Client**	: Port Stephens Shire Council
Northing (m)	: 6,394,246.63	**Logged By**	: JT	**Project**	: East Seaham Road, East Seaham (stage 6 Road Reconstruction)
Ground Elevation	: Not Surveyed	**Reviewed By**	: NR	**Location**	: East Seaham Road, East Seaham
Total Depth	: 1.2 m BGL	**Date**	: 28/05/2024	**Loc Comment**	: CH: 1205m (1m Left of CL)

Drilling Method	Water	DCP graph	Samples	Depth (m)	Graphic Log	Classification Code	Material Description	Moisture	Consistency/Density	Soil Origin	Remarks
				0.1		GM	FILL: Silty to sandy GRAVEL, fine to coarse sized, fine to coarse grained sand, grey.	D		Fill	
						GM	FILL: Silty to sandy GRAVEL, fine to coarse sized, fine to coarse grained sand, brown.			Fill	
		3		0.5							
		5				SC	Clayey to silty SAND, fine to coarse grained, grey brown, low plasticity clay.	M-D	MD	Residual	
		3		0.7							
		3				SC	Clayey to silty to gravelly SAND, fine to coarse grained, fine sized gravel, grey brown, low plasticity clay.		MD-D	Residual	
		6									
		8									
		5		1							
		T		1.1		CL	Silty to sandy to gravelly CLAY, low plasticity, grey brown, fine to coarse sized gravel, fine to coarse grained sand.	w > PL	St-VSt	Residual	
							BH13 refusal at 1.2m (refusal on sandstone)				

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Geotechnical Log - Borehole

BH14

UTM	: 56H	**Drill Rig**	: Ute Mounted Drill Rig	**Job Number**	: G0558
Easting (m)	: 384,375.92	**Driller Supplier**	: Hunter Civilab	**Client**	: Port Stephens Shire Council
Northing (m)	: 6,393,622.85	**Logged By**	: JT	**Project**	: East Seaham Road, East Seaham (stage 6 Road Reconstruction)
Ground Elevation	: Not Surveyed	**Reviewed By**	: NR	**Location**	: East Seaham Road, East Seaham
Total Depth	: 1.2 m BGL	**Date**	: 28/05/2024	**Loc Comment**	: CH:1290m (1m Right of CL)

Drilling Method	Water	DCP graph	Samples	Depth (m)	Graphic Log	Classification Code	Material Description	Moisture	Consistency/Density	Soil Origin	Remarks
				0.1		GM	FILL: Silty to sandy GRAVEL, fine to coarse sized, fine to coarse grained sand, grey.	D		Fill	
						GM	FILL: Silty to sandy GRAVEL, fine to coarse sized, fine to coarse grained sand, brown.			Fill	
		3		1							
		2		1.1		CL	Silty to sandy CLAY, low plasticity, grey brown, fine grained sand.	w > PL	St	Residual	
		3					**BH14 Terminated at 1.2m**				
		2									
		3									
		T									

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Geotechnical Log - Borehole

BH15

UTM	: 56H	**Drill Rig**	: Ute Mounted Drill Rig	**Job Number**	: G0558
Easting (m)	: 385,535.43	**Driller Supplier**	: Hunter Civilab	**Client**	: Port Stephens Shire Council
Northing (m)	: 6,394,237.16	**Logged By**	: JT	**Project**	: East Seaham Road, East Seaham (stage 6 Road Reconstruction)
Ground Elevation	: Not Surveyed	**Reviewed By**	: NR	**Location**	: East Seaham Road, East Seaham
Total Depth	: 1.2 m BGL	**Date**	: 29/05/2024	**Loc Comment**	: CH: 1380m (1m Left of CL)

Drilling Method	Water	DCP graph	Samples: Bulk	Depth (m)	Graphic Log	Classification Code	Material Description	Moisture	Consistency/Density	Soil Origin	Remarks
				0.1		GM	FILL: Silty to sandy GRAVEL, fine to coarse sized, fine to coarse grained sand, grey.	D		Fill	
				0.2		GM	FILL: Silty to sandy GRAVEL, fine to coarse sized, fine to coarse grained sand, brown.			Fill	
			1 bulk			CL-CI	Silty to sandy CLAY, low to medium plasticity, brown / grey, fine grained sand, trace fine sized gravel.	w > PL	St	Residual	
			2bulk								
		2									
		4									
		5									
		5									
		8		1							
		T									
							BH15 Terminated at 1.2m				

Figure 6 – Showing Borehole 15

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Unit 3, 62 Sandringham Avenue Thornton NSW 2322

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Geotechnical Log - Borehole

BH16

UTM	: 56H	**Drill Rig**	: Ute Mounted Drill Rig	**Job Number**	: G0558
Easting (m)	: 385,501.01	**Driller Supplier**	: Hunter Civilab	**Client**	: Port Stephens Shire Council
Northing (m)	: 6,394,246.63	**Logged By**	: JT	**Project**	: East Seaham Road, East Seaham (stage 6 Road Reconstruction)
Ground Elevation	: Not Surveyed	**Reviewed By**	: NR	**Location**	: East Seaham Road, East Seaham
Total Depth	: 1 m BGL	**Date**	: 29/05/2024	**Loc Comment**	: CH:1475m (1m Right of CL)

Drilling Method	Water	DCP graph	Samples	Depth (m)	Graphic Log	Classification Code	Material Description	Moisture	Consistency/Density	Soil Origin	Remarks
				0.1		GM	FILL: Silty to sandy GRAVEL, fine to coarse sized, fine to coarse grained sand, grey.	D		Fill	
						GM	FILL: Silty to sandy GRAVEL, fine to coarse sized, fine to coarse grained sand, brown.			Fill	
				0.6							
		6				CL	Silty to sandy to gravelly CLAY, low plasticity, brown, fine sized gravel, fine to coarse grained sand.	w ≈ PL-w > PL	VSt-H	Residual	
		8									
		12									
		T									
				1			**BH16 refusal at 1m (refusal on sandstone rock)**				

Hunter Civilab

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Geotechnical Log - Borehole

BH17

UTM	: 56H	**Drill Rig**	: Ute Mounted Drill Rig	**Job Number**	: G0558
Easting (m)	: 385,501.01	**Driller Supplier**	: Hunter Civilab	**Client**	: Port Stephens Shire Council
Northing (m)	: 6,394,246.63	**Logged By**	: JT	**Project**	: East Seaham Road, East Seaham (stage 6 Road Reconstruction)
Ground Elevation	: Not Surveyed	**Reviewed By**	: NR	**Location**	: East Seaham Road, East Seaham
Total Depth	: 1.2 m BGL	**Date**	: 29/05/2024	**Loc Comment**	: CH:1570m (1m of Right CL)

Drilling Method	Water	DCP graph	Samples	Depth (m)	Graphic Log	Classification Code	Material Description	Moisture	Consistency/Density	Soil Origin	Remarks
				0.1		GM	FILL: Silty to sandy GRAVEL, fine to coarse sized, fine to coarse grained sand, grey.	D		Fill	
						GM	FILL: Silty to sandy GRAVEL, fine to coarse sized, fine to coarse grained sand, brown.			Fill	
		3		0.3							
		3				GC	Clayey to silty to sandy GRAVEL, fine to coarse sized, fine to coarse grained sand, brown, low plasticity clay.		D	Residual	
		4									
		4									
		6									
		6									
		T		1							
							BH17 Terminated at 1.2m				

Hunter Civilab

Unit 3, 62 Sandringham Avenue Thornton NSW 2322

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Geotechnical Log - Borehole

BH18

UTM	: 56H	**Drill Rig**	: Ute Mounted Drill Rig	**Job Number**	: G0558
Easting (m)	: 385,535.43	**Driller Supplier**	: Hunter Civilab	**Client**	: Port Stephens Shire Council
Northing (m)	: 6,394,237.16	**Logged By**	: JT	**Project**	: East Seaham Road, East Seaham (stage 6 Road Reconstruction)
Ground Elevation	: Not Surveyed	**Reviewed By**	: NR	**Location**	: East Seaham Road, East Seaham
Total Depth	: 0.3 m BGL	**Date**	: 29/05/2024	**Loc Comment**	: CH:1670m (1m Right of CL)

Drilling Method	Water	DCP graph	Samples: Bulk	Depth (m)	Graphic Log	Classification Code	Material Description	Moisture	Consistency/Density	Soil Origin	Remarks
				0.1		GM	FILL: Silty to sandy GRAVEL, fine to coarse sized, fine to coarse grained sand, grey.	D		Fill	
				0.2		GM	FILL: Silty to sandy GRAVEL, fine to coarse sized, fine to coarse grained sand, brown.			Fill	
		R	1 bulk			SST	Highly weathered SANDSTONE, fine to medium grained, brown orange, indistinct, very low to low strength.		VLS-LS	Rock	
				1			**BH18 refusal at 0.3m**				

Figure 7 – Showing Borehole 18

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Unit 3, 62 Sandringham Avenue Thornton NSW 2322

Phone: (02) 4966 1844

Geotechnical Log - Borehole

BH19

UTM	: 56H	**Drill Rig**	: Ute Mounted Drill Rig	**Job Number**	: G0558
Easting (m)	: 385,535.43	**Driller Supplier**	: Hunter Civilab	**Client**	: Port Stephens Shire Council
Northing (m)	: 6,394,237.16	**Logged By**	: JT	**Project**	: East Seaham Road, East Seaham (stage 6 Road Reconstruction)
Ground Elevation	: Not Surveyed	**Reviewed By**	: NR	**Location**	: East Seaham Road, East Seaham
Total Depth	: 1 m BGL	**Date**	: 29/05/2024	**Loc Comment**	: CH: 1755m (1m Left of CL)

Drilling Method	Water	DCP graph	Samples: Bulk	Depth (m)	Graphic Log	Classification Code	Material Description	Moisture	Consistency/Density	Soil Origin	Remarks
				0.1		GM	FILL: Silty to sandy GRAVEL, fine to coarse sized, fine to coarse grained sand, grey.	D		Fill	
				0.3		GM	FILL: Silty to sandy GRAVEL, fine to coarse sized, fine to coarse grained sand, brown.			Fill	
		6 8 12 15 T	2 bulk	1		SC	Clayey to gravelly SAND, fine to coarse grained, fine to medium sized gravel, brown / red, low plasticity clay, extremely weathered material		D-VD	Residual	
							BH19 refusal at 1m				

Figure 8 – Showing Borehole 19

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Unit 3, 62 Sandringham Avenue Thornton NSW 2322

Phone: (02) 4966 1844

Geotechnical Log - Borehole

BH20

UTM	: 56H	**Drill Rig**	: Ute Mounted Drill Rig	**Job Number**	: G0558
Easting (m)	: 385,535.43	**Driller Supplier**	: Hunter Civilab	**Client**	: Port Stephens Shire Council
Northing (m)	: 6,394,237.16	**Logged By**	: JT	**Project**	: East Seaham Road, East Seaham (stage 6 Road Reconstruction)
Ground Elevation	: Not Surveyed	**Reviewed By**	: NR	**Location**	: East Seaham Road, East Seaham
Total Depth	: 1 m BGL	**Date**	: 29/05/2024	**Loc Comment**	: CH:1860m (1m Right of CL)

Drilling Method	Water	DCP graph	Samples	Depth (m)	Graphic Log	Classification Code	Material Description	Moisture	Consistency/Density	Soil Origin	Remarks
				0.1		GM	FILL: Silty to sandy GRAVEL, fine to coarse sized, fine to coarse grained sand, grey.	D		Fill	
				0.3		GM	FILL: Silty to sandy GRAVEL, fine to medium sized, fine to coarse grained sand, brown.			Fill	
		13				GC	FILL: Clayey to silty to sandy GRAVEL, fine to coarse sized, fine to coarse grained sand, low plasticity clay, brown, with basalt and granite cobbles.			Fill	
		R		1							
							BH20 refusal at 1m (refusal on sandstone rock)				

Hunter Civilab

Unit 3, 62 Sandringham Avenue Thornton NSW 2322

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Geotechnical Log - Borehole

BH21

UTM	: 56H	**Drill Rig**	: Ute Mounted Drill Rig	**Job Number**	: G0558
Easting (m)	: 385,535.43	**Driller Supplier**	: Hunter Civilab	**Client**	: Port Stephens Shire Council
Northing (m)	: 6,394,237.16	**Logged By**	: JT	**Project**	: East Seaham Road, East Seaham (stage 6 Road Reconstruction)
Ground Elevation	: Not Surveyed	**Reviewed By**	: NR	**Location**	: East Seaham Road, East Seaham
Total Depth	: 1.2 m BGL	**Date**	: 29/05/2024	**Loc Comment**	: CH: 1960m (1m Left of CL)

Drilling Method	Water	DCP graph	Samples: Bulk	Depth (m)	Graphic Log	Classification Code	Material Description	Moisture	Consistency/Density	Soil Origin	Remarks
				0.1		GM	FILL: Silty to sandy GRAVEL, fine to coarse sized, fine to coarse grained sand, grey.	M-D		Fill	
						GM	FILL: Silty to sandy GRAVEL, fine to coarse sized, fine to coarse grained sand, brown.	D		Fill	
			2 bulk	0.3							
		4				CI-CH	Silty to sandy to gravelly CLAY, medium to high plasticity, grey, fine sized gravel, fine to medium grained sand, with roots.	w > PL	F-St	Residual	
		6									
		6	2 bulk								
		6									
		6									
		9									
		T									
				1	1						
						CL	Sandy to gravelly CLAY, low plasticity, brown, fine to medium sized gravel, fine to coarse grained sand.	w ≈ PL	St-VSt	Residual	
							BH21 Terminated at 1.2m				

Figure 9 – Showing Borehole 21

Hunter Civilab

Unit 3, 62 Sandringham Avenue Thornton NSW 2322

Phone: (02) 4966 1844

Geotechnical Log - Borehole

BH22

UTM	**: 56H**	**Drill Rig**	**: Ute Mounted Drill Rig**	**Job Number**	**: G0558**
Easting (m)	**: 385,535.43**	**Driller Supplier**	**: Hunter Civilab**	**Client**	**: Port Stephens Shire Council**
Northing (m)	**: 6,394,237.16**	**Logged By**	**: JT**	**Project**	**: East Seaham Road, East Seaham (stage 6 Road Reconstruction)**
Ground Elevation	**: Not Surveyed**	**Reviewed By**	**: NR**	**Location**	**: East Seaham Road, East Seaham**
Total Depth	**: 1.2 m BGL**	**Date**	**: 29/05/2024**	**Loc Comment**	**: CH:2040m (1m Right of CL)**

Drilling Method	Water	DCP graph	Samples	Depth (m)	Graphic Log	Classification Code	Material Description	Moisture	Consistency/Density	Soil Origin	Remarks
				0.1		GM	FILL: Silty to sandy GRAVEL, fine to coarse sized, fine to coarse grained sand, grey.	D		Fill	
						GM	FILL: Silty to sandy GRAVEL, fine to coarse sized, fine to coarse grained sand, brown.			Fill	
				0.3		SM	FILL: Silty to gravelly SAND, fine to coarse grained, fine to coarse sized gravel, brown, with cobble size sandstone floaters .			Fill	
		6									
		9									
		7									
		7									
		14									
		R		1							
							BH22 Terminated at 1.2m				

Hunter Civilab

Unit 3, 62 Sandringham Avenue Thornton NSW 2322

Phone: (02) 4966 1844

Geotechnical Log - Borehole

BH23

UTM	: 56H	**Drill Rig**	: Ute Mounted Drill Rig	**Job Number**	: G0558
Easting (m)	: 385,535.43	**Driller Supplier**	: Hunter Environmental Consulting	**Client**	: Port Stephens Shire Council
Northing (m)	: 6,394,237.16	**Logged By**	: JT	**Project**	: East Seaham Road, East Seaham (stage 6 Road Reconstruction)
Ground Elevation	: Not Surveyed	**Reviewed By**	: NR	**Location**	: East Seaham Road, East Seaham
Total Depth	: 1.2 m BGL	**Date**	: 29/05/2024	**Loc Comment**	: CH: 2070m (1m Left of CL)

Drilling Method	Water	DCP graph	Samples	Depth (m)	Graphic Log	Classification Code	Material Description	Moisture	Consistency/Density	Soil Origin	Remarks
				0.02		FILL	Two Coat Seal			Non-Soil	
						GM	Silty to sandy GRAVEL, fine to coarse sized, fine to coarse grained sand, grey.	D		Fill (Sub-base	
		2									
				0.4							
		4				CI-CH	Silty to sandy CLAY, medium to high plasticity, grey / brown, fine grained sand.	w > PL	F-St	Alluvial	
		3									
		4									
		4									
		6									
		6		1							
		T									
							BH23 Terminated at 1.2m				

Figure 10 – Showing Borehole 23

Hunter Civilab

Unit 3, 62 Sandringham Avenue Thornton NSW 2322

Phone: (02) 4966 1844

Geotechnical Log - Borehole

BHN1

UTM	**: 43Q**	**Drill Rig**	**: Ute Mounted Drill Rig**	**Job Number**	**: G0558**
Easting (m)	**: 0.00**	**Driller Supplier**	**: Hunter Civilab**	**Client**	**: Port Stephens Shire Council**
Northing (m)	**: 0.00**	**Logged By**	**: JT**	**Project**	**: East Seaham Road, East Seaham (stage 6 Road Reconstruction)**
Ground Elevation	**: Not Surveyed**	**Reviewed By**	**: NR**	**Location**	**: East Seaham Road, East Seaham**
Total Depth	**: 0.5 m BGL**	**Date**	**: 28/05/2024**	**Loc Comment**	**: CH:205m (7m Left of CL)**

Drilling Method	Water	DCP graph	Samples: Bulk	Depth (m)	Graphic Log	Classification Code	Material Description	Moisture	Consistency/Density	Soil Origin	Remarks
		0		0.05		CL	Silty CLAY, low plasticity, brown, with organics.	w > PL	VS	Topsoil	
		1				CL-Cl	Silty to sandy CLAY, low to medium plasticity, brown, fine grained sand.		F-St	Residual	
		2									
		4									
		9		0.4		SST	Extremely weathered SAND, fine grained, brown, inferred very low strength	M-D		Rock	
		T		1			**BHN1 refusal at 0.5m**				

Hunter Civilab

Unit 3, 62 Sandringham Avenue Thornton NSW 2322

Phone: (02) 4966 1844

Geotechnical Log - Borehole

BHN2

UTM	: 56H	**Drill Rig**	: Ute Mounted Drill Rig	**Job Number**	: G0558
Easting (m)	: 385,501.01	**Driller Supplier**	: Hunter Civilab	**Client**	: Port Stephens Shire Council
Northing (m)	: 6,394,246.63	**Logged By**	: JT	**Project**	: East Seaham Road, East Seaham (stage 6 Road Reconstruction)
Ground Elevation	: Not Surveyed	**Reviewed By**	: NR	**Location**	: East Seaham Road, East Seaham
Total Depth	: 1.2 m BGL	**Date**	: 28/05/2024	**Loc Comment**	: CH: 295m (8m Left of CL)

Drilling Method	Water	DCP graph	Samples	Depth (m)	Graphic Log	Classification Code	Material Description	Moisture	Consistency/Density	Soil Origin	Remarks
		0				CL	Silty to sandy CLAY, low plasticity, brown, fine grained sand, with organics.	w > PL	VS	Topsoil	
		0		0.1		CL-Cl	Silty to sandy CLAY, low to medium plasticity, grey brown, fine to medium grained sand.	w ≈ PL	F-St	Residual	
		0									
		3									
		6									
		5									
		5									
		6									
		5									
		6									
		6		1		CL-Cl	As above, but fine to coarse grained sand.			Residual	
		T									
							BHN2 Terminated at 1.2m				

Hunter Civilab

Unit 3, 62 Sandringham Avenue Thornton NSW 2322

Phone: (02) 4966 1844

Geotechnical Log - Borehole

BHN3

UTM	: 56H	**Drill Rig**	: Ute Mounted Drill Rig	**Job Number**	: G0558
Easting (m)	: 385,693.28	**Driller Supplier**	: Hunter Civilab	**Client**	: Port Stephens Shire Council
Northing (m)	: 6,391,123.08	**Logged By**	: JT	**Project**	: East Seaham Road, East Seaham (stage 6 Road Reconstruction)
Ground Elevation	: Not Surveyed	**Reviewed By**	: NR	**Location**	: East Seaham Road, East Seaham
Total Depth	: 1.2 m BGL	**Date**	: 28/05/2024	**Loc Comment**	: CH: 380m (12m Left of CL)

Drilling Method	Water	DCP graph	Samples: Bulk	Depth (m)	Graphic Log	Classification Code	Material Description	Moisture	Consistency/Density	Soil Origin	Remarks
		0				CL	Silty CLAY, low plasticity, brown, with fine grained sand, with organics.	w ≈ LL	VS	Topsoil	
		0		0.1		CL	Silty to sandy CLAY, low plasticity, black brown, fine grained sand, with organics.	w > PL		Alluvial	
		0									
		0									
		3		0.5							
		2				CL	As above, but		F-St	Alluvial	
		3									
		3									
		3									
		4									
	▶	6		1							
		6									
		7					**BHN3 Terminated at 1.2m**				
		7									
		9									
		T									

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Geotechnical Log - Borehole

BHR1

UTM	: 56H	**Drill Rig**	: Ute Mounted Drill Rig	**Job Number**	: G0558
Easting (m)	: 385,501.01	**Driller Supplier**	: Hunter Civilab	**Client**	: Port Stephens Shire Council
Northing (m)	: 6,394,246.63	**Logged By**	: JT	**Project**	: East Seaham Road, East Seaham (stage 6 Road Reconstruction)
Ground Elevation	: Not Surveyed	**Reviewed By**	: NR	**Location**	: East Seaham Road, East Seaham
Total Depth	: 0.6 m BGL	**Date**	: 28/05/2024	**Loc Comment**	: CH:830m (2m Right of CL)

Drilling Method	Water	DCP graph	Samples	Depth (m)	Graphic Log	Classification Code	Material Description	Moisture	Consistency/Density	Soil Origin	Remarks
						GM	FILL: Silty to sandy GRAVEL, fine to coarse sized, fine to coarse grained sand, grey.	D		Fill	
				0.3		SC	FILL: Clayey to gravelly SAND, fine to coarse grained, fine to coarse sized gravel, low plasticity clay, grey / brown.	M		Fill	
		9		0.5		SW	SAND, fine to coarse grained, grey / brown.		MD	Residual	
		R		1			**BHR1 refusal at 0.6m (refusal on sandstone rock)**				

Hunter Civilab

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Geotechnical Log - Borehole

BHR2

UTM	: 56H	**Drill Rig**	: Ute Mounted Drill Rig	**Job Number**	: G0558
Easting (m)	: 385,501.01	**Driller Supplier**	: Hunter Civilab	**Client**	: Port Stephens Shire Council
Northing (m)	: 6,394,246.63	**Logged By**	: JT	**Project**	: East Seaham Road, East Seaham (stage 6 Road Reconstruction)
Ground Elevation	: Not Surveyed	**Reviewed By**	: NR	**Location**	: East Seaham Road, East Seaham
Total Depth	: 1.1 m BGL	**Date**	: 28/05/2024	**Loc Comment**	: CH: 840m (2m Right of CL)

Drilling Method	Water	DCP graph	Samples	Depth (m)	Graphic Log	Classification Code	Material Description	Moisture	Consistency/Density	Soil Origin	Remarks
						GM	FILL: Silty to sandy GRAVEL, fine to coarse sized, fine to coarse grained sand, grey.	M-D		Fill	
				0.3							
		3				SC	Clayey SAND, fine to coarse grained, trace fine sized gravel, grey / brown, low plasticity clay.		MD-D	Residual	
		4									
		4									
		4									
		5									
		5									
		9									
		R		1		SST	Extremely weathered SAND, fine grained, brown.	D	VD	Rock	
							BHR2 refusal at 1.1m				

Hunter Civilab

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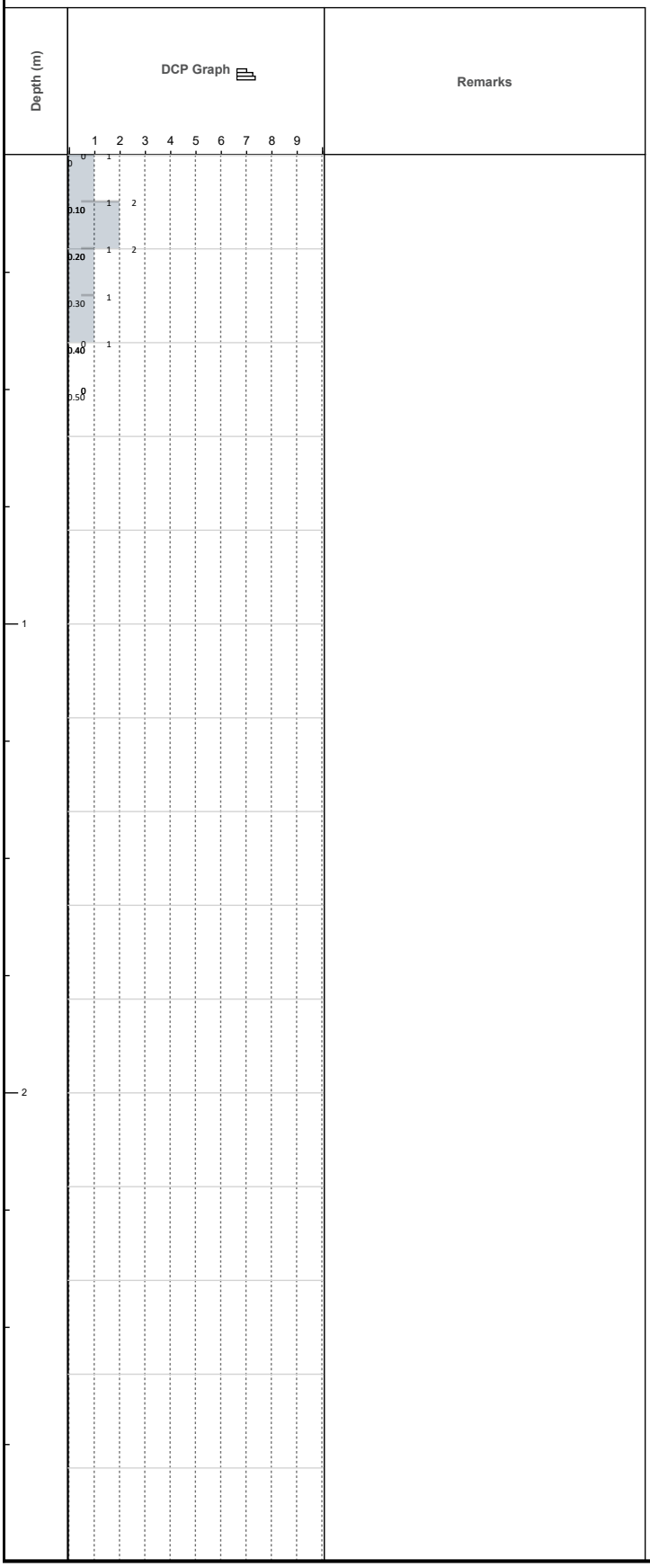
Geotechnical Log - Borehole

DCP N4

UTM	:	**Drill Rig**	: Ute Mounted Drill Rig	**Job Number**	: G0558
Easting (m)	: 0.00	**Driller Supplier**	: Hunter Civilab	**Client**	: Port Stephens Shire Council
Northing (m)	: 0.00	**Logged By**	: JT	**Project**	: East Seaham Road, East Seaham (stage 6 Road Reconstruction)
Ground Elevation	: Not Surveyed	**Reviewed By**	: NR	**Location**	: East Seaham Road, East Seaham
Total Depth	: 30 m BGL	**Date**	: 29/05/2024	**Loc Comment**	: CH: 250 (7m Left of CL)



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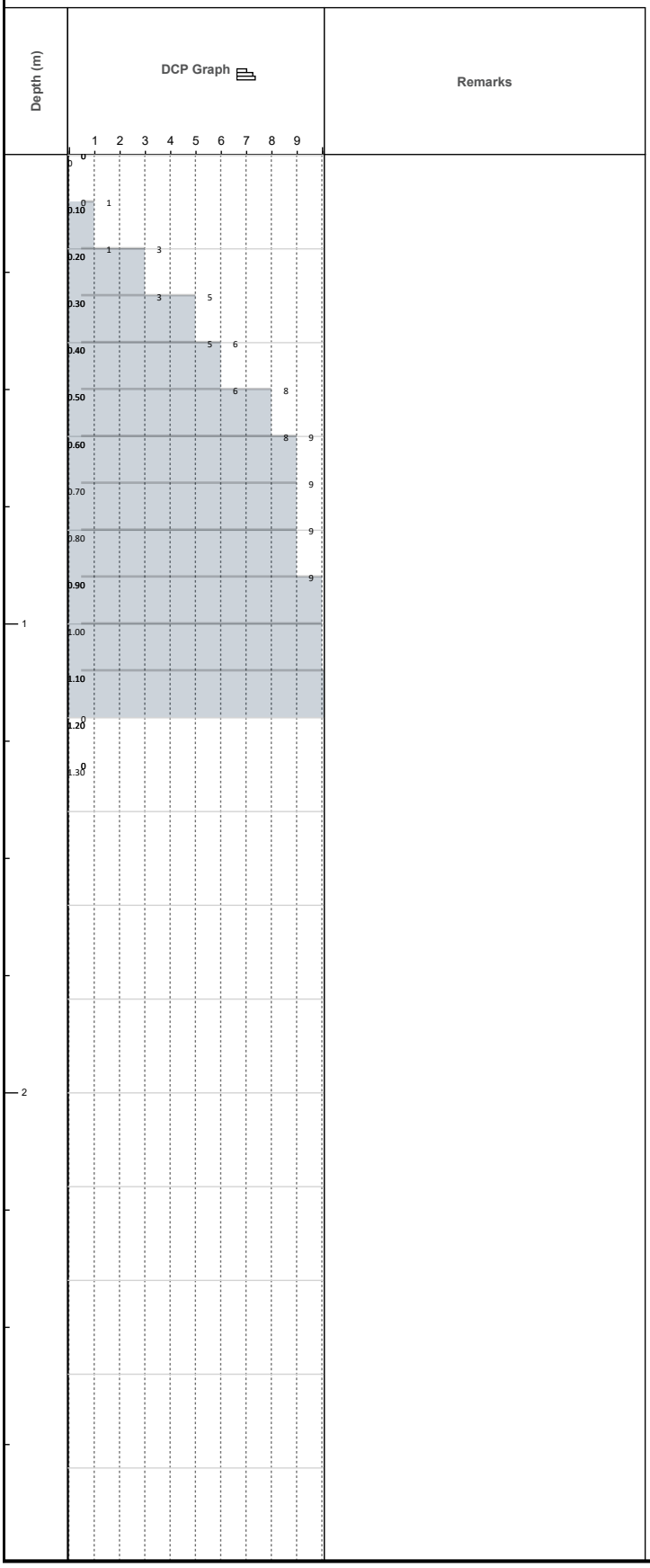
Phone: (02) 4966 1844

Geotechnical Log - Borehole

DCP N5

UTM	:	Drill Rig	: Ute Mounted Drill Rig	Job Number	: G0558
Easting (m)	: 0.00	Driller Supplier	: Hunter Civilab	Client	: Port Stephens Shire Council
Northing (m)	: 0.00	Logged By	: JT	Project	: East Seaham Road, East Seaham (stage 6 Road Reconstruction)
Ground Elevation	: Not Surveyed	Reviewed By	: NR	Location	: East Seaham Road, East Seaham
Total Depth	: 30 m BGL	Date	: 29/05/2024	Loc Comment	: CH: 320m (11m Left of CL)



Hunter Civilab

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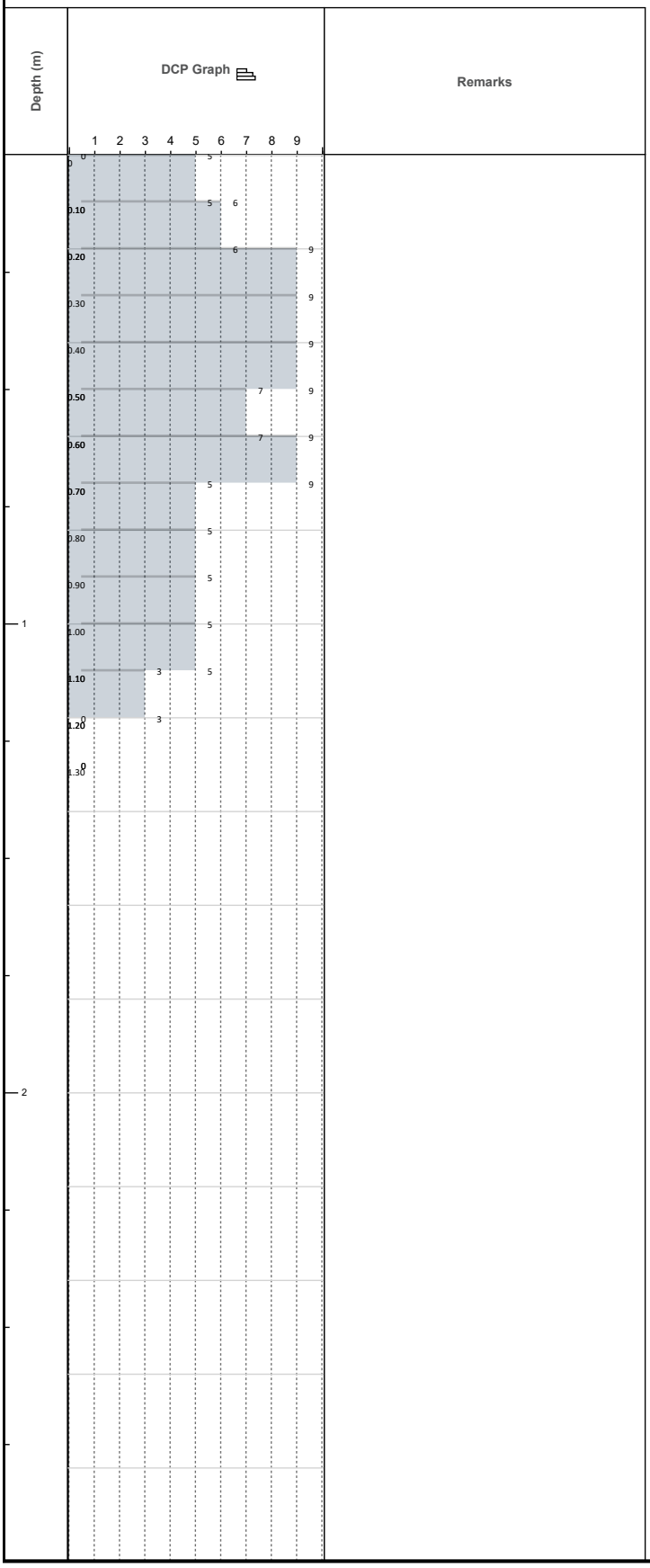
Phone: (02) 4966 1844

Geotechnical Log - Borehole

DCP N6

UTM	:	Drill Rig	: Ute Mounted Drill Rig	Job Number	: G0558
Easting (m)	: 0.00	Driller Supplier	: Hunter Civilab	Client	: Port Stephens Shire Council
Northing (m)	: 0.00	Logged By	: JT	Project	: East Seaham Road, East Seaham (stage 6 Road Reconstruction)
Ground Elevation	: Not Surveyed	Reviewed By	: NR	Location	: East Seaham Road, East Seaham
Total Depth	: 30 m BGL	Date	: 29/05/2024	Loc Comment	: CH: 405m (11m Left of CL)



Hunter Civilab

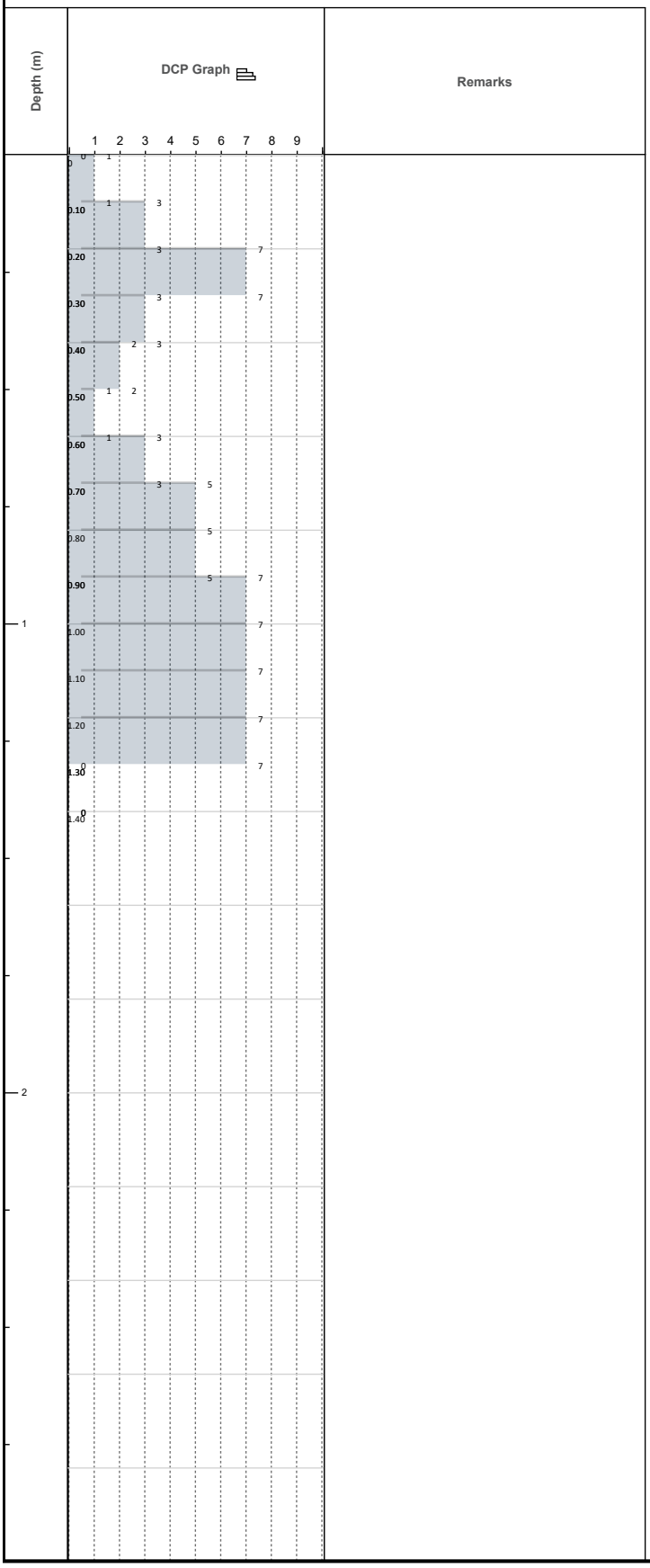
Unit 3, 62 Sandringham Avenue Thornton NSW 2322

Phone: (02) 4966 1844

Geotechnical Log - Borehole

DCP R3

UTM	:	**Drill Rig**	: Ute Mounted Drill Rig	**Job Number**	: G0558
Easting (m)	: 0.00	**Driller Supplier**	: Hunter Civilab	**Client**	: Port Stephens Shire Council
Northing (m)	: 0.00	**Logged By**	: JT	**Project**	: East Seaham Road, East Seaham (stage 6 Road Reconstruction)
Ground Elevation	: Not Surveyed	**Reviewed By**	: NR	**Location**	: East Seaham Road, East Seaham
Total Depth	: 30 m BGL	**Date**	: 29/05/2024	**Loc Comment**	: CH: 833(6m Right of CL)



Hunter Civilab

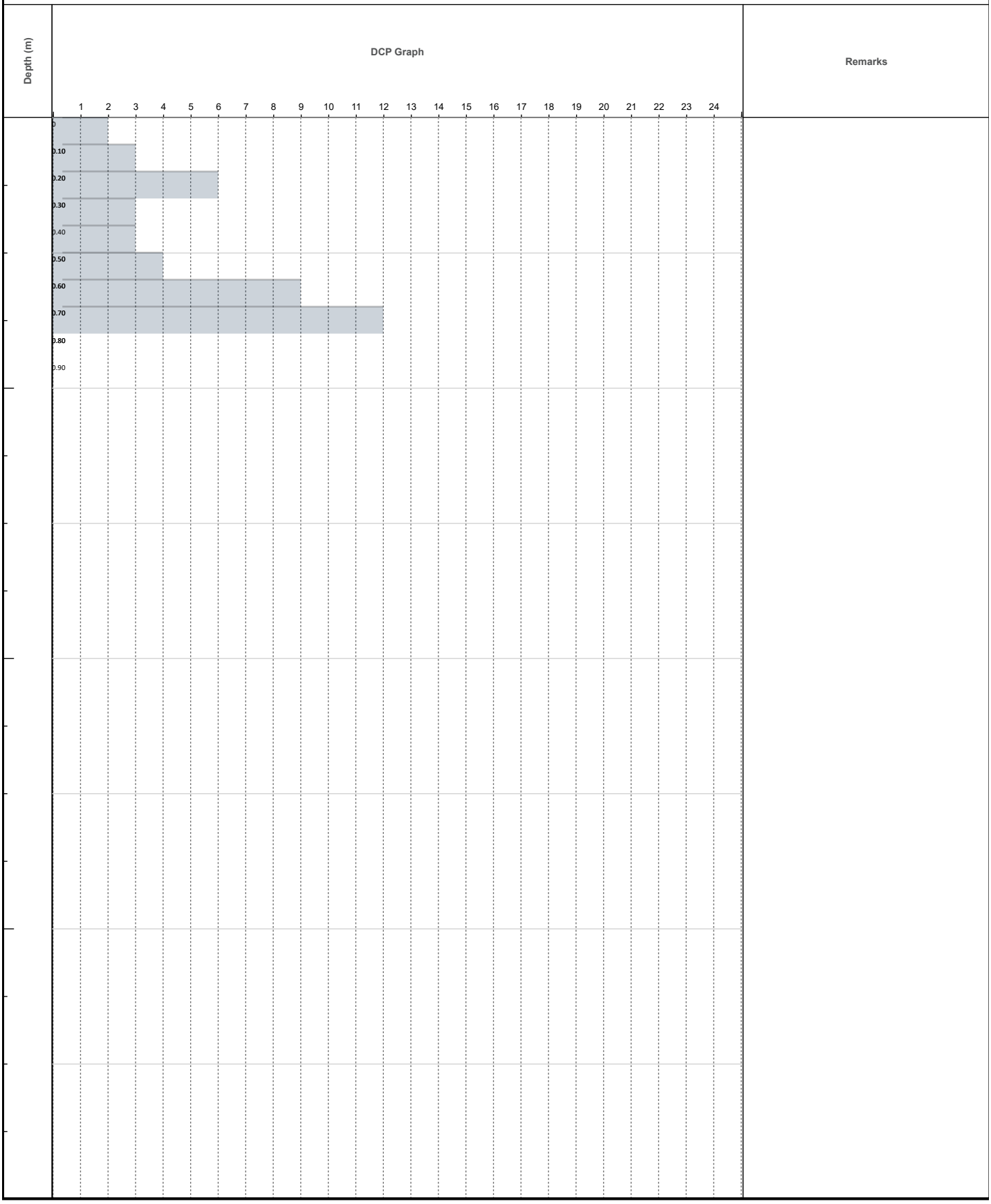
Unit 3, 62 Sandringham Avenue Thornton NSW 2322

Phone: (02) 4966 1844

Geotechnical Log - Borehole

DCP R4

UTM	:	Drill Rig	: Ute Mounted Drill Rig	Job Number	: G0558
Easting (m)	: 0.00	Driller Supplier	: Hunter Civilab	Client	: Port Stephens Shire Council
Northing (m)	: 0.00	Logged By	: JT	Project	: East Seaham Road, East Seaham (stage 6 Road Reconstruction)
Ground Elevation	: Not Surveyed	Reviewed By	: NR	Location	: East Seaham Road, East Seaham
Total Depth	: 30 m BGL	Date	: 29/05/2024	Loc Comment	: CH: 838m (6m Right of CL)



1 Introduction

The following notes are provided to be used in conjunction with Hunter Civilab's report to explain the terms and abbreviations used throughout the report.

2 Material Descriptions

Descriptions of soil and rock are generally in accordance with the Unified Soil Classification System and Australian Standard AS1726-2017 – Geotechnical Site Investigations. The descriptions of soil and rock are based on field tests and observations and are independent of any laboratory test results. The data presented throughout this report is as factual as possible. However, some interpretations is unavoidable.

2.1 Unified Soil Classification Group Symbols

Soils are generally assigned one of the following unified soil classification group symbols:

Table 2.1 - Unified Soil Classification Group Symbols

Symbol	Description
CH	Organic clays of high plasticity
OL	Organic silts of low plasticity
MH	Inorganic silts of high plasticity
ML	Inorganic silts of low plasticity
GC	Clayey gravels
GM	Silty gravels
GP	Poorly graded gravels
GW	Well graded gravels

Symbol	Description
Pt	Peat and other highly organic soils
CH	Inorganic clays of high plasticity
CI	Inorganic clays of low plasticity
CL	Inorganic clays of low plasticity
SC	Clayey sands
SM	Silty sands
SP	Poorly graded sands
SW	Well graded sands

2.2 Soil Description

Soils are described in general accordance with AS1726-2017, Section 6.1:

Table 2.2 - Particle Size Definitions (AS1726-2017, Table 1)

Component	Subdivision	Size (mm)
BOULDERS		>200
COBBLES		63 - 200
GRAVEL	Coarse	19 - 63
	Medium	6.7 - 19
	Fine	2.36 - 6.7
SAND	Coarse	0.6 - 2.36
	Medium	0.21 - 0.6
	Fine	0.075 - 0.21
SILT		0.002 - 0.075
CLAY		<0.002

Table 2.3 - Descriptive Terms for Accessory Soil Components (AS1726-2017, Table 2)

Designation of Components	In Coarse Grained Soils				In Fine Grained Soils	
	% Fines	Terminology	% Accessory Coarse Fraction	Terminology	% Sand / Gravel	Terminology
Minor	≤ 5	Add 'trace clay / silt' to description where applicable	≤ 15	Add 'trace sand / gravel' to description where applicable	≤ 15	Add 'trace sand / gravel' to description where applicable
	> 5, ≤ 12	Add 'with clay / silt' to description where applicable	> 15, ≤ 30	Add 'with sand / gravel' to description where applicable	> 15, ≤ 30	Add 'with sand / gravel' to description where applicable
Secondary	> 12	Prefix soil name as 'Silty' or 'Clayey', as applicable	> 30	Prefix soil name as 'Sandy' or 'Gravelly', as applicable	> 30	Prefix soil name as 'Sandy' or 'Gravelly', as applicable

Table 2.4 - Descriptive Terms for Plasticity (AS1726-2017, Table 6)

Descriptive Term	Range of Liquid Limit for SILT	Range of Liquid Limit for CLAY
Non-Plastic	Not applicable	Not applicable
Low Plasticity	≤ 50	≤ 35
Medium Plasticity	Not applicable	> 35 and ≤ 50
High Plasticity	> 50	> 50

Table 2.5 - Moisture Condition (AS1726-2017, Clause 6.1.7 (a))

Material	Term	Abbreviation	Field Description Terms
Coarse Grained Soil	Dry	D	Non-cohesive and free-running
	Moist	M	Soil feels cool, darkened in colour; Soil tends to stick together
	Wet	W	Soil feels cool, darkened in colour; Soil tends to stick together, free water forms when handling
Fine Grained Soil	Moist, dry of plastic limit	w < PL	Hard and friable or powdery
	Moist, near plastic limit	w ≈ PL	Soil can be moulded at a moisture content approximately equal to the plastic limit
	Moist, wet of plastic limit	w > PL	Soil usually weakened and free water forms on hands when handling
	Wet, near liquid limit	w ≈ LL	Near liquid limit
	Wet, wet of liquid limit	w > LL	Wet of liquid limit

Table 2.6 - Consistency Terms for Cohesive Soils (AS1726-2017, Table 11)

Consistency	Abbreviation	Field Guide to Consistency
Very Soft	VS	Exudes between the fingers when squeezed in hand
Soft	S	Can be moulded by light finger pressure
Firm	F	Can be moulded by strong finger pressure
Stiff	St	Cannot be moulded by fingers
Very Stiff	VSt	Can be indented by thumb nail
Hard	H	Can be indented with difficulty by thumb nail
Friable	Fr	Can be easily crumbled or broken into small pieces by hand

Table 2.7 - Relative Density of Non-Cohesive Soils (AS1726-2017, Table 12)

Relative Density	Abbreviation	Density Index (%)
Very Loose	VL	≤ 15
Loose	L	> 15 and ≤ 35
Medium Dense	MD	> 35 and ≤ 65
Dense	D	> 65 and ≤ 85
Very Dense	VD	> 85

Table 2.8 - Soil Origin (AS1726-2017, Clause 6.1.9)

Origin	Description
Residual Soil	Formed directly from in situ weathering of geological formations. These soils no longer retain any visible structure of fabric of the parent soil or rock material.
Extremely weathered material	Formed directly from in situ weathering of geological formations. Although this material is of soil strength, it retains the structure and / or fabric of the parent rock material.
Alluvial soil	Deposited by streams and rivers.
Estuarine soil	Deposited in coastal estuaries, and including sediments carried by inflowing rivers and streams, and tidal currents.
Marine soil	Deposited in a marine environment.
Lacustrine soil	Deposited in freshwater lakes.
Aeolian soil	Carried and deposited by wind.
Colluvial soil	Soil and rock debris transported down slopes by gravity, with or without the assistance of flowing water and generally deposited in gullies or at the base of slopes. Colluvium is often used to refer to thicker deposits such as those formed from landslides, whereas the term 'slopewash' may be use for thinner and more widespread deposits that accumulate gradually over longer geological timeframes.
Topsoil	Surface and / or near surface soils often, but not always, defined by high levels of organic material.
Fill	Material placed by anthropogenic processes.

2.3 Rock Description

Rocks are described in general accordance with AS1726-2017, Clause 6.2.

Table 2.9 - Rock Material Strength Classification (AS1726-2017, Table 19)

Strength	Abbreviation	Field Assessment
Very Low Strength	VLS	Material crumbles under firm blows with sharp end of pick; Can be peeled with sharp knife; Too hard to cut a triaxial sample by hand; Pieces up to 30mm thick can be broken by finger pressure.
Low Strength	LS	Easily scored with a knife; Indentations 1mm to 3mm show in the specimen with firm blows of the pick point; Has dull sound under the hammer; A piece of core 150mm long by 50mm diameter may be broken by hand; Sharp edges of core may be friable and break during handling.
Medium Strength	MS	Readily scored with a knife; A piece of core 150mm long by 50mm diameter can be broken by hand with difficulty.
High Strength	HS	A piece of core 150mm long by 50mm diameter cannot be broken by hand but can be broken by a pick with a single firm blow; Rock rings under hammer.
Very High Strength	VH	Hand specimen breaks with pick after more than one blow; Rock rings under hammer.
Extremely High Strength	EH	Specimen required many blows with geological pick to break through intact material; Rock rings under hammer.

Note: Material with strength less than 'Very Low' shall be described using soil characteristics. The presence of an original rock structure, fabric or texture should be noted, if relevant.

Table 2.10 - Classification of Material Weathering (AS1726-2017, Table 20)

Term		Abbreviation		Definition
Residual Soil		RS		Material is weathered to such an extent that is has soil properties. Mass structure and material texture and fabric of original rock are no longer visible, but the soil has not been significantly transported. The material is described using soil descriptive terms.
Extremely Weathered		XW		Material is weathered to such an extent that is has soil properties. Mass structure and material structure and fabric of original rock are still visible. The material is described using soil descriptive terms.
Highly Weathered	Distinctly Weathered	HW	DW	The whole of the rock material is discoloured, usually by iron staining or bleaching to the extent that the colour of the original rock is not recognizable. Rock strength is significantly changed by weathering.
Moderately Weathered		MW		The whole of the rock material is discoloured, usually by iron staining or bleaching to the extent that the colour of the original rock is not recognizable, but shows little or no change of strength from fresh rock.
Slightly Weathered		SW		Rock is partially discoloured with staining or bleaching along joints but shows little or no change of strength from fresh rock.
Fresh		FR		Rock shows no sign of decomposition of individual minerals or colour changes.

3 Drilling, In Situ Testing & Sampling Methodology

Table 3.1 - Drilling Methods

Abbreviation	Method
HA	Hand Auger
EX	Excavator bucket
AV	Auger drilling with steel 'V' bit
AT	Auger drilling with tungsten carbide bit
AB	Auger for bulk sampling
WB	Wash bore rotary drilling
NMLC	Rock coring using a NMLC core barrel
HQ	Rock coring using a HQ core barrel

Table 3.2 - Field Sampling and In Situ Testing Key

Abbreviation	In Situ Test
DCP	Dynamic Cone Penetrometer (blows/100mm)
PSP	Perth Sand Penetrometer (blow/100mm)
SPT	Standard Penetrometer Test
PP	Pocket Penetrometer Measurement (kPa)
3,4,5 (example)	SPT blows per 150mm
N=9 (example)	STP 'blow count number' over 300mm after initial 150mm seating
VS	Handheld Shear Vane Measurement (kPa)
CPT	Cone Penetrometer Test
IS50 (D) (A)	Point Load Index Value (reported in MPA) (D) = Diametric (A) = Axial

Abbreviation	Sample Type
U	Undisturbed Sample (50mm)
D	Disturbed Sample
B	Bulk Disturbed Sample
ES	Environmental Sample
W	Water Sample

4 Groundwater Observations

Table 4.1 - Water Comments Key

Water Comment	Symbol
Water Inflow	
Water / drilling fluid loss	
Measurement of standing water level	
Water Noted	

Annex C

Material Test Report

Report Number: **P24967-63A**
Issue Number: 1
Date Issued: 18/06/2024
Client: Hunter Civilab
3/62 Sandringham Avenue, Thornton New South Wales 2322
Contact: Nathan Roberts
Project Number: P24967
Project Name: Geotechnical Consulting Services (THO)
Project Location: East Seaham Road Stage 6 Road Reconstruction
Client Reference: G0558
Work Request: 15203
Sample Number: 24-15203A
Date Sampled: 29/05/2024
Dates Tested: 30/05/2024 - 04/06/2024
Sampling Method: Sampled by Engineering Department
The results apply to the sample as received
Preparation Method: In accordance with the test method
Sample Location: **BH1, Depth: 0.0-0.3m**
Material: Sandy Gravel

Hunter Civilab
62 Sandringham Avenue Thornton NSW 2322
Phone: (02) 4966 1844
Email: sc@huntercivilab.com.au

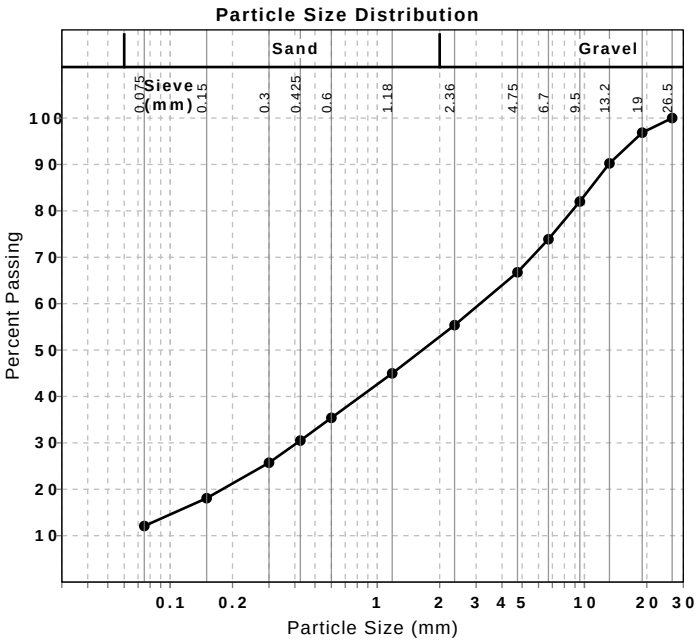
Accredited for compliance with ISO/IEC 17025 - Testing

Approved Signatory: Scott Callinan
Laboratory Operations Manager
NATA Accredited Laboratory Number: 14975

Particle Size Distribution (AS1289 3.6.1)			
Sieve	Passed %	Passing Limits	
26.5 mm	**100**		
19 mm	**97**		
13.2 mm	**90**		
9.5 mm	**82**		
6.7 mm	**74**		
4.75 mm	**67**		
2.36 mm	**55**		
1.18 mm	**45**		
0.6 mm	**35**		
0.425 mm	**30**		
0.3 mm	**26**		
0.15 mm	**18**		
0.075 mm	**12**		

Atterberg Limit (AS1289 3.1.2 & 3.2.1 & 3.3.1)		Min	Max
Sample History	Oven Dried		
Preparation Method	Dry Sieve		
Liquid Limit (%)	Not Obtainable		
Plastic Limit (%)	Not Obtainable		
Plasticity Index (%)	**Non Plastic**		
Linear shrinkage could not be determined as the liquid limit could not be obtained and the material is non-plastic.			

Linear Shrinkage (AS1289 3.4.1)		Min	Max
Moisture Condition Determined By	AS 1289.3.1.2		
Linear Shrinkage (%)			
Cracking Crumbling Curling			
Linear shrinkage could not be determined as the liquid limit could not be obtained and the material is non-plastic.			



Material Test Report

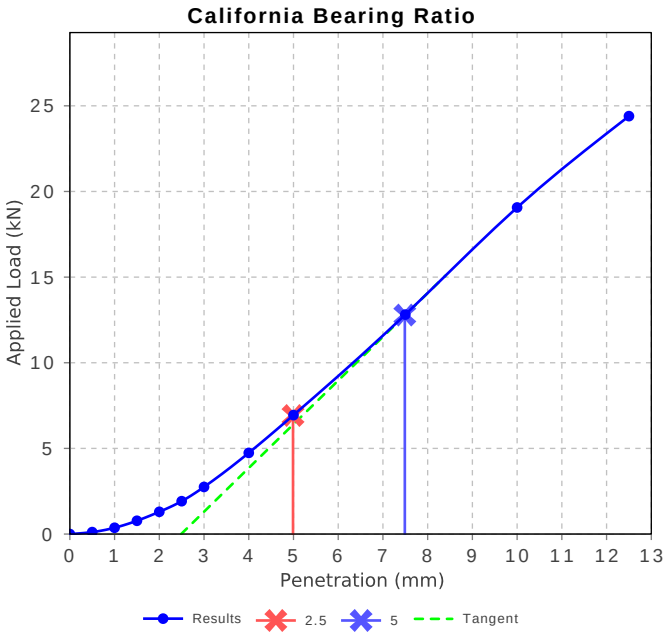
Report Number: **P24967-63A**
Issue Number: 1
Date Issued: 18/06/2024
Client: Hunter Civilab
3/62 Sandringham Avenue, Thornton New South Wales 2322
Contact: Nathan Roberts
Project Number: P24967
Project Name: Geotechnical Consulting Services (THO)
Project Location: East Seaham Road Stage 6 Road Reconstruction
Client Reference: G0558
Work Request: 15203
Sample Number: 24-15203A
Date Sampled: 29/05/2024
Dates Tested: 30/05/2024 - 11/06/2024
Sampling Method: Sampled by Engineering Department
The results apply to the sample as received
Preparation Method: In accordance with the test method
Sample Location: **BH1, Depth: 0.0-0.3m**
Material: Sandy Gravel

Hunter Civilab
62 Sandringham Avenue Thornton NSW 2322
Phone: (02) 4966 1844
Email: sc@huntercivilab.com.au

Accredited for compliance with ISO/IEC 17025 - Testing

Approved Signatory: Scott Callinan
Laboratory Operations Manager
NATA Accredited Laboratory Number: 14975

California Bearing Ratio (AS 1289 6.1.1 & 2.1.1)		Min	Max
CBR taken at	5 mm		
CBR %	**60**		
Method of Compactive Effort	Standard		
Method used to Determine MDD	AS 1289 5.1.1 & 2.1.1		
Method used to Determine Plasticity	vt		
Maximum Dry Density (t/m^3)	2.11		
Optimum Moisture Content (%)	8.0		
Laboratory Density Ratio (%)	100.5		
Laboratory Moisture Ratio (%)	102.0		
Dry Density after Soaking (t/m^3)	2.14		
Field Moisture Content (%)	5.9		
Moisture Content at Placement (%)	8.1		
Moisture Content Top 30mm (%)	9.2		
Moisture Content Rest of Sample (%)	8.1		
Mass Surcharge (kg)	4.5		
Soaking Period (days)	4		
Curing Hours (h)	97.8		
Swell (%)	-1.0		
Oversize Material (mm)	19		
Oversize Material Included	Excluded		
Oversize Material (%)	3.0		



Material Test Report

Report Number: **P24967-63A**
Issue Number: 1
Date Issued: 18/06/2024
Client: Hunter Civilab
3/62 Sandringham Avenue, Thornton New South Wales 2322
Contact: Nathan Roberts
Project Number: P24967
Project Name: Geotechnical Consulting Services (THO)
Project Location: East Seaham Road Stage 6 Road Reconstruction
Client Reference: G0558
Work Request: 15203
Sample Number: 24-15203B
Date Sampled: 29/05/2024
Dates Tested: 30/05/2024 - 04/06/2024
Sampling Method: Sampled by Engineering Department
The results apply to the sample as received
Preparation Method: In accordance with the test method
Sample Location: **BH6, Depth: 0.0-0.2m**
Material: Sandy Gravel

Hunter Civilab
62 Sandringham Avenue Thornton NSW 2322
Phone: (02) 4966 1844
Email: sc@huntercivilab.com.au

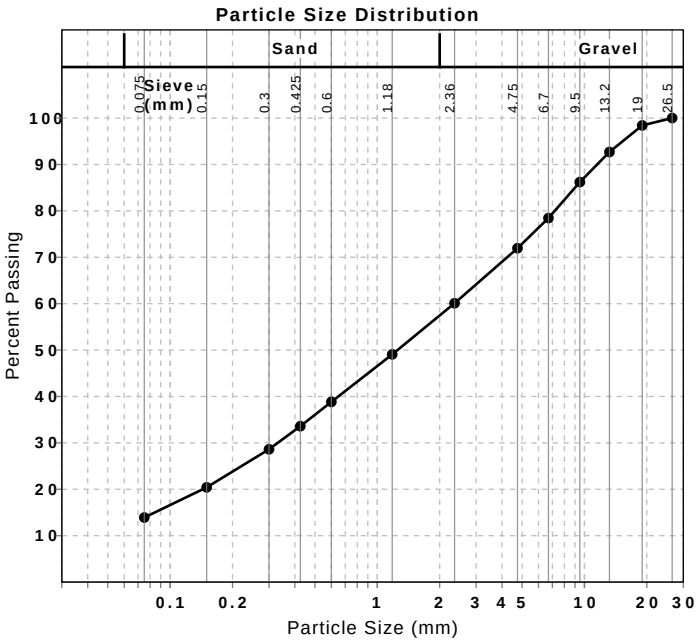
Accredited for compliance with ISO/IEC 17025 - Testing

Approved Signatory: Scott Callinan
Laboratory Operations Manager
NATA Accredited Laboratory Number: 14975

Particle Size Distribution (AS1289 3.6.1)			
Sieve	Passed %	Passing Limits	
26.5 mm	**100**		
19 mm	**98**		
13.2 mm	**93**		
9.5 mm	**86**		
6.7 mm	**78**		
4.75 mm	**72**		
2.36 mm	**60**		
1.18 mm	**49**		
0.6 mm	**39**		
0.425 mm	**34**		
0.3 mm	**29**		
0.15 mm	**20**		
0.075 mm	**14**		

Atterberg Limit (AS1289 3.1.2 & 3.2.1 & 3.3.1)		Min	Max
Sample History	Oven Dried		
Preparation Method	Dry Sieve		
Liquid Limit (%)	Not Obtainable		
Plastic Limit (%)	Not Obtainable		
Plasticity Index (%)	**Non Plastic**		
Linear shrinkage could not be determined as the liquid limit could not be obtained and the material is non-plastic.			

Linear Shrinkage (AS1289 3.4.1)		Min	Max
Moisture Condition Determined By	AS 1289.3.1.2		
Linear Shrinkage (%)			
Cracking Crumbling Curling			
Linear shrinkage could not be determined as the liquid limit could not be obtained and the material is non-plastic.			



Material Test Report

Report Number: **P24967-63A**
Issue Number: 1
Date Issued: 18/06/2024
Client: Hunter Civilab
3/62 Sandringham Avenue, Thornton New South Wales 2322
Contact: Nathan Roberts
Project Number: P24967
Project Name: Geotechnical Consulting Services (THO)
Project Location: East Seaham Road Stage 6 Road Reconstruction
Client Reference: G0558
Work Request: 15203
Sample Number: 24-15203C
Date Sampled: 29/05/2024
Dates Tested: 30/05/2024 - 04/06/2024
Sampling Method: Sampled by Engineering Department
The results apply to the sample as received
Preparation Method: In accordance with the test method
Sample Location: **BH9, Depth: 0.0-0.2m**
Material: Sandy Gravel

Hunter Civilab
62 Sandringham Avenue Thornton NSW 2322
Phone: (02) 4966 1844
Email: sc@huntercivilab.com.au

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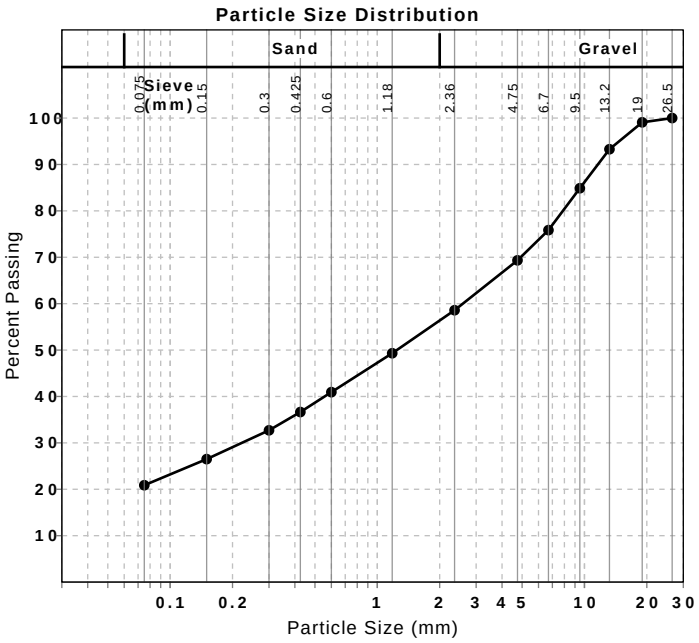
Approved Signatory: Scott Callinan
Laboratory Operations Manager
NATA Accredited Laboratory Number: 14975

Particle Size Distribution (AS1289 3.6.1)			
Sieve	Passed %	Passing Limits	
26.5 mm	**100**		
19 mm	**99**		
13.2 mm	**93**		
9.5 mm	**85**		
6.7 mm	**76**		
4.75 mm	**69**		
2.36 mm	**59**		
1.18 mm	**49**		
0.6 mm	**41**		
0.425 mm	**37**		
0.3 mm	**33**		
0.15 mm	**26**		
0.075 mm	**21**		

Atterberg Limit (AS1289 3.1.2 & 3.2.1 & 3.3.1)		Min	Max
Sample History	Oven Dried		
Preparation Method	Dry Sieve		
Liquid Limit (%)	Not Obtainable		
Plastic Limit (%)	Not Obtainable		
Plasticity Index (%)	**Non Plastic**		
Linear shrinkage could not be determined as the liquid limit could not be obtained and the material is non-plastic.			

Linear Shrinkage (AS1289 3.4.1)		Min	Max
Moisture Condition Determined By	AS 1289.3.1.2		
Linear Shrinkage (%)			
Cracking Crumbling Curling			
Linear shrinkage could not be determined as the liquid limit could not be obtained and the material is non-plastic.			



Material Test Report

Report Number: **P24967-63A**
Issue Number: 1
Date Issued: 18/06/2024
Client: Hunter Civilab
3/62 Sandringham Avenue, Thornton New South Wales 2322
Contact: Nathan Roberts
Project Number: P24967
Project Name: Geotechnical Consulting Services (THO)
Project Location: East Seaham Road Stage 6 Road Reconstruction
Client Reference: G0558
Work Request: 15203
Sample Number: 24-15203D
Date Sampled: 29/05/2024
Dates Tested: 30/05/2024 - 06/06/2024
Sampling Method: Sampled by Engineering Department
The results apply to the sample as received
Preparation Method: In accordance with the test method
Sample Location: **BH12, Depth: 0.0-0.2m**
Material: Sandy Gravel

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62 Sandringham Avenue Thornton NSW 2322
Phone: (02) 4966 1844
Email: sc@huntercivilab.com.au

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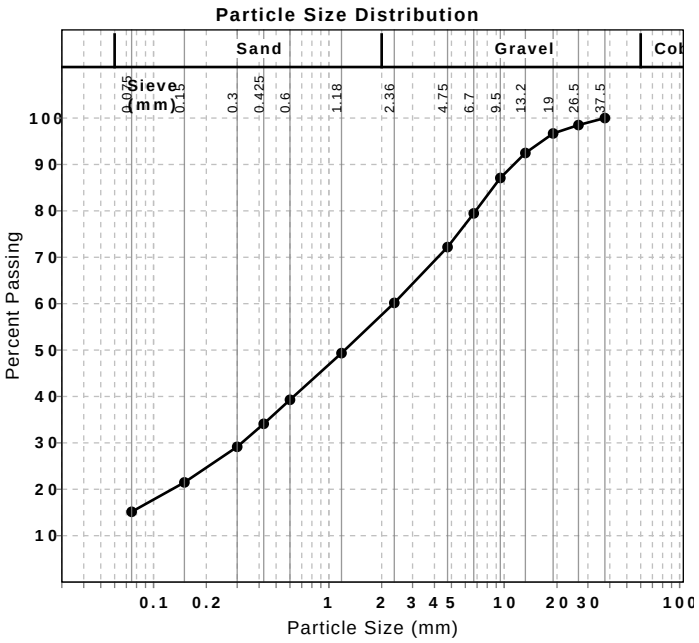
Approved Signatory: Scott Callinan
Laboratory Operations Manager
NATA Accredited Laboratory Number: 14975

Particle Size Distribution (AS1289 3.6.1)			
Sieve	Passed %	Passing Limits	
37.5 mm	**100**		
26.5 mm	**98**		
19 mm	**97**		
13.2 mm	**92**		
9.5 mm	**87**		
6.7 mm	**79**		
4.75 mm	**72**		
2.36 mm	**60**		
1.18 mm	**49**		
0.6 mm	**39**		
0.425 mm	**34**		
0.3 mm	**29**		
0.15 mm	**21**		
0.075 mm	**15**		

Atterberg Limit (AS1289 3.1.2 & 3.2.1 & 3.3.1)		Min	Max
Sample History	Oven Dried		
Preparation Method	Dry Sieve		
Liquid Limit (%)	19		
Plastic Limit (%)	18		
Plasticity Index (%)	**1**		

Linear Shrinkage (AS1289 3.4.1)		Min	Max
Moisture Condition Determined By	AS 1289.3.1.2		
Linear Shrinkage (%)	**2.5**		
Cracking Crumbling Curling	Cracking		



Material Test Report

Report Number: **P24967-63A**
Issue Number: 1
Date Issued: 18/06/2024
Client: Hunter Civilab
3/62 Sandringham Avenue, Thornton New South Wales 2322
Contact: Nathan Roberts
Project Number: P24967
Project Name: Geotechnical Consulting Services (THO)
Project Location: East Seaham Road Stage 6 Road Reconstruction
Client Reference: G0558
Work Request: 15203
Sample Number: 24-15203D
Date Sampled: 29/05/2024
Dates Tested: 30/05/2024 - 17/06/2024
Sampling Method: Sampled by Engineering Department
The results apply to the sample as received
Preparation Method: In accordance with the test method
Sample Location: **BH12, Depth: 0.0-0.2m**
Material: Sandy Gravel

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Phone: (02) 4966 1844
Email: sc@huntercivilab.com.au

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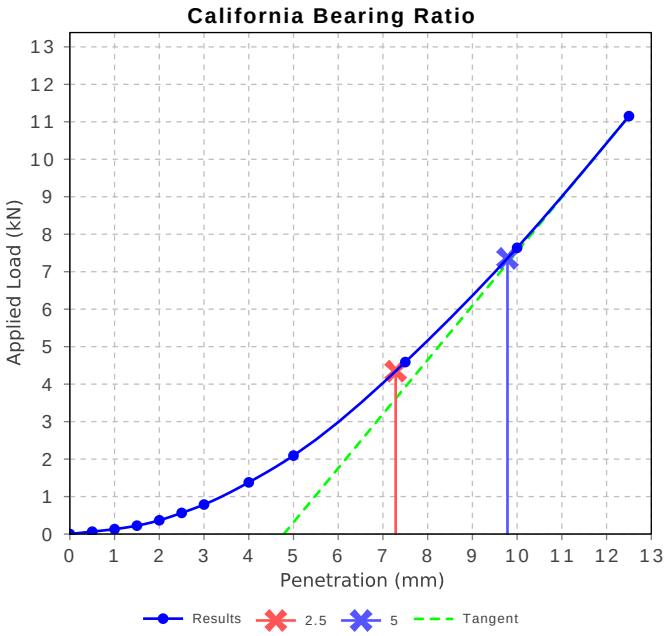
Approved Signatory: Scott Callinan
Laboratory Operations Manager
NATA Accredited Laboratory Number: 14975

California Bearing Ratio (AS 1289 6.1.1 & 2.1.1)		Min	Max
CBR taken at	5 mm		
CBR %	**35**		
Method of Compactive Effort	Standard		
Method used to Determine MDD	AS 1289 5.1.1 & 2.1.1		
Method used to Determine Plasticity	vt		
Maximum Dry Density (t/m^3)	2.14		
Optimum Moisture Content (%)	8.5		
Laboratory Density Ratio (%)	93.5		
Laboratory Moisture Ratio (%)	102.5		
Dry Density after Soaking (t/m^3)	2.00		
Field Moisture Content (%)	4.8		
Moisture Content at Placement (%)	8.5		
Moisture Content Top 30mm (%)	9.0		
Moisture Content Rest of Sample (%)	8.8		
Mass Surcharge (kg)	4.5		
Soaking Period (days)	4		
Curing Hours (h)	235.7		
Swell (%)	-0.5		
Oversize Material (mm)	19		
Oversize Material Included	Excluded		
Oversize Material (%)	2.6		
Variation from Test Method	Variation to the test method: CBR moulded 312g short of target weight, due to lack of sample. Target Laboratory Density Ratio should be within 1%. The current difference is 6.6%.		



Material Test Report

Report Number: **P24967-63A**
Issue Number: 1
Date Issued: 18/06/2024
Client: Hunter Civilab
3/62 Sandringham Avenue, Thornton New South Wales 2322
Contact: Nathan Roberts
Project Number: P24967
Project Name: Geotechnical Consulting Services (THO)
Project Location: East Seaham Road Stage 6 Road Reconstruction
Client Reference: G0558
Work Request: 15203
Sample Number: 24-15203E
Date Sampled: 29/05/2024
Dates Tested: 30/05/2024 - 06/06/2024
Sampling Method: Sampled by Engineering Department
The results apply to the sample as received
Preparation Method: In accordance with the test method
Sample Location: **BH15, Depth: 0.0-0.2m**
Material: Sandy Gravel

Hunter Civilab
62 Sandringham Avenue Thornton NSW 2322
Phone: (02) 4966 1844
Email: sc@huntercivilab.com.au

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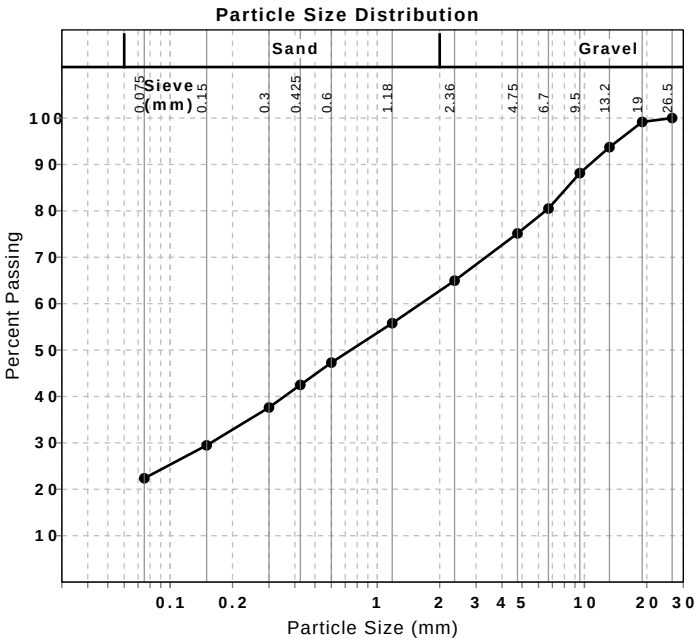
Approved Signatory: Scott Callinan
Laboratory Operations Manager
NATA Accredited Laboratory Number: 14975

Particle Size Distribution (AS1289 3.6.1)			
Sieve	Passed %	Passing Limits	
26.5 mm	**100**		
19 mm	**99**		
13.2 mm	**94**		
9.5 mm	**88**		
6.7 mm	**81**		
4.75 mm	**75**		
2.36 mm	**65**		
1.18 mm	**56**		
0.6 mm	**47**		
0.425 mm	**42**		
0.3 mm	**38**		
0.15 mm	**29**		
0.075 mm	**22**		

Atterberg Limit (AS1289 3.1.2 & 3.2.1 & 3.3.1)		Min	Max
Sample History	Oven Dried		
Preparation Method	Dry Sieve		
Liquid Limit (%)	18		
Plastic Limit (%)	16		
Plasticity Index (%)	**2**		

Linear Shrinkage (AS1289 3.4.1)		Min	Max
Moisture Condition Determined By	AS 1289.3.1.2		
Linear Shrinkage (%)	**2.5**		
Cracking Crumbling Curling	Cracking		



Material Test Report

Report Number: **P24967-63A**
Issue Number: 1
Date Issued: 18/06/2024
Client: Hunter Civilab
3/62 Sandringham Avenue, Thornton New South Wales 2322
Contact: Nathan Roberts
Project Number: P24967
Project Name: Geotechnical Consulting Services (THO)
Project Location: East Seaham Road Stage 6 Road Reconstruction
Client Reference: G0558
Work Request: 15203
Sample Number: 24-15203F
Date Sampled: 29/05/2024
Dates Tested: 30/05/2024 - 06/06/2024
Sampling Method: Sampled by Engineering Department
The results apply to the sample as received
Preparation Method: In accordance with the test method
Sample Location: **BH18, Depth: 0.0-0.2m**
Material: Sandy Gravel

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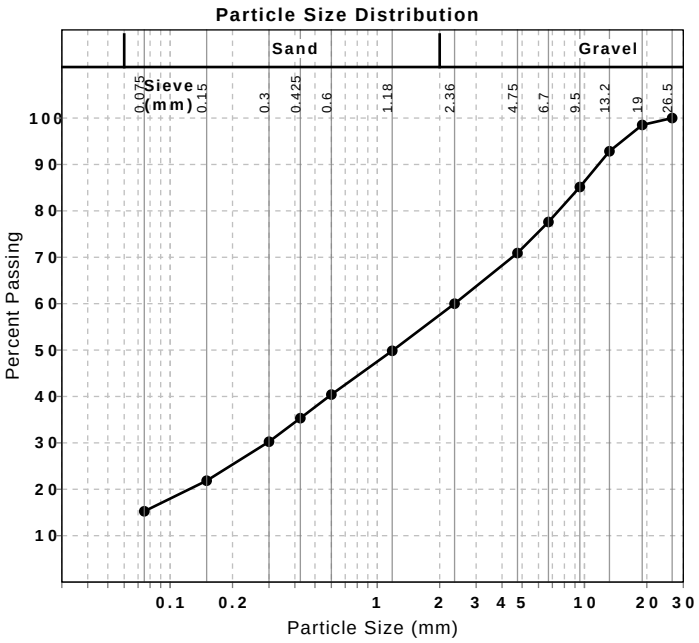
Approved Signatory: Scott Callinan
Laboratory Operations Manager
NATA Accredited Laboratory Number: 14975

Particle Size Distribution (AS1289 3.6.1)			
Sieve	Passed %	Passing Limits	
26.5 mm	**100**		
19 mm	**99**		
13.2 mm	**93**		
9.5 mm	**85**		
6.7 mm	**78**		
4.75 mm	**71**		
2.36 mm	**60**		
1.18 mm	**50**		
0.6 mm	**40**		
0.425 mm	**35**		
0.3 mm	**30**		
0.15 mm	**22**		
0.075 mm	**15**		

Atterberg Limit (AS1289 3.1.2 & 3.2.1 & 3.3.1)		Min	Max
Sample History	Oven Dried		
Preparation Method	Dry Sieve		
Liquid Limit (%)	19		
Plastic Limit (%)	18		
Plasticity Index (%)	**1**		

Linear Shrinkage (AS1289 3.4.1)		Min	Max
Moisture Condition Determined By	AS 1289.3.1.2		
Linear Shrinkage (%)	**2.5**		
Cracking Crumbling Curling	Cracking		



Material Test Report

Report Number: **P24967-63A**
Issue Number: 1
Date Issued: 18/06/2024
Client: Hunter Civilab
3/62 Sandringham Avenue, Thornton New South Wales 2322
Contact: Nathan Roberts
Project Number: P24967
Project Name: Geotechnical Consulting Services (THO)
Project Location: East Seaham Road Stage 6 Road Reconstruction
Client Reference: G0558
Work Request: 15203
Sample Number: 24-15203G
Date Sampled: 29/05/2024
Dates Tested: 30/05/2024 - 04/06/2024
Sampling Method: Sampled by Engineering Department
The results apply to the sample as received
Preparation Method: In accordance with the test method
Sample Location: **BH21, Depth: 0.0-0.2m**
Material: Sandy Gravel

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62 Sandringham Avenue Thornton NSW 2322
Phone: (02) 4966 1844
Email: sc@huntercivilab.com.au

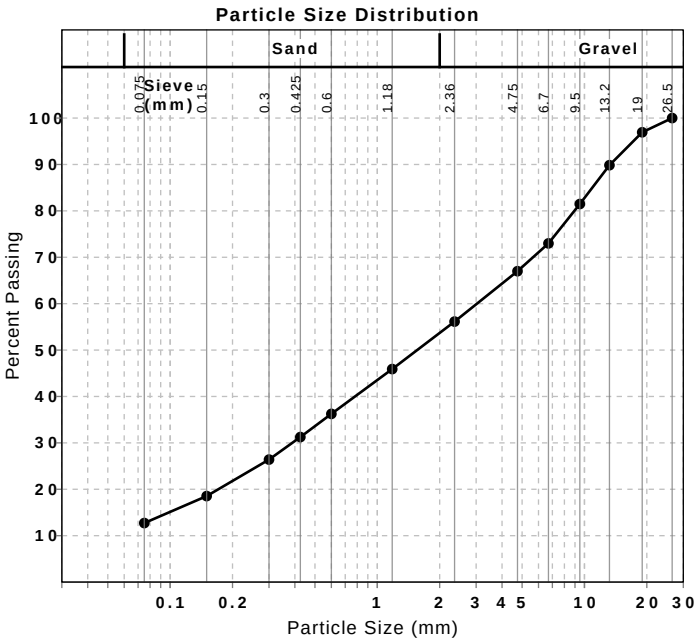
Accredited for compliance with ISO/IEC 17025 - Testing

Approved Signatory: Scott Callinan
Laboratory Operations Manager
NATA Accredited Laboratory Number: 14975

Particle Size Distribution (AS1289 3.6.1)			
Sieve	Passed %	Passing Limits	
26.5 mm	**100**		
19 mm	**97**		
13.2 mm	**90**		
9.5 mm	**81**		
6.7 mm	**73**		
4.75 mm	**67**		
2.36 mm	**56**		
1.18 mm	**46**		
0.6 mm	**36**		
0.425 mm	**31**		
0.3 mm	**26**		
0.15 mm	**19**		
0.075 mm	**13**		

Atterberg Limit (AS1289 3.1.2 & 3.2.1 & 3.3.1)		Min	Max
Sample History	Oven Dried		
Preparation Method	Dry Sieve		
Liquid Limit (%)	Not Obtainable		
Plastic Limit (%)	Not Obtainable		
Plasticity Index (%)	**Non Plastic**		
Linear shrinkage could not be determined as the liquid limit could not be obtained and the material is non-plastic.			

Linear Shrinkage (AS1289 3.4.1)		Min	Max
Moisture Condition Determined By	AS 1289.3.1.2		
Linear Shrinkage (%)			
Cracking Crumbling Curling			
Linear shrinkage could not be determined as the liquid limit could not be obtained and the material is non-plastic.			



Material Test Report

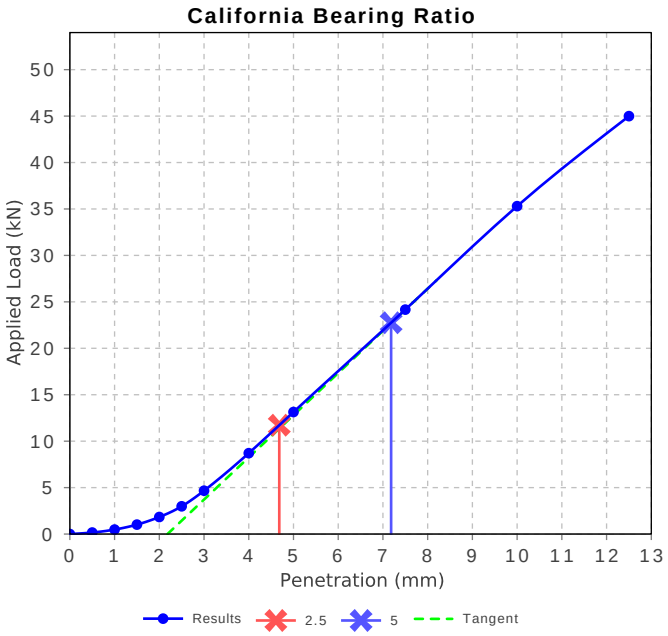
Report Number: **P24967-63A**
Issue Number: 1
Date Issued: 18/06/2024
Client: Hunter Civilab
3/62 Sandringham Avenue, Thornton New South Wales 2322
Contact: Nathan Roberts
Project Number: P24967
Project Name: Geotechnical Consulting Services (THO)
Project Location: East Seaham Road Stage 6 Road Reconstruction
Client Reference: G0558
Work Request: 15203
Sample Number: 24-15203G
Date Sampled: 29/05/2024
Dates Tested: 30/05/2024 - 11/06/2024
Sampling Method: Sampled by Engineering Department
The results apply to the sample as received
Preparation Method: In accordance with the test method
Sample Location: **BH21, Depth: 0.0-0.2m**
Material: Sandy Gravel

Hunter Civilab
62 Sandringham Avenue Thornton NSW 2322
Phone: (02) 4966 1844
Email: sc@huntercivilab.com.au

Accredited for compliance with ISO/IEC 17025 - Testing

Approved Signatory: Scott Callinan
Laboratory Operations Manager
NATA Accredited Laboratory Number: 14975

California Bearing Ratio (AS 1289 6.1.1 & 2.1.1)		Min	Max
CBR taken at	5 mm		
CBR %	**110**		
Method of Compactive Effort	Standard		
Method used to Determine MDD	AS 1289 5.1.1 & 2.1.1		
Method used to Determine Plasticity	vt		
Maximum Dry Density (t/m^3)	2.16		
Optimum Moisture Content (%)	8.0		
Laboratory Density Ratio (%)	100.0		
Laboratory Moisture Ratio (%)	99.0		
Dry Density after Soaking (t/m^3)	2.16		
Field Moisture Content (%)			
Moisture Content at Placement (%)	7.9		
Moisture Content Top 30mm (%)	8.9		
Moisture Content Rest of Sample (%)	8.3		
Mass Surcharge (kg)	4.5		
Soaking Period (days)	4		
Curing Hours (h)	241.2		
Swell (%)	0.0		
Oversize Material (mm)	19		
Oversize Material Included	Excluded		
Oversize Material (%)	2.3		



Material Test Report

Report Number: **P24967-63A**
Issue Number: 1
Date Issued: 18/06/2024
Client: Hunter Civilab
3/62 Sandringham Avenue, Thornton New South Wales 2322
Contact: Nathan Roberts
Project Number: P24967
Project Name: Geotechnical Consulting Services (THO)
Project Location: East Seaham Road Stage 6 Road Reconstruction
Client Reference: G0558
Work Request: 15203
Sample Number: 24-15203H
Date Sampled: 29/05/2024
Dates Tested: 30/05/2024 - 11/06/2024
Sampling Method: Sampled by Engineering Department
The results apply to the sample as received
Preparation Method: In accordance with the test method
Sample Location: **BH1, Depth: 0.8-1.0m**
Material: Silty CLAY

Hunter Civilab
62 Sandringham Avenue Thornton NSW 2322
Phone: (02) 4966 1844
Email: sc@huntercivilab.com.au

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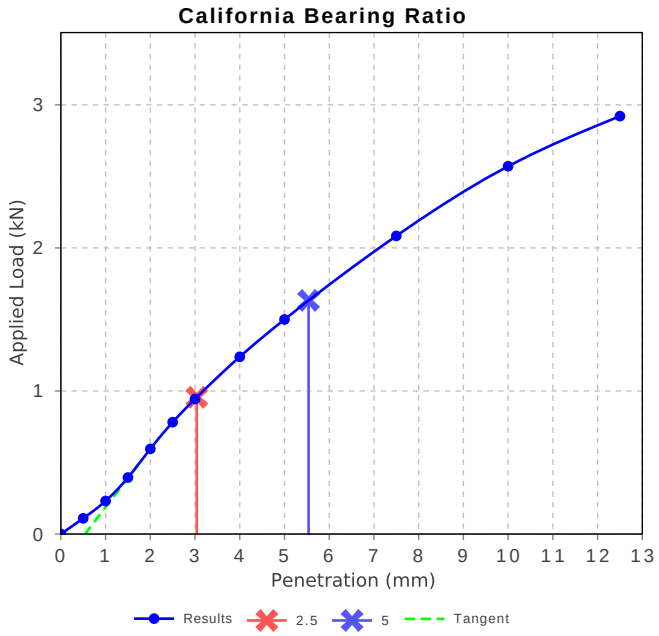
Approved Signatory: Scott Callinan
Laboratory Operations Manager
NATA Accredited Laboratory Number: 14975

California Bearing Ratio (AS 1289 6.1.1 & 2.1.1)		Min	Max
CBR taken at	5 mm		
CBR %	**8**		
Method of Compactive Effort	Standard		
Method used to Determine MDD	AS 1289 5.1.1 & 2.1.1		
Method used to Determine Plasticity	vt		
Maximum Dry Density (t/m^3)	1.90		
Optimum Moisture Content (%)	12.5		
Laboratory Density Ratio (%)	99.0		
Laboratory Moisture Ratio (%)	105.0		
Dry Density after Soaking (t/m^3)	1.89		
Field Moisture Content (%)	7.9		
Moisture Content at Placement (%)	13.0		
Moisture Content Top 30mm (%)	14.6		
Moisture Content Rest of Sample (%)	14.7		
Mass Surcharge (kg)	4.5		
Soaking Period (days)	4		
Curing Hours (h)	96.0		
Swell (%)	-0.5		
Oversize Material (mm)	19		
Oversize Material Included	Excluded		
Oversize Material (%)	0.0		



Material Test Report

Report Number: **P24967-63A**
Issue Number: 1
Date Issued: 18/06/2024
Client: Hunter Civilab
3/62 Sandringham Avenue, Thornton New South Wales 2322
Contact: Nathan Roberts
Project Number: P24967
Project Name: Geotechnical Consulting Services (THO)
Project Location: East Seaham Road Stage 6 Road Reconstruction
Client Reference: G0558
Work Request: 15203
Sample Number: 24-15203I
Date Sampled: 29/05/2024
Dates Tested: 30/05/2024 - 11/06/2024
Sampling Method: Sampled by Engineering Department
The results apply to the sample as received
Preparation Method: In accordance with the test method
Sample Location: **BH7, Depth: 0.6-0.8m**
Material: Sandy GRAVEL

Hunter Civilab
62 Sandringham Avenue Thornton NSW 2322
Phone: (02) 4966 1844
Email: sc@huntercivilab.com.au

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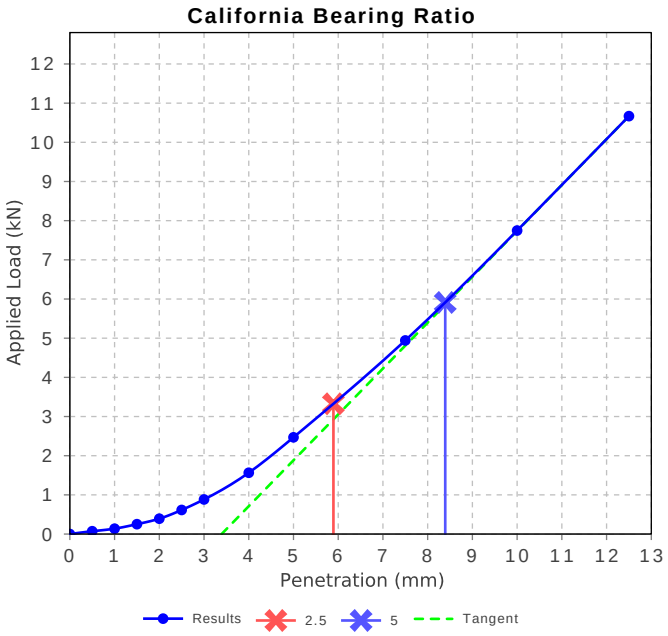
Approved Signatory: Scott Callinan
Laboratory Operations Manager
NATA Accredited Laboratory Number: 14975

California Bearing Ratio (AS 1289 6.1.1 & 2.1.1)		Min	Max
CBR taken at	5 mm		
CBR %	**30**		
Method of Compactive Effort	Standard		
Method used to Determine MDD	AS 1289 5.1.1 & 2.1.1		
Method used to Determine Plasticity	Vt		
Maximum Dry Density (t/m^3)	2.12		
Optimum Moisture Content (%)	8.5		
Laboratory Density Ratio (%)	100.0		
Laboratory Moisture Ratio (%)	99.0		
Dry Density after Soaking (t/m^3)	2.12		
Field Moisture Content (%)	4.8		
Moisture Content at Placement (%)	8.5		
Moisture Content Top 30mm (%)	9.4		
Moisture Content Rest of Sample (%)	9.0		
Mass Surcharge (kg)	4.5		
Soaking Period (days)	4		
Curing Hours (h)	97.6		
Swell (%)	-0.5		
Oversize Material (mm)	19		
Oversize Material Included	Excluded		
Oversize Material (%)	3.8		



Material Test Report

Report Number: **P24967-63A**
Issue Number: 1
Date Issued: 18/06/2024
Client: Hunter Civilab
3/62 Sandringham Avenue, Thornton New South Wales 2322
Contact: Nathan Roberts
Project Number: P24967
Project Name: Geotechnical Consulting Services (THO)
Project Location: East Seaham Road Stage 6 Road Reconstruction
Client Reference: G0558
Work Request: 15203
Sample Number: 24-15203J
Date Sampled: 29/05/2024
Dates Tested: 30/05/2024 - 11/06/2024
Sampling Method: Sampled by Engineering Department
The results apply to the sample as received
Preparation Method: In accordance with the test method
Sample Location: **BH9, Depth: 0.4-0.5m**
Material: Clayey SAND

Hunter Civilab
62 Sandringham Avenue Thornton NSW 2322
Phone: (02) 4966 1844
Email: sc@huntercivilab.com.au

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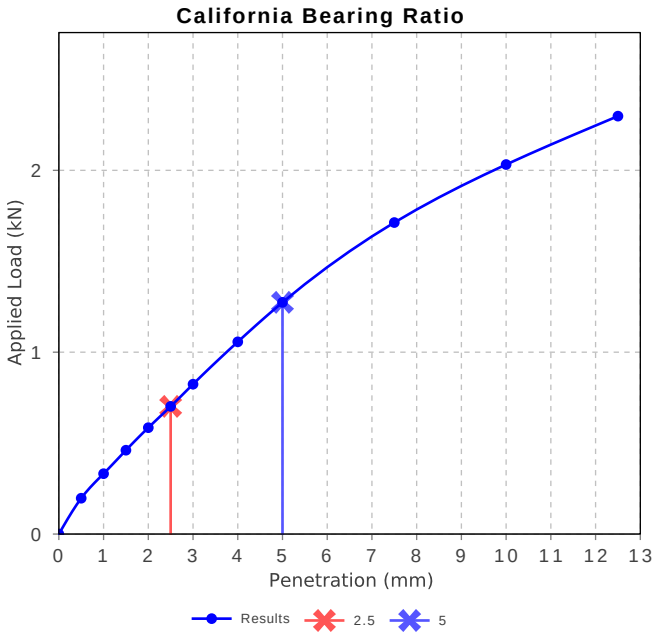
Approved Signatory: Scott Callinan
Laboratory Operations Manager
NATA Accredited Laboratory Number: 14975

California Bearing Ratio (AS 1289 6.1.1 & 2.1.1)		Min	Max
CBR taken at	5 mm		
CBR %	**6**		
Method of Compactive Effort	Standard		
Method used to Determine MDD	AS 1289 5.1.1 & 2.1.1		
Method used to Determine Plasticity	vt		
Maximum Dry Density (t/m^3)	1.90		
Optimum Moisture Content (%)	12.5		
Laboratory Density Ratio (%)	99.5		
Laboratory Moisture Ratio (%)	105.0		
Dry Density after Soaking (t/m^3)	1.88		
Field Moisture Content (%)	9.6		
Moisture Content at Placement (%)	13.1		
Moisture Content Top 30mm (%)	14.3		
Moisture Content Rest of Sample (%)	13.9		
Mass Surcharge (kg)	4.5		
Soaking Period (days)	4		
Curing Hours (h)	96.0		
Swell (%)	0.5		
Oversize Material (mm)	19		
Oversize Material Included	Excluded		
Oversize Material (%)	0.0		
Variation to the test method: expected variation from OMC different to actual, curing duration variation			



Material Test Report

Report Number: **P24967-63A**
Issue Number: 1
Date Issued: 18/06/2024
Client: Hunter Civilab
3/62 Sandringham Avenue, Thornton New South Wales 2322
Contact: Nathan Roberts
Project Number: P24967
Project Name: Geotechnical Consulting Services (THO)
Project Location: East Seaham Road Stage 6 Road Reconstruction
Client Reference: G0558
Work Request: 15203
Sample Number: 24-15203K
Date Sampled: 29/05/2024
Dates Tested: 30/05/2024 - 17/06/2024
Sampling Method: Sampled by Engineering Department
The results apply to the sample as received
Preparation Method: In accordance with the test method
Sample Location: **BH12, Depth: 0.5-0.6m**
Material: Silty Sandy GRAVEL

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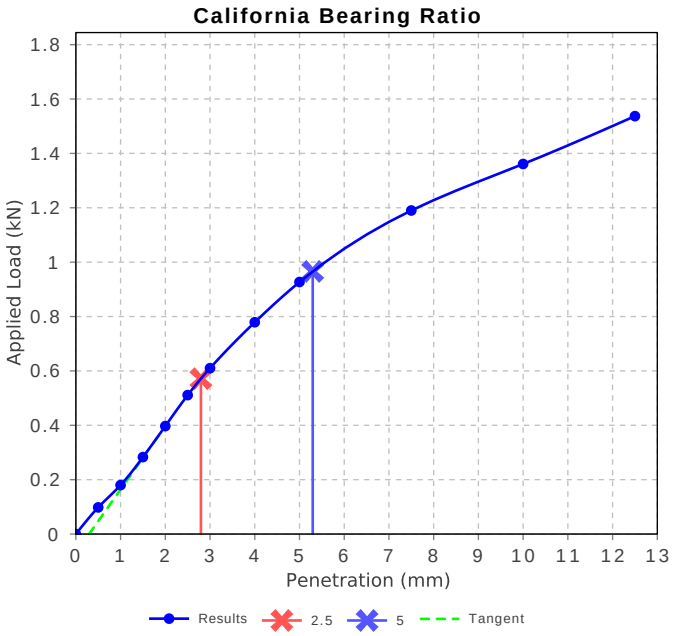
Accredited for compliance with ISO/IEC 17025 - Testing

Approved Signatory: Scott Callinan
Laboratory Operations Manager
NATA Accredited Laboratory Number: 14975

California Bearing Ratio (AS 1289 6.1.1 & 2.1.1)		Min	Max
CBR taken at	5 mm		
CBR %	**5.0**		
Method of Compactive Effort	Standard		
Method used to Determine MDD	AS 1289 5.1.1 & 2.1.1		
Method used to Determine Plasticity	vt		
Maximum Dry Density (t/m^3)	1.93		
Optimum Moisture Content (%)	12.5		
Laboratory Density Ratio (%)	100.0		
Laboratory Moisture Ratio (%)	97.5		
Dry Density after Soaking (t/m^3)	1.96		
Field Moisture Content (%)	8.1		
Moisture Content at Placement (%)	12.1		
Moisture Content Top 30mm (%)	14.6		
Moisture Content Rest of Sample (%)	13.2		
Mass Surcharge (kg)	4.5		
Soaking Period (days)	4		
Curing Hours (h)	242.2		
Swell (%)	-1.5		
Oversize Material (mm)	19		
Oversize Material Included	Excluded		
Oversize Material (%)	0.0		



Material Test Report

Report Number: **P24967-63A**
Issue Number: 1
Date Issued: 18/06/2024
Client: Hunter Civilab
3/62 Sandringham Avenue, Thornton New South Wales 2322
Contact: Nathan Roberts
Project Number: P24967
Project Name: Geotechnical Consulting Services (THO)
Project Location: East Seaham Road Stage 6 Road Reconstruction
Client Reference: G0558
Work Request: 15203
Sample Number: 24-15203L
Date Sampled: 29/05/2024
Dates Tested: 30/05/2024 - 11/06/2024
Sampling Method: Sampled by Engineering Department
The results apply to the sample as received
Preparation Method: In accordance with the test method
Sample Location: **BH15, Depth: 0.3-0.5m**
Material: Sandy CLAY

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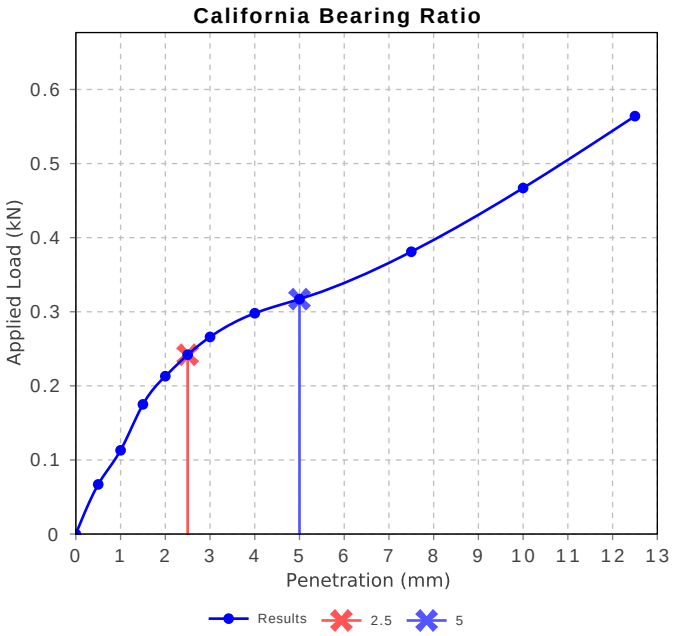
Approved Signatory: Scott Callinan
Laboratory Operations Manager
NATA Accredited Laboratory Number: 14975

California Bearing Ratio (AS 1289 6.1.1 & 2.1.1)		Min	Max
CBR taken at	2.5 mm		
CBR %	**2.0**		
Method of Compactive Effort	Standard		
Method used to Determine MDD	AS 1289 5.1.1 & 2.1.1		
Method used to Determine Plasticity	vt		
Maximum Dry Density (t/m^3)	1.74		
Optimum Moisture Content (%)	18.0		
Laboratory Density Ratio (%)	99.0		
Laboratory Moisture Ratio (%)	100.5		
Dry Density after Soaking (t/m^3)	1.71		
Field Moisture Content (%)	19.8		
Moisture Content at Placement (%)	18.3		
Moisture Content Top 30mm (%)	25.8		
Moisture Content Rest of Sample (%)	18.3		
Mass Surcharge (kg)	4.5		
Soaking Period (days)	4		
Curing Hours (h)	166.3		
Swell (%)	0.5		
Oversize Material (mm)	19		
Oversize Material Included	Excluded		
Oversize Material (%)	0		



Material Test Report

Report Number: **P24967-63A**
Issue Number: 1
Date Issued: 18/06/2024
Client: Hunter Civilab
3/62 Sandringham Avenue, Thornton New South Wales 2322
Contact: Nathan Roberts
Project Number: P24967
Project Name: Geotechnical Consulting Services (THO)
Project Location: East Seaham Road Stage 6 Road Reconstruction
Client Reference: G0558
Work Request: 15203
Sample Number: 24-15203M
Date Sampled: 29/05/2024
Dates Tested: 30/05/2024 - 11/06/2024
Sampling Method: Sampled by Engineering Department
The results apply to the sample as received
Preparation Method: In accordance with the test method
Sample Location: **BH19, Depth: 0.3-0.5m**
Material: Clayey SAND

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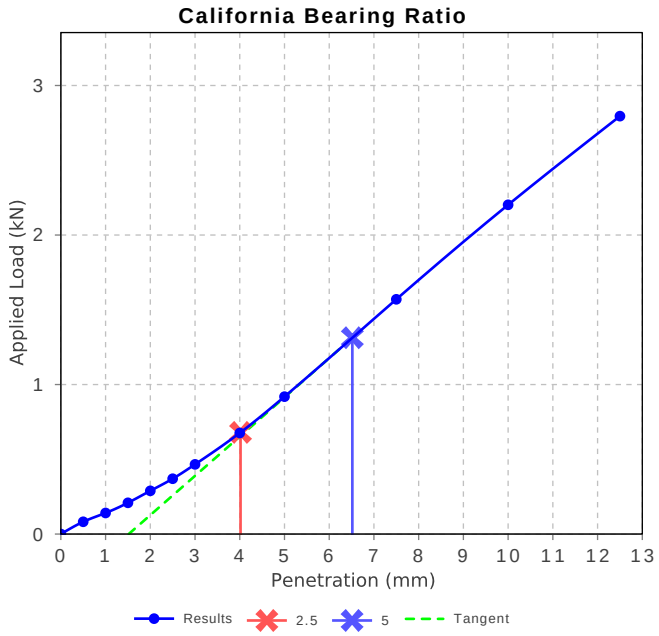
Approved Signatory: Scott Callinan
Laboratory Operations Manager
NATA Accredited Laboratory Number: 14975

California Bearing Ratio (AS 1289 6.1.1 & 2.1.1)		Min	Max
CBR taken at	5 mm		
CBR %	**7**		
Method of Compactive Effort	Standard		
Method used to Determine MDD	AS 1289 5.1.1 & 2.1.1		
Method used to Determine Plasticity	vt		
Maximum Dry Density (t/m^3)	1.87		
Optimum Moisture Content (%)	13.5		
Laboratory Density Ratio (%)	101.5		
Laboratory Moisture Ratio (%)	92.5		
Dry Density after Soaking (t/m^3)	1.95		
Field Moisture Content (%)	8.1		
Moisture Content at Placement (%)	12.5		
Moisture Content Top 30mm (%)	15.6		
Moisture Content Rest of Sample (%)	15.0		
Mass Surcharge (kg)	4.5		
Soaking Period (days)	4		
Curing Hours (h)	94.0		
Swell (%)	-3.0		
Oversize Material (mm)	19		
Oversize Material Included	Excluded		
Oversize Material (%)	0.0		
Variation from Test Method	Moulded outside the Target Moisture Content Moulded outside the Target Laboratory Density Ratio		



Material Test Report

Report Number: **P24967-63A**
Issue Number: 1
Date Issued: 18/06/2024
Client: Hunter Civilab
3/62 Sandringham Avenue, Thornton New South Wales 2322
Contact: Nathan Roberts
Project Number: P24967
Project Name: Geotechnical Consulting Services (THO)
Project Location: East Seaham Road Stage 6 Road Reconstruction
Client Reference: G0558
Work Request: 15203
Sample Number: 24-15203N
Date Sampled: 29/05/2024
Dates Tested: 30/05/2024 - 17/06/2024
Sampling Method: Sampled by Engineering Department
The results apply to the sample as received
Preparation Method: In accordance with the test method
Sample Location: **BH21, Depth: 0.3-0.5m**
Material: Silty CLAY

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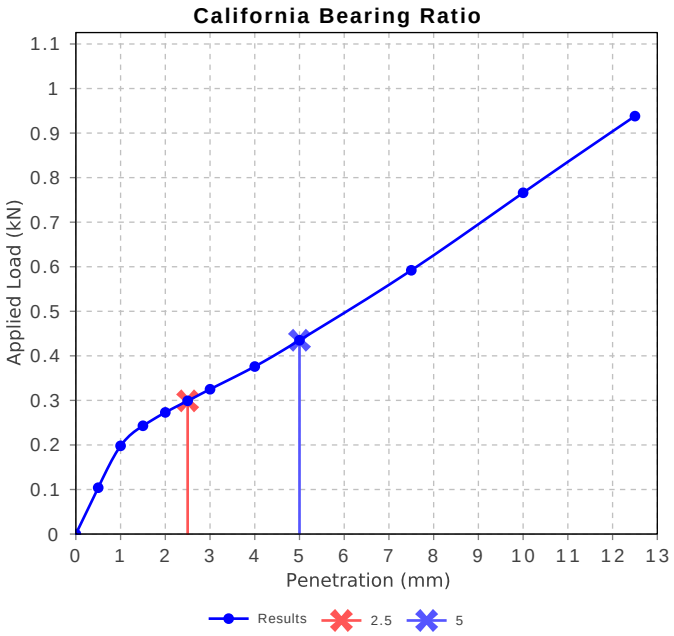
Approved Signatory: Scott Callinan
Laboratory Operations Manager
NATA Accredited Laboratory Number: 14975

California Bearing Ratio (AS 1289 6.1.1 & 2.1.1)		Min	Max
CBR taken at	2.5 mm		
CBR %	**2.5**		
Method of Compactive Effort	Standard		
Method used to Determine MDD	AS 1289 5.1.1 & 2.1.1		
Method used to Determine Plasticity	vt		
Maximum Dry Density (t/m^3)	1.69		
Optimum Moisture Content (%)	18.5		
Laboratory Density Ratio (%)	100.0		
Laboratory Moisture Ratio (%)	100.5		
Dry Density after Soaking (t/m^3)	1.65		
Field Moisture Content (%)	20.7		
Moisture Content at Placement (%)	18.6		
Moisture Content Top 30mm (%)	25.3		
Moisture Content Rest of Sample (%)	19.9		
Mass Surcharge (kg)	4.5		
Soaking Period (days)	4		
Curing Hours (h)	234.6		
Swell (%)	2.5		
Oversize Material (mm)	19		
Oversize Material Included	Excluded		
Oversize Material (%)			



Material Test Report

Report Number: **P24967-63A**
Issue Number: 1
Date Issued: 18/06/2024
Client: Hunter Civilab
3/62 Sandringham Avenue, Thornton New South Wales 2322
Contact: Nathan Roberts
Project Number: P24967
Project Name: Geotechnical Consulting Services (THO)
Project Location: East Seaham Road Stage 6 Road Reconstruction
Client Reference: G0558
Work Request: 15203
Sample Number: 24-15203O
Date Sampled: 29/05/2024
Dates Tested: 30/05/2024 - 11/06/2024
Sampling Method: Sampled by Engineering Department
The results apply to the sample as received
Preparation Method: In accordance with the test method
Sample Location: **BHN1, Depth: 0.1-0.3m**
Material: Silty Clay

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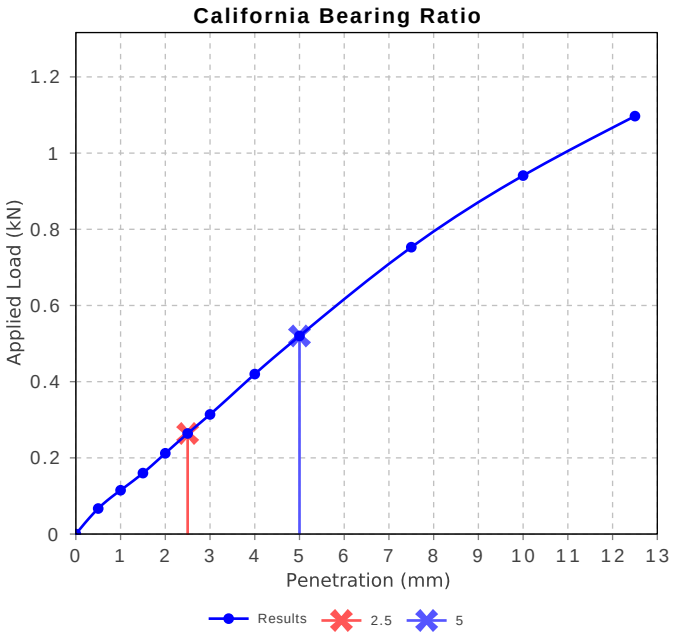
Approved Signatory: Scott Callinan
Laboratory Operations Manager
NATA Accredited Laboratory Number: 14975

California Bearing Ratio (AS 1289 6.1.1 & 2.1.1)		Min	Max
CBR taken at	5 mm		
CBR %	**2.5**		
Method of Compactive Effort	Standard		
Method used to Determine MDD	AS 1289 5.1.1 & 2.1.1		
Method used to Determine Plasticity	Vt		
Maximum Dry Density (t/m^3)	1.68		
Optimum Moisture Content (%)	21.0		
Laboratory Density Ratio (%)	100.5		
Laboratory Moisture Ratio (%)	98.5		
Dry Density after Soaking (t/m^3)	1.70		
Field Moisture Content (%)	21.8		
Moisture Content at Placement (%)	20.9		
Moisture Content Top 30mm (%)	22.2		
Moisture Content Rest of Sample (%)	20.6		
Mass Surcharge (kg)	4.5		
Soaking Period (days)	4		
Curing Hours (h)	48.0		
Swell (%)	-1.0		
Oversize Material (mm)	19		
Oversize Material Included	Excluded		
Oversize Material (%)			



Material Test Report

Report Number: **P24967-63A**
Issue Number: 1
Date Issued: 18/06/2024
Client: Hunter Civilab
3/62 Sandringham Avenue, Thornton New South Wales 2322
Contact: Nathan Roberts
Project Number: P24967
Project Name: Geotechnical Consulting Services (THO)
Project Location: East Seaham Road Stage 6 Road Reconstruction
Client Reference: G0558
Work Request: 15203
Sample Number: 24-15203P
Date Sampled: 29/05/2024
Dates Tested: 30/05/2024 - 17/06/2024
Sampling Method: Sampled by Engineering Department
The results apply to the sample as received
Preparation Method: In accordance with the test method
Sample Location: **BHN3, Depth: 0.3-0.4m**
Material: Silty CLAY

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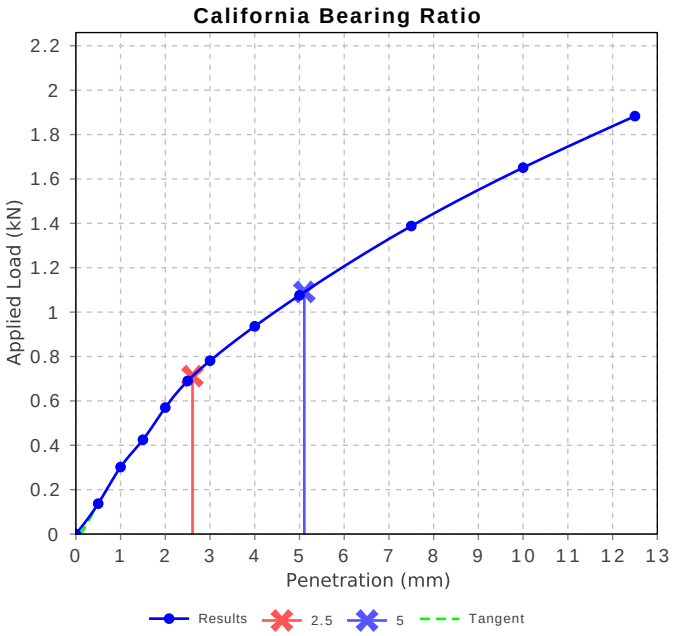
Approved Signatory: Scott Callinan
Laboratory Operations Manager
NATA Accredited Laboratory Number: 14975

California Bearing Ratio (AS 1289 6.1.1 & 2.1.1)		Min	Max
CBR taken at	5 mm		
CBR %	**6**		
Method of Compactive Effort	Standard		
Method used to Determine MDD	AS 1289 5.1.1 & 2.1.1		
Method used to Determine Plasticity	vt		
Maximum Dry Density (t/m^3)	1.77		
Optimum Moisture Content (%)	15.0		
Laboratory Density Ratio (%)	99.5		
Laboratory Moisture Ratio (%)	101.5		
Dry Density after Soaking (t/m^3)	1.74		
Field Moisture Content (%)	24.9		
Moisture Content at Placement (%)	15.4		
Moisture Content Top 30mm (%)	21.6		
Moisture Content Rest of Sample (%)	17.4		
Mass Surcharge (kg)	4.5		
Soaking Period (days)	4		
Curing Hours (h)	191.7		
Swell (%)	1.0		
Oversize Material (mm)	19		
Oversize Material Included	Excluded		
Oversize Material (%)	0.0		



Annex D

CIRCLY - Version 7.0 (8 May 2024)

Job Title: East Seaham Road Stage 6

Design Method: General Design

Assumed number of damage pulses per movement:
Combined pulse for gear (i.e. ignore NROWS)

Traffic Spectrum Details:

ID: Ex - General Title: Example - General Analysis and General Design

Load No.	Load ID	Movements
1	ESA75-Full	5.14E+05

Details of Load Groups:

Load No.	Load ID	Load Category	Load Type	Radius	Pressure/ Ref. stress	Exponent
1	ESA75-Full	SADT,80	Vertical Force	92.1	0.75	0.00

Load Locations:

Location No.	Load ID	Gear No.	X	Y	Scaling Factor	Theta
1	ESA75-Full	1	-165.0	0.0	1.00E+00	0.00
2	ESA75-Full	1	165.0	0.0	1.00E+00	0.00
3	ESA75-Full	1	1635.0	0.0	1.00E+00	0.00
4	ESA75-Full	1	1965.0	0.0	1.00E+00	0.00

Layout of result points on horizontal plane:
Xmin: 0 Xmax: 165 Xdel: 165
Y: 0

Details of Layered System:

ID: G0558-RC-FL-CBR2 Title: G0558 Reconstruct Flex CBR2.0

Layer No.	Lower i/face	Material ID	Isotropy	Modulus (or Ev)	P.Ratio (or vvh)	F	Eh	vh
1	rough	Gran_350	Aniso.	3.50E+02	0.35	2.59E+02	1.75E+02	0.35
2	rough	Gran_250	Aniso.	2.50E+02	0.35	1.85E+02	1.25E+02	0.35
3	rough	subsltCB10	Aniso.	1.00E+02	0.45	6.90E+01	5.00E+01	0.45
4	rough	Sub_CBR2	Aniso.	2.00E+01	0.45	1.38E+01	1.00E+01	0.45

Performance Relationships:

Layer No.	Location	Material ID	Component	Perform. Constant	Perform. Exponent	Traffic Multiplier
3	top	subsltCB10	EZZ	0.009150	7.000	1.000
4	top	Sub_CBR2	EZZ	0.009150	7.000	1.000

Reliability Factors: Not Used.

Details of Layers to be sublayered:
Layer no. 1: Austroads (2004) sublayering
Layer no. 2: Austroads (2004) sublayering
Layer no. 3: Austroads (2004) sublayering

Results:

Layer No.	Thickness	Material ID	Load ID	Critical Strain	CDF
1	150.00	Gran_350	n/a		n/a
2	290.00	Gran_250	n/a		n/a
3	200.00	subsltCB10	ESA75-Full	1.07E-03	1.553E-01
4	0.00	Sub_CBR2	ESA75-Full	1.19E-03	3.290E-01

CIRCLY - Version 7.0 (8 May 2024)

Job Title: East Seaham Road Stage 6

Design Method: General Design

Assumed number of damage pulses per movement:
Combined pulse for gear (i.e. ignore NROWS)

Traffic Spectrum Details:

ID: Ex - General Title: Example - General Analysis and General Design

Load No.	Load ID	Movements
1	ESA75-Full	5.14E+05

Details of Load Groups:

Load No.	Load ID	Load Category	Load Type	Radius	Pressure/ Ref. stress	Exponent
1	ESA75-Full	SADT,80	Vertical Force	92.1	0.75	0.00

Load Locations:

Location No.	Load ID	Gear No.	X	Y	Scaling Factor	Theta
1	ESA75-Full	1	-165.0	0.0	1.00E+00	0.00
2	ESA75-Full	1	165.0	0.0	1.00E+00	0.00
3	ESA75-Full	1	1635.0	0.0	1.00E+00	0.00
4	ESA75-Full	1	1965.0	0.0	1.00E+00	0.00

Layout of result points on horizontal plane:
Xmin: 0 Xmax: 165 Xdel: 165
Y: 0

Details of Layered System:

ID: G0558-RC-FL-CBR4 Title: G0558 Reconstruct Flex CBR4.0

Layer No.	Lower i/face	Material ID	Isotropy	Modulus (or Ev)	P.Ratio (or vvh)	F	Eh	vh
1	rough	Gran_350	Aniso.	3.50E+02	0.35	2.59E+02	1.75E+02	0.35
2	rough	Gran_250	Aniso.	2.50E+02	0.35	1.85E+02	1.25E+02	0.35
3	rough	Sub_CBR4	Aniso.	4.00E+01	0.45	2.76E+01	2.00E+01	0.45

Performance Relationships:

Layer No.	Location	Material ID	Component	Perform. Constant	Perform. Exponent	Traffic Multiplier
3	top	Sub_CBR4	EZZ	0.009150	7.000	1.000

Reliability Factors: Not Used.

Details of Layers to be sublayered:
Layer no. 1: Austroads (2004) sublayering
Layer no. 2: Austroads (2004) sublayering

Results:

Layer No.	Thickness	Material ID	Load ID	Critical Strain	CDF
1	150.00	Gran_350	n/a		n/a
2	290.00	Gran_250	n/a		n/a
3	0.00	Sub_CBR4	ESA75-Full	1.31E-03	6.306E-01

CIRCLY - Version 7.0 (8 May 2024)

Job Title: East Seaham Road Stage 6

Design Method: General Design

Assumed number of damage pulses per movement:
Combined pulse for gear (i.e. ignore NROWS)

Traffic Spectrum Details:

ID: Ex - General Title: Example - General Analysis and General Design

Load No.	Load ID	Movements
1	ESA75-Full	5.14E+05

Details of Load Groups:

Load No.	Load ID	Load Category	Load Type	Radius	Pressure/ Ref. stress	Exponent
1	ESA75-Full	SADT,80	Vertical Force	92.1	0.75	0.00

Load Locations:

Location No.	Load ID	Gear No.	X	Y	Scaling Factor	Theta
1	ESA75-Full	1	-165.0	0.0	1.00E+00	0.00
2	ESA75-Full	1	165.0	0.0	1.00E+00	0.00
3	ESA75-Full	1	1635.0	0.0	1.00E+00	0.00
4	ESA75-Full	1	1965.0	0.0	1.00E+00	0.00

Layout of result points on horizontal plane:
Xmin: 0 Xmax: 165 Xdel: 165
Y: 0

Details of Layered System:

ID: G0558-RC-FL-CBR10 Title: G0558 Reconstruct Flex CBR10.0

Layer No.	Lower i/face	Material ID	Isotropy	Modulus (or Ev)	P.Ratio (or vvh)	F	Eh	vh
1	rough	Gran_350	Aniso.	3.50E+02	0.35	2.59E+02	1.75E+02	0.35
2	rough	Gran_250	Aniso.	2.50E+02	0.35	1.85E+02	1.25E+02	0.35
3	rough	Sub_CBR10	Aniso.	1.00E+02	0.45	6.90E+01	5.00E+01	0.45

Performance Relationships:

Layer No.	Location	Material ID	Component	Perform. Constant	Perform. Exponent	Traffic Multiplier
3	top	Sub_CBR10	EZZ	0.009150	7.000	1.000

Reliability Factors: Not Used.

Details of Layers to be sublayered:
Layer no. 1: Austroads (2004) sublayering
Layer no. 2: Austroads (2004) sublayering

Results:

Layer No.	Thickness	Material ID	Load ID	Critical Strain	CDF
1	150.00	Gran_350	n/a		n/a
2	150.00	Gran_250	n/a		n/a
3	0.00	Sub_CBR10	ESA75-Full	9.68E-04	7.620E-02