



## GEOTECHNICAL SITE INVESTIGATION

**PROJECT:** 11 & 21-33 Owlpen Lane, Farley, NSW 2320

**CLIENT:** BATHLA GROUP

**DATE:** 28 September 2022

**REPORT No.:** NE1165



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## Table of Contents

<b>1. INTRODUCTION .....</b>	<b>3</b>
<b>2. FIELD INVESTIGATION.....</b>	<b>4</b>
<b>3. FINDINGS .....</b>	<b>5</b>
3.1 Site Condition and topography.....	5
3.2 Site Geology .....	5
3.3 Soil/Rock Profile .....	5
3.4 Site Classification.....	6
3.5 Groundwater.....	7
3.6 Earthquake Design .....	7
3.7 Salinity and Aggressivity Assessment .....	7
3.7.1 Salinity Assessment.....	8
3.7.2 Aggressivity assessment.....	8
3.7.3 Exposure Classifications for concrete and steel in Saline and sulfate soils .....	9
<b>4. FOUNDATION RECOMMENDATIONS.....</b>	<b>9</b>
4.1 Geotechnical Design Parameters.....	9
4.2 Strip Footing.....	9
4.3 Bored Piles.....	10
<b>5. EARTHWORKS .....</b>	<b>11</b>
5.1 Site Preparation .....	11
5.2 Excavation .....	12
5.3 Engineered Fill.....	13
5.4 Temporary Cut Batters.....	13
5.5 Retaining Wall .....	14
5.6 Compaction Requirements.....	14
<b>6. REFERENCES .....</b>	<b>16</b>

## Table Index

<b>Table 1: Summary of Sub-surface Materials</b>	<b>6</b>
<b>Table 2: Summary of Soil Laboratory Test Results</b>	<b>6</b>
<b>Table 3: Soil Salinity Test Results</b>	<b>8</b>
<b>Table 4: Soil Aggressivity test results for concrete and steel piles</b>	<b>8</b>
<b>Table 5: Estimated Geotechnical Design Parameters</b>	<b>9</b>
<b>Table 6: Allowable Bearing Capacity for Strip Footings</b>	<b>10</b>
<b>Table 7: Allowable Skin Friction and End Bearing Capacity</b>	<b>11</b>
<b>Table 8: Excavation classes as per SANS 1200D</b>	<b>12</b>
<b>Table 9: Retaining wall design parameters</b>	<b>14</b>

## Figures

<b>Figure 1: Site Plan and Boreholes</b>	<b>4</b>
<b>Figure 2: Geology Map of Site and surrounding area</b>	<b>5</b>

## Appendixes

Borehole Logs	
Laboratory Test Results	

## 1. INTRODUCTION

Geotesta was engaged by Bathla Group to conduct a geotechnical site investigation at 11 & 21-33 Owlpen Lane, Farley, NSW 2320. Based on the information received from the client, it is understood that the proposed development comprises of a residential subdivision with on-site roadways. This site investigation was carried out accordance with the fee proposal and scope of work provided to the client and approved on 22<sup>nd</sup> December 2021.

The field work was carried out on 28<sup>th</sup> March 2022. This report presents the geotechnical investigation results including sub-surface soil profile with interpreted geotechnical properties of the assessed subsurface lithology and recommendations on the design parameters of footing/foundation, footing type, founding depth, geotechnical parameters including allowable bearing capacity, site classification, salinity assessment, and construction/excavation recommendations.

This assessment has been carried out in general accordance with the following guidelines:

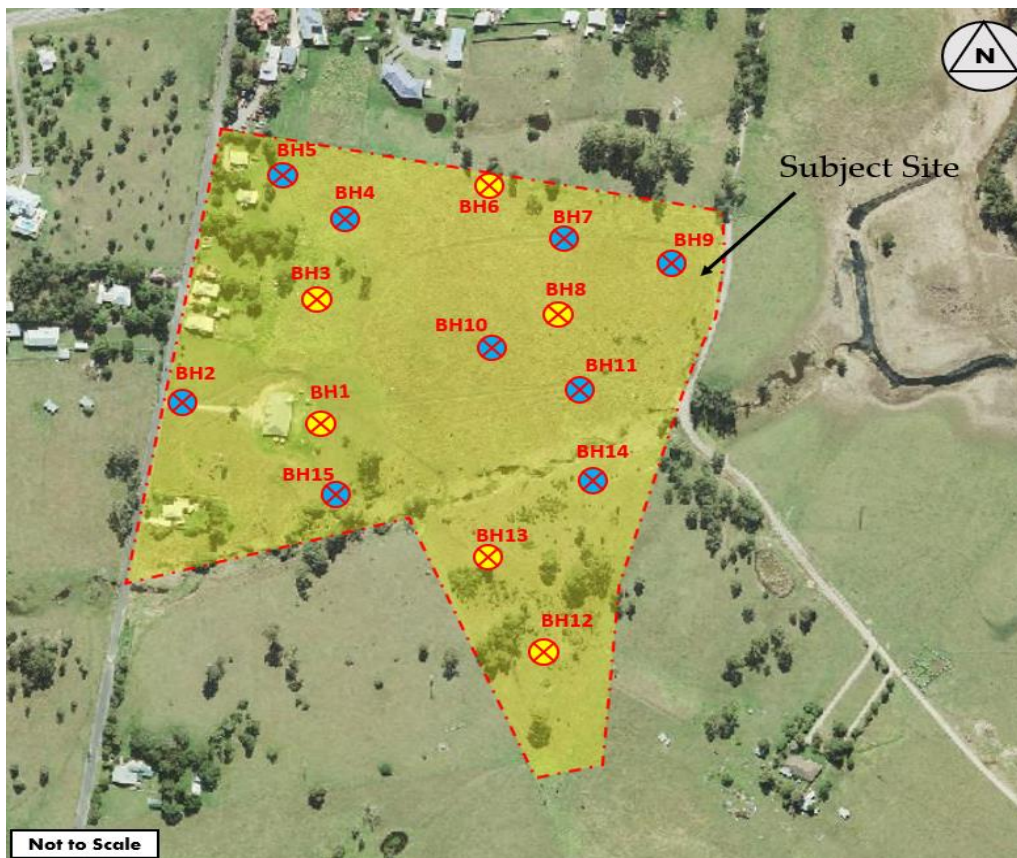
- Australian Standard (AS1726) 2017: Geotechnical Site Investigation
- Australian Standard (AS2870) 2011: Residential Slabs and Footings
- Australian Standard (AS) 3600 (2009), Concrete Structures
- Salinity Code of Practice March 2003 (Amended January 2004)

## 2. FIELD INVESTIGATION



The geotechnical site investigation involves drilling of six (6) boreholes to a maximum depth of 3.0m (BH1, 3, 6, 8, 12 and 13). All the boreholes were terminated on refusal depths from 0.8m to 3.0m. Nine (9) additional boreholes to 1.5m depth were drilled for the pavement design investigation (BH2, 4, 5, 7, 9, 10, 11, 14 and 15). The borehole location was determined by Geotesta, according to site accessibility and the locations of underground services.

A site plan showing the boreholes location is presented in Figure 1. Borehole drilling was carried out using a Ute-mounted drilling rig using a solid flight auger method. Dynamic Cone Penetrometer Testings were performed next to boreholes to determine the soil strength of soil layers.

The fieldwork was performed in the presence of a Geotesta Geotechnical Engineer who positioned borehole, collected samples, nominated testing depths, and prepared borehole logs in accordance with AS1726 – 2017 “Geotechnical Site Investigations”. All field observations and in-situ test results are presented in borehole logs attached in Appendix A of this report.



**Figure 1: Site Plan and Boreholes**

-  bore holes for geotechnical site investigation
-  bore holes for pavement design investigation  
(will be used in another report)



### 3. FINDINGS

#### 3.1 Site Condition and topography

The investigation area is situated at 11 & 21-33 Owlpen Lane, Farley, NSW 2320. The site under investigation is in the east of Owlpen Lane.

The site slopes down and then up towards the southeast with slope angle varying from 3° to 7°. At the time of the investigation, there was a single storey dwelling with a floor size of 317 m<sup>2</sup>. The site with area of approximately 11ha is bounded by Owlpen Lane and residential dwellings to the northwest and by vacant lands to the other sides.

The site lies at an elevation of approximately 20m above sea level (ASL) referenced to Australian Height Datum (AHD) (<http://en-au.topographic-map.com>). The site is located within Maitland City Council.

#### 3.2 Site Geology

The geological origin of the soil profile was identified from our visual examination of the soil samples, geotechnical experience, and reference to geological maps of the area. The Hunter 1:100,000 Quaternary Geology map indicates the site is situated in Dalwood Group (Pda) comprising of sandstone, lithic sandstone, conglomerate, siltstone and basalt. The geology map of the site and surrounding areas is shown in Figure 2.

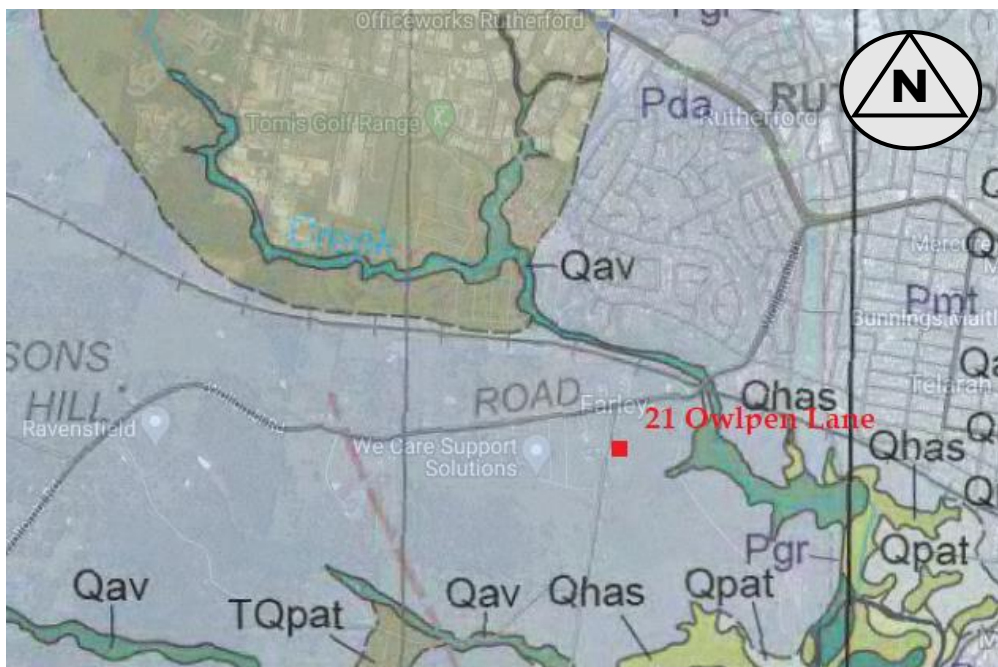


Figure 2: Geology Map of Site and surrounding area

#### 3.3 Soil/Rock Profile

Information gathered from the geotechnical fieldwork indicates that the site is overlain by topsoil/fill to a maximum depth of 0.5m. This layer is underlain by natural soil

comprising firm to hard Silty CLAY in the depths ranging from 0.2 to 3.0m. Very low strength, extremely weathered SHALE bedrock was encountered at boreholes BH3, BH6, and BH8 in the depth from 0.9 to 1.4m. At boreholes BH12 and BH13, very low strength, extremely weathered SANDSTONE bedrock was observed at the depth of 0.7 and 0.9m, respectively. The encountered soil profiles are presented in the borehole logs in Appendix A and tabulated in Table 1.

**Table 1: Summary of Sub-surface Materials**

Approximate Depth range of Unit (mBGL*)								
Unit	Material	BH1	BH3	BH6	BH8	BH12	BH13	Description
1	TOPSOIL/FILL	0.0- 0.5	0.0- 0.3	0.0- 0.3	0.0- 0.2	0.0- 0.2	0.0- 0.3	-
2	Silty CLAY	0.5- 1.1	0.3- 0.8	0.3- 0.8	0.2- 1.0	0.2- 0.5	0.3- 0.6	Firm to Stiff
3	Silty CLAY	1.1- 1.4	-	0.8- 0.9	-	-	-	Very Stiff
4	Silty CLAY	1.4- 3.0	0.8- 1.0	-	1.0- 1.3	0.5- 0.7	0.6- 0.9	Hard
5	SHALE	-	1.0- 1.1	0.9- 1.0	1.3- 1.4	-	-	Very low strength, Extremely Weathered
6	SANDSTONE	-	-	-	-	0.7- 0.8	0.9- 1.0	Very low strength, Extremely Weathered

\*measured from the existing ground surface

### 3.4 Site Classification

Six (6) soil samples were taken from the natural silty CLAY soil in boreholes and sent to Geotesta's laboratory, a NATA accredited laboratory for testing of index properties to assess the site reactivity and classification. The laboratory test results are summarised in Table 2.

**Table 2: Summary of Soil Laboratory Test Results**

Bore No.	Depth (m)	Soil Type	LL %	PL %	PI%	LS %
BH1	1.40	Silty CLAY	42	20	22	9.5
BH5	0.5	Silty CLAY	52	25	27	13
BH6	0.5	Silty CLAY	86	32	54	20.5
BH8	0.8	Silty CLAY	89	36	53	15
BH9	0.6	Silty CLAY	69	32	37	18
BH13	0.5	Silty CLAY	36	20	16	6.5

Note: LL= Liquid Limit; PL=Plastic Limit; PI= Plasticity Index; LS= Linear Shrinkage

Atterberg limit test results indicate that the natural Silty Clay at the site is medium to high plasticity soil. After considering the area geology, and the soil profile encountered in the bore holes; the site is classified as **CLASS 'H1'** with respect to foundation construction (Australian Standard 2870-2011 Residential Slabs and Footings). We assume the footing will be founded on stiff or better natural silty clay soil.

It has been estimated that the Characteristic Surface Movement ( $y_s$ ) of the underlying natural soil material will be in the range of 40-60mm provided the building site is protected from "abnormal moisture conditions" and is drained as described in AS 2870.

It must be emphasized that the heave mentioned, and recommendations referred to in this report are based solely on the observed soil profile observed at the time of the investigation for this report, without taking into account any abnormal moisture conditions as defined in AS2870 – 2011, Clause 1.3.3 that might be created thereafter. With abnormal moisture conditions, distresses will occur and may result in "non-acceptable probabilities of serviceability and safety of the building during its design life," as defined in AS2870-2011, Clause 1.3.1. If these distresses are not acceptable to the builder, owner or other relevant parties then further fieldwork and revised footing recommendations must be carried out.

### **3.5 Groundwater**

Groundwater was not encountered in any boreholes to 1.4m below the ground surface.

### **3.6 Earthquake Design**

Australian Standard AS 1170.4 "Structural design actions, Part 4: Earthquake actions in Australia" outlines the relevant methods used in earthquake risk classification and design requirements, enabling the assessment of an earthquake design category for the structure to be determined. Based on the results of the geotechnical investigation and the soil data gathered from the boreholes, a site sub-soil class of Ce – shallow soil site can be adopted as per Section 4 of the above standard.

A hazard factor (Z) of 0.1 can be adopted for Maitland area based on information obtained from Table 3.2 and Figure 3.2(A) of AS 1170.4 – 2007.

### **3.7 Salinity and Aggressivity Assessment**

Six (6) soil samples were submitted to Eurofin MGT Laboratory, a NATA accredited laboratory, for chemical testings for the salinity and aggressivity assessment. The

testings were carried out for aggressivity suit and to assess exposure classification for the proposed development.

Sampling was targeted to achieve a representative coverage of site conditions in line with assessed sub-surface profiles, proposed development, and the investigation scope. Laboratory test certificates are presented in Appendix B.

### 3.7.1 Salinity Assessment

Laboratory test results for salinity assessment are summarised in Table 3.

**Table 3: Soil Salinity Test Results**

Sample ID	Conductivity (Ec) (1:5 Aqueous extract dS/m)	Ece <sup>1</sup> (ds/m)	Salinity Assessment <sup>2</sup>
S1(1.5m)-BH1	0.062	0.56	Non-saline
S5(0.5m)-BH5	0.046	0.42	Non-saline
S6 (0.5m)-BH6	0.039	0.35	Non-saline
S8 (0.6m)-BH8	0.061	0.55	Non-saline
S9 (0.6m)-BH9	0.040	0.36	Non-saline
S13 (0.5m)-BH13	0.050	0.45	Non-saline

<sup>1</sup>Based on EC to Ece multiplication factors in Department of Land and Water Conservation (2002) Guidelines (Table 6.1), a multiplication factor of 9 were applied to medium clays.

<sup>2</sup>Based on Table 6.2 of Department of Land and Water Conservation (2002) where Ece < 2dS/m = Non-saline; Ece= 2-4dS/m = slightly saline; Ece = 4-8dS/m = moderately saline; Ece = 8-16dS/m = very saline; Ece > 16dS/m = highly saline.

Referring to the above test results, the site is considered to be non-saline.

### 3.7.2 Aggressivity assessment

Sulphate and pH test results for aggressivity assessment are summarised in Table 4.

**Table 4: Soil Aggressivity test results for concrete and steel piles**

Sample ID	pH (1:5 Aqueous extract)	Sulphate (SO <sub>4</sub> ) (mg/kg)	Aggressivity Assessment <sup>1</sup> Concrete	Aggressivity Assessment <sup>1</sup> Steel
S1-BH1	6.0	33	Non-aggressive	Non-aggressive
S5-BH5	5.8	35	Non-aggressive	Non-aggressive
S6-BH6	5.9	24	Non-aggressive	Non-aggressive
S8-BH8	5.8	14	Non-aggressive	Non-aggressive
S9-BH9	5.8	35	Non-aggressive	Non-aggressive
S13-BH13	6.4	15	Non-aggressive	Non-aggressive

<sup>1</sup>In accordance with AS3600 (2009)



Referring to the above test results, the site is considered non-aggressive.

### 3.7.3 Exposure Classifications for concrete and steel in Saline and sulfate soils

The site soil is considered non-saline and non-aggressive to steel and concrete. An exposure classification of A1 for concrete in saline soils and an exposure classification of A1 for concrete and steel in sulphate soils should be adopted for preliminary design of proposed concrete structures.

## 4. FOUNDATION RECOMMENDATIONS

### 4.1 Geotechnical Design Parameters

The estimated geotechnical parameters of the soil materials encountered below the site is provided in Table 5:

**Table 5: Estimated Geotechnical Design Parameters**

Unit/ Soil Type	$\gamma$ (kN/m <sup>3</sup> )	$S_u$ (kPa)	$c'$ (kPa)	$\Phi'$	$E'$ (MPa)	$\nu'$
Unit 2 / Silty CLAY (Firm to Stiff)	18	35	4	26	12	0.3
Unit 3 / Silty CLAY (Very Stiff)	20	100	8	28	30	0.3
Unit 4 / Silty CLAY (Hard)	20	200	10	28	60	0.3
Unit 5 / SHALE	22	-	30	28	100	0.3
Unit 6 / SANDSTONE	24	-	100	30	300	0.3

### 4.2 Strip Footing

Engineer designed strip footing system for a Class “H1” soil can be used on this site. We recommend that the designing engineer refer to AS2870-2011 to ensure design compliance to this document. As shale and sandstone are encountered in some boreholes at shallow depths (i.e., less than 1 m), strip footings of buildings in these locations should be embedded into shale and/or sandstone to avoid differential settlements. For buildings in locations with thick silty CLAY layers, strip footing systems supported by the natural silty CLAY (stiff or better) can be considered.

As a guide with information obtained from the boreholes and DCP tests, the allowable bearing capacity for strip founding on the natural silty CLAY, SHALE, and SANDSTONE, at the test locations should be as follow:

**Table 6: Allowable Bearing Capacity for Strip Footings**

<b>Material</b>	<b>Unit 2 Firm to Stiff Silty CLAY</b>	<b>Unit 3 Very Stiff Silty CLAY</b>	<b>Unit 4 Hard Silty CLAY</b>	<b>Unit 5 SHALE</b>	<b>Unit 6 SANDSTONE</b>
Allowable Bearing Capacity (kPa)	70	180	300	600	700

It should be noted that the soil/rock profile may vary across the site. The foundation depths quoted in this report are measured from the surface during our testing and may vary accordingly if any filling or excavation works are carried out. It is recommended that a geotechnical engineer be engaged during footing excavation stage to confirm the founding depth and founding material.

Controlled fill is material that has been placed and compacted in layers by compaction equipment within a defined moisture range to a defined density requirement. Except as provided below, controlled fill shall be placed in accordance with AS 3798.

If more than 400mm of CLAY FILL or 800mm of SAND FILL, imported or site derived, including existing FILL material, is required, then the slab must be designed as a suspended slab and supported by a grid of beams founded through any fill material in accordance with the above edge beam recommendations.

The settlement of a footing is dependent on the load applied to the footing and the foundation conditions below the footing. However, it can be expected that the settlement of a strip footing designed using the parameters in Table 5 will be  $\leq 1\%$  of the footing width.

All footings for the same structure should be founded on strata of similar stiffness to minimize the risk of differential movements, with articulation provided where appropriate.

### 4.3 Bored Piles

Bored piles can be used to support residential buildings. The piles should be founded with an embedment of at least one (1) pile diameter in the founding material for which the footing has been designed. The allowable end bearing capacities for hard clay and shale are presented in Table 7. Additional embedment of three (3) pile diameters would be necessary to utilise adhesion for the embedment in the respective materials.

**Table 7: Allowable Skin Friction and End Bearing Capacity**

<b>Material</b>	<b>Unit 3 Very Stiff Silty CLAY</b>	<b>Unit 4 Hard Silty CLAY</b>	<b>Unit 5 SHALE</b>	<b>Unit 6 SANDSTONE</b>
Allowable Shaft Adhesion (kPa)	15 kPa	30 kPa	40 kPa	70 kPa
Allowable End Bearing Capacity (kPa)	-	-	700 kPa	800 kPa

*Note: Minimum embedment depths of one (1) and three (3) pile diameters in/to the Shale/Sandstone are necessary to achieve these allowable design values for end bearing and adhesion, respectively.*

Considering the depth and variation of soil profile across the site, concrete slab on bored piers is recommended to support the loads of the proposed residential building and, the piers should be founded onto the shale bedrock through any fill/silty clay layers. Hence, it is preferable for the piles to have a minimum length of 1.5-2m to ensure them approach the soil layer with an end bearing capacity of 700kPa (Unit 5 -SHALE) or 800kPa (Unit 6-SANDSTONE).

The pile foundation of the proposed structure is assumed to be a high redundancy system and the intrinsic test factor ( $\phi_{tf}$ ) is assumed to be equal to basic geotechnical strength reduction factor ( $\phi_{gb}$ ), in accordance with AS2159-2009. The overall design average risk rating (ARR) is to be calculated by the designer and the corresponding geotechnical strength reduction shall be adopted.

## **5. EARTHWORKS**

### **5.1 Site Preparation**

The depth of topsoil/fill varies across the site up to a depth of 0.5m. Any fill encountered during excavation should be treated as uncontrolled. The following measures should be adopted for the site preparation of the site:

- All topsoil from the construction area should be stripped to subgrade/foundation level and stockpiled on site for possible re-use. Topsoil not being re-used should be disposed of offsite following a waste classification report.
- Any evidence of contamination or asbestos containing materials found during excavation works should be brought to the attention of the Project Engineer immediately.

It is recommended that Geotesta be engaged to provide a site inspection during the early stage of construction to confirm that the ground conditions of the subgrade for the proposed construction are consistent with the assumptions/findings in this report.

Earthworks recommendations in this report should be read in conjunction with AS 3798-2007: 'Guidelines on Earthworks for Commercial and Residential Developments'. It is recommended that any uncontrolled fill material or soft spots encountered in the proposed subgrade be removed to reveal stiff/very stiff natural soil. The removed section of the subgrade shall be backfilled to the underside of the foundation level, in layers not exceeding 200 mm loose thickness with controlled fill or site derived clay material compacted to 98-102% of maximum dry density of standard compaction (AS 1289.5.1.1) with moisture condition at the equilibrium moisture content or -2% to +2% of the optimum.

## 5.2 Excavation

Based on the soil/bedrock profile and conditions encountered at the borehole locations, light excavation machinery should be adequate for the footing excavations (down to 1.5m) in fill materials. Soft/Intermediate excavation condition is expected in Silty Clay (i.e., Unit 2, 3 and 4), while excavations into SHALE/SANDSTONE (i.e., Unit 5/6) will encounter intermediate to hard excavation conditions per SANS 1200D. Table 8 describes the excavation classes as per SANS 1200D.

**Table 8: Excavation classes as per SANS 1200D**

Excavation Class	Description
Soft	Excavation in material that can be efficiently removed by a back-acting excavator of flywheel power approximately 0.10kW per millimetre of tined-bucket width, without the use of pneumatic tools such as paving breakers
Intermediate	Excavation in material that requires a back-acting excavator of flywheel power exceeding 0.10 kW per millimetre of tined-bucket width or the use of pneumatic tools before removal by equipment equivalent to that specified for soft excavation.
Hard	Hard rock excavation shall be excavation in material (excluding boulder excavation) that cannot be efficiently removed without blasting or wedging and splitting.

Based on the current investigation, the excavation is unlikely to encounter groundwater. All topsoil from the construction area should be stripped to subgrade level and stockpiled on site for possible re-use. Topsoil not being re-used should be disposed of offsite following a waste classification report.

Any evidence of contamination or asbestos containing materials found during excavation works should be notified to the Project Engineer immediately.

### 5.3 Engineered Fill

Controlled or Rolled fill can be constructed in uniform layers to provide the required design level in accordance with the project foundation design requirements (if applicable). Controlled/Rolled fill must be well compacted in layers not exceeding 200 mm thick.

The fill material shall be uniformly compacted with the required moisture content to achieve satisfactory compaction and shall be graded and trimmed parallel to the designed finished surface.

Filling used to raise levels beneath foundations must be placed and compacted as per specifications for Controlled or Rolled fill.

All fill material is to be compacted to a minimum of 98% Standard Maximum Dry Density (SMDD) ratio determined in accordance AS 1289.5.4.1.

Generally, the soils encountered on site will be suitable for reuse as engineered fill within the site. The natural clayey soils are best suited for bulk filling within site. The material should not contain any particle sizes greater than 150 mm. It is expected that bedrock of low strength or less (if applicable) should readily break down beneath the weight of the rollers, however, bedrock of medium strength or higher may potentially need to be crushed using a rock crusher.

### 5.4 Temporary Cut Batters

Temporary unsupported excavation up to 1.5m deep within the existing Unit 2/3 Silty Clay layer should be no steeper than 1.5H:1V; Temporary unsupported cut batters more than 1.5m up to 3.0m deep within the existing Unit 3/4 Silty Clay should not be steeper than 2H:1V.

The above recommendations assume that there is no existing structure directly adjacent to the excavation area. It should be noted that following rainy periods, some degree of deterioration and minor slumping of unsupported cut batters is to be anticipated.

It is recommended that a geotechnical engineer be engaged during excavation stage to confirm/identify the material for the whole excavation depth.

The batter slope angles are recommended subjected to the following measures:

- The batters should be protected against erosion
- Permanent batters should be drained



- Temporary batters shall not be left unsupported for more than 2 months without further advice. Following heavy rains (raining more than 6 hours with the intensity of greater than 15 mm/day) should be inspected by a geotechnical engineer.
- A minimum offset distance of 1.5 m from the batter crest should be maintained for surcharge loads and the offset distance should be increased to match the maximum depth of excavation.

## 5.5 Retaining Wall

Any proposed retaining walls at the site should be engineer designed adopting the geotechnical parameters summarised in Table 9 below.

**Table 9: Retaining wall design parameters**

Unit/ Soil Type	$\gamma$ (kN/m <sup>3</sup> )	$K_0$	$K_a$	$K_p$ /Ultimate Earth Pressure Resistance
Unit 2: Sandy Clay/Silty Clay, Stiff	18	0.56	0.39	2.56
Unit 3-4: Sandy Clay/Silty Clay, Very Stiff-Hard	20	0.53	0.36	2.77
Unit 5-6: Shale/Sandstone (Class V)	22	0.4	0.3	200kPa

For construction methods which minimise deflection and where restraint is applied via struts, bracings or anchors, the temporary or short-term lateral earth pressure distribution should be approximated as a trapezoidal distribution behind the retaining wall. A maximum lateral earth pressure of 8H kPa is obtained at a depth of 0.25H, where H is the total depth of the excavation to be retained. For basement walls where wall deflections are not critical, the maximum lateral earth pressure may be reduced to 6H kPa.

It must be emphasised that where adjoining footings exist near the retaining walls, the “at rest” earth pressures must be maintained, and the active design condition is not appropriate.

## 5.6 Compaction Requirements

Compaction of backfill material is required to ensure that excessive surface settlement does not occur. The required backfill density and minimum frequency of testing for compaction control as detailed in AS 3798 are summarised below:

- 1 test per layer per 500 m<sup>2</sup>; or

- 1 test per 100 m<sup>3</sup> distributed reasonably evenly throughout full depth and area; or
- 3 tests per visit (whichever requires the most tests)

Testing should be undertaken in accordance with AS 1289, *Methods of testing for soil engineering purposes*. Tested layers that do not satisfy the outlined criteria are to be stripped, replaced, re-compacted and re-tested to achieve the minimum compaction requirement specified above.

Testing of compaction density should be undertaken by a suitably qualified geotechnical testing company.

### **DOCUMENT CONTROL**

<b>Date</b>	<b>Version</b>	<b>Report Prepared By:</b>	<b>Report Reviewed by:</b>
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## 6. REFERENCES

- Australian Standard (AS1726) 2017: Geotechnical Site Investigation
- Australian Standard (AS2870) 2011: Residential Slabs and Footings
- Salinity Code of Practice March 2003 (Amended January 2004);
- Australian Standard (AS) 3600 (2009), Concrete Structures
- Australian Standard (2009), Piling - Design and Installation (AS2159).
- Australian Standard (2002), Earth-retaining Structures (AS4678).
- Australian Standard (2004), Bridge Design Part 5: Concrete (AS5100.5).
- Pells, P.J.N., Mostyn, G., Walker, B.F. (1998) Design Loadings for Foundations on Shale and Sandstone in the Sydney Region.

## **Information about This Report**

The report contains the results of Soil and water quality Assessment conducted for a specific purpose and client. The results should not be used by other parties, or for other purposes, as they may contain neither adequate nor appropriate information.

### **Test Hole Logging**

The information on the test hole logs (boreholes, test pits, exposures etc.) is based on a visual and tactile assessment, except at the discrete locations where test information is available (field and/or laboratory results). The test hole logs include both factual data and inferred information.

### **Groundwater**

Unless otherwise indicated, the water levels presented on the test hole logs are the levels of free water or seepage in the test hole recorded at the given time of measuring. The actual groundwater level may differ from this recorded level depending on material permeability (i.e. depending on response time of the measuring instrument). Further, variations of this level could occur with time due to such effects as seasonal, environmental and tidal fluctuations or construction activities. Confirmation of groundwater levels, phreatic surfaces or piezometric pressures can only be made by appropriate instrumentation techniques and monitoring programmes.

### **Interpretation of Results**

The discussion or recommendations contained within this report normally are based on a site evaluation from discrete test hole data. Generalised, idealised or inferred subsurface conditions (including any geotechnical cross-sections) have been assumed or prepared by interpolation and/or extrapolation of these data. As such these conditions are an interpretation and must be considered as a guide only.

### **Change in Conditions**

Local variations or anomalies in the generalised ground conditions do occur in the natural environment, particularly between discrete test hole locations. Additionally, certain design or construction procedures may have been assumed in assessing the soil-structure interaction behaviour of the site. Furthermore, conditions may change at the site from those encountered at the time of the geotechnical investigation through construction activities and constantly changing natural forces.

Any change in design, in construction methods, or in ground conditions as noted during construction, from those assumed or reported should be referred to GEOTESTA for appropriate assessment and comment.

### **Reproduction of Reports**

Where it is desired to reproduce the information contained in our geotechnical report, or other technical information, for the inclusion in contract documents or engineering specification of the subject development, such reproductions should include at least all of the relevant test hole and test data, together with the appropriate standard description sheets and remarks made in the written report of a factual or descriptive nature. Reports are the subject of copyright and shall not be reproduced without the permission of Geotesta.

Appendix A  
Borehole Logs





# BOREHOLE: BH1

Sheet 1 OF 1

Client	Bathla Group	Contractor	Geotesta	Easting	As per Plan
Project	21-33 Owlpen Lane Farely NSW	Drill Rig	Hand Auger	Northing	As per Plan
Job No.	NE1165	Driller	VL	Grid Ref	MGA94 Zone 55
Location	21-33 Owlpen Lane Farely NSW	Inclination	-90°	Logged	VL Date 28/03/22
Date Drilled	28/03/22	Hole Depth	3.00m	Checked	MHB Date 28/03/22

METHOD	WATER	DEPTH (metres)	DEPTH RL	GRAPHIC LOG	GROUP SYMBOL	SOIL/ROCK MATERIAL DESCRIPTION	MOISTURE CONDITION	CONSISTENCY	DENSITY	DCP BLOWS PER 100mm	FIELD TESTING AND ADDITIONAL NOTES	SAMPLE	
AS	Not Encountered	0.00											0.00
		0.50			FILL	TOPSOIL/FILL: Silty CLAY, medium plasticity, brown	M - W	PC		1		AS 0.10m AS1	
		0.80			CI	Silty CLAY: medium plasticity, yellow brown; trace medium-grained sand.	M - W	F - St		2		BD 0.50m ES 0.50m EBH1	
		1.00					W			3			1.00
		1.40				Grades: becoming orange brown			VSt	5			
		2.00							H	8			
		2.20				Grades: becoming mottled red grey, trace shale fragments	M			10			
		3.00	3.00							14		D 1.40m Att1 E 1.50m S1	
										17			
										19			
										20	DCP refusal at 1.7m, 20 blows reached		
						Hole Terminated at 3.00 m Refusal							3.00
		4.00											4.00
		5.00											5.00

STANDARD: AS1726-2017

**CONSISTENCY:**

VS very soft  
 S soft  
 F firm  
 St stiff  
 VSt very stiff  
 H hard

**RELATIVE DENSITY:**

VL very loose  
 L loose  
 MD medium dense  
 D dense  
 VD very dense

**WATER:**

☒ water level  
 ▷ water inflow  
 ▷ water loss

**SAMPLING/IN-SITU TESTING:**

C core sample  
 U tube sample  
 D disturbed sample  
 B bulk sample  
 LB large bulk sample  
 E environmental sample  
 HB hammer bouncing  
 SPT standard penetration test  
 PP pocket penetrometer reading (kPa)  
 FV field vane shear test (uncorrected peak shear strength, kPa)  
 DCP dynamic cone penetration test  
 CPT static cone penetration test

**COMPACTION:**

WC well compacted  
 MC moderately compacted  
 PC poorly compacted

**MOISTURE:**

D dry  
 M moist  
 W wet



# BOREHOLE: BH2

Sheet 1 OF 1

Client	Bathla Group	Contractor	Geotesta	Easting	As per Plan
Project	21-33 Owlpen Lane Farelly NSW	Drill Rig	Hand Auger	Northing	As per Plan
Job No.	NE1165	Driller	VL	Grid Ref	MGA94 Zone 55
Location	21-33 Owlpen Lane Farelly NSW	Inclination	-90°	Logged	VL Date 29/03/22
Date Drilled	29/03/22	Hole Depth	1.30m	Checked	MHB Date 29/03/22

METHOD	WATER	DEPTH (metres)	DEPTH RL	GRAPHIC LOG	GROUP SYMBOL	SOIL/ROCK MATERIAL DESCRIPTION	MOISTURE CONDITION	CONSISTENCY	DENSITY	DCP BLOWS PER 100mm	FIELD TESTING AND ADDITIONAL NOTES	SAMPLE	
AS	Not Encountered	0.00											0.00
		0.20			FILL	TOPSOIL/FILL: Silty CLAY, medium plasticity, black brown	M	PC				AS 0.10m	
		0.50			CI	Silty CLAY: low - medium plasticity, yellow brown, mottled red.  Grades: trace sandstone and gravel pieces	M	St				AS2 B 0.20 - 0.50m CBR2 ES 0.40m EBH2	
		1.00											1.00
		1.10											
		1.30				SHALE: grey, very low strength, extremely weathered.	M	VLS					
						Hole Terminated at 1.30 m Refusal							
		2.00											2.00
		3.00											3.00
		4.00											4.00
		5.00											5.00

STANDARD: AS1726-2017

<b>CONSISTENCY:</b>	<b>RELATIVE DENSITY:</b>	<b>WATER:</b>	<b>SAMPLING/IN-SITU TESTING:</b>
VS very soft	VL very loose	water level	C core sample
S soft	L loose	water inflow	U tube sample
F firm	MD medium dense	water loss	D disturbed sample
St stiff	D dense		B bulk sample
VSt very stiff	VD very dense		LB large bulk sample
H hard			E environmental sample
			HB hammer bouncing
<b>COMPACTION:</b>	<b>MOISTURE:</b>		
WC well compacted	D dry		SPT standard penetration test
MC moderately compacted	M moist		PP pocket penetrometer reading (kPa)
PC poorly compacted	W wet		FV field vane shear test (uncorrected peak shear strength, kPa)
			DCP dynamic cone penetration test
			CPT static cone penetration test



# BOREHOLE: BH3

Sheet 1 OF 1

Client	Bathla Group	Contractor	Geotesta	Easting	As per Plan
Project	21-33 Owlpen Lane Farely NSW	Drill Rig	Hand Auger	Northing	As per Plan
Job No.	NE1165	Driller	VL	Grid Ref	MGA94 Zone 55
Location	21-33 Owlpen Lane Farely NSW	Inclination	-90°	Logged	VL Date 29/03/22
Date Drilled	29/03/22	Hole Depth	1.10m	Checked	MHB Date 29/03/22

METHOD	WATER	DEPTH (metres)	DEPTH RL	GRAPHIC LOG	GROUP SYMBOL	SOIL/ROCK MATERIAL DESCRIPTION	MOISTURE CONDITION	CONSISTENCY	DENSITY	DCP BLOWS PER 100mm	FIELD TESTING AND ADDITIONAL NOTES	SAMPLE					
		0.00											0.00				
AS	Not Encountered	0.30	0.30		FILL	TOPSOIL/FILL: Silty CLAY, medium plasticity, brown	M	PC		1			AS 0.10m AS3				
					CI	Silty CLAY: medium plasticity, yellow brown.	M	F		2					ES 0.40m EBH3		
						Grades: becoming mottled red grey, trace ironstone pieces		H		2							
						SHALE: grey, very low strength, extremely weathered, trace sandstone pieces.	M	VLS		20			DCP refusal at 0.7m, 20 blows reached				1.00
		1.00	1.10			Hole Terminated at 1.10 m Refusal											
		2.00											2.00				
		3.00											3.00				
		4.00											4.00				
		5.00											5.00				

STANDARD: AS1726-2017

<b>CONSISTENCY:</b>	<b>RELATIVE DENSITY:</b>	<b>WATER:</b>	<b>SAMPLING/IN-SITU TESTING:</b>
VS very soft	VL very loose	water level	C core sample
S soft	L loose	water inflow	U tube sample
F firm	MD medium dense	water loss	D disturbed sample
St stiff	D dense		B bulk sample
VSt very stiff	VD very dense		LB large bulk sample
H hard			E environmental sample
			HB hammer bouncing
<b>COMPACTION:</b>	<b>MOISTURE:</b>		SPT standard penetration test
WC well compacted	D dry		PP pocket penetrometer reading (kPa)
MC moderately compacted	M moist		FV field vane shear test (uncorrected peak shear strength, kPa)
PC poorly compacted	W wet		DCP dynamic cone penetration test
			CPT static cone penetration test



# BOREHOLE: BH4

Sheet 1 OF 1

Client	Bathla Group	Contractor	Geotesta	Easting	As per Plan
Project	21-33 Owlpen Lane Farely NSW	Drill Rig	Hand Auger	Northing	As per Plan
Job No.	NE1165	Driller	VL	Grid Ref	MGA94 Zone 55
Location	21-33 Owlpen Lane Farely NSW	Inclination	-90°	Logged	VL Date 29/03/22
Date Drilled	29/03/202	Hole Depth	1.60m	Checked	MHB Date 29/03/22

METHOD	WATER	DEPTH (metres)	DEPTH RL	GRAPHIC LOG	GROUP SYMBOL	SOIL/ROCK MATERIAL DESCRIPTION	MOISTURE CONDITION	CONSISTENCY	DENSITY	DCP BLOWS PER 100mm	FIELD TESTING AND ADDITIONAL NOTES	SAMPLE	
AS	Not Encountered	0.00											0.00
		0.30			FILL	TOPSOIL/FILL: Silty CLAY, medium plasticity, brown	M	PC				AS 0.10m AS4	
		0.80			CI	Silty CLAY: medium plasticity, orange brown.	M	St				B 0.30 - 0.80m CBR4 ES 0.40m EBH4	
		1.00				Grades: low-medium plasticity, becoming mottled red grey							1.00
		1.30											
		1.50				SHALE: grey, very low strength, extremely weathered.	M	VLS					
		1.60				Grades: becoming yellow brown, mottled grey							
		2.00				Hole Terminated at 1.60 m Refusal							2.00
		3.00											3.00
		4.00											4.00
		5.00											5.00

STANDARD: AS1726-2017

**CONSISTENCY:**

VS very soft  
S soft  
F firm  
St stiff  
VSt very stiff  
H hard

**RELATIVE DENSITY:**

VL very loose  
L loose  
MD medium dense  
D dense  
VD very dense

**WATER:**

☒ water level  
☐ water inflow  
☐ water loss

**SAMPLING/IN-SITU TESTING:**

C core sample  
U tube sample  
D disturbed sample  
B bulk sample  
LB large bulk sample  
E environmental sample  
HB hammer bouncing  
SPT standard penetration test  
PP pocket penetrometer reading (kPa)  
FV field vane shear test (uncorrected peak shear strength, kPa)  
DCP dynamic cone penetration test  
CPT static cone penetration test

**COMPACTION:**

WC well compacted  
MC moderately compacted  
PC poorly compacted

**MOISTURE:**

D dry  
M moist  
W wet



# BOREHOLE: BH5

Sheet 1 OF 1

Client	Bathla Group	Contractor	Geotesta	Easting	As per Plan
Project	21-33 Owlpen Lane Farely NSW	Drill Rig	Hand Auger	Northing	As per Plan
Job No.	NE1165	Driller	VL	Grid Ref	MGA94 Zone 55
Location	21-33 Owlpen Lane Farely NSW	Inclination	-90°	Logged	VL Date 29/03/22
Date Drilled	29/03/22	Hole Depth	1.00m	Checked	MHB Date 29/03/22

METHOD	WATER	DEPTH (metres)	DEPTH RL	GRAPHIC LOG	GROUP SYMBOL	SOIL/ROCK MATERIAL DESCRIPTION	MOISTURE CONDITION	CONSISTENCY	DENSITY	DCP BLOWS PER 100mm	FIELD TESTING AND ADDITIONAL NOTES	SAMPLE	
AS	Not Encountered	0.00											0.00
		0.20			FILL	TOPSOIL/FILL: Silty CLAY, medium plasticity, brown	M	PC					
		0.90			CI	Silty CLAY: high plasticity, yellow brown, mottled red grey; trace ironstone pieces.	M	F - St				AS 0.10m AS5 B 0.20 - 0.60m CBR5 ES 0.40m EBH5 D 0.50m Att5 E 0.50m S5	
		1.00	1.00			SHALE: brown, very low strength, extremely weathered, trace sandstone pieces. Hole Terminated at 1.00 m Refusal	M	VLS					1.00
		2.00											2.00
		3.00											3.00
		4.00											4.00
		5.00											5.00

STANDARD: AS1726-2017

<b>CONSISTENCY:</b>	<b>RELATIVE DENSITY:</b>	<b>WATER:</b>	<b>SAMPLING/IN-SITU TESTING:</b>
VS very soft	VL very loose	☒ water level	C core sample
S soft	L loose	☐ water inflow	U tube sample
F firm	MD medium dense	☐ water loss	D disturbed sample
St stiff	D dense		B bulk sample
VSt very stiff	VD very dense		LB large bulk sample
H hard			E environmental sample
			HB hammer bouncing
<b>COMPACTION:</b>	<b>MOISTURE:</b>		SPT standard penetration test
WC well compacted	D dry		PP pocket penetrometer reading (kPa)
MC moderately compacted	M moist		FV field vane shear test (uncorrected peak shear strength, kPa)
PC poorly compacted	W wet		DCP dynamic cone penetration test
			CPT static cone penetration test





# BOREHOLE: BH6

Sheet 1 OF 1

Client	Bathla Group	Contractor	Geotesta	Easting	As per Plan
Project	21-33 Owlpen Lane Farely NSW	Drill Rig	Hand Auger	Northing	As per Plan
Job No.	NE1165	Driller	VL	Grid Ref	MGA94 Zone 55
Location	21-33 Owlpen Lane Farely NSW	Inclination	-90°	Logged	VL Date 29/03/22
Date Drilled	29/03/22	Hole Depth	1.00m	Checked	MHB Date 29/03/22

METHOD	WATER	DEPTH (metres)	DEPTH RL	GRAPHIC LOG	GROUP SYMBOL	SOIL/ROCK MATERIAL DESCRIPTION	MOISTURE CONDITION	CONSISTENCY	DENSITY	DCP BLOWS PER 100mm	FIELD TESTING AND ADDITIONAL NOTES	SAMPLE	
AS	Not Encountered	0.00											0.00
		0.30			FILL	TOPSOIL/FILL: Silty CLAY, medium plasticity, brown	M	PC		1		AS 0.10m AS6	
		0.90			CI	Silty CLAY: high plasticity, orange brown, mottled red grey.	M	F		1		ES 0.40m EBH6	
		1.00				SHALE: grey, with red planar layers, very low strength, extremely weathered, trace sandstone pieces.	M	VSt		2		D 0.50m Att6	
		1.00				Hole Terminated at 1.00 m Refusal		VLS		7		E 0.50m S6	1.00
										10	DCP refusal at 1m, 20 blows reached		
		2.00											2.00
		3.00											3.00
		4.00											4.00
		5.00											5.00

STANDARD: AS1726-2017

**CONSISTENCY:**

VS very soft  
 S soft  
 F firm  
 St stiff  
 VSt very stiff  
 H hard

**RELATIVE DENSITY:**

VL very loose  
 L loose  
 MD medium dense  
 D dense  
 VD very dense

**WATER:**

☒ water level  
 ▷ water inflow  
 ▷ water loss

**SAMPLING/IN-SITU TESTING:**

C core sample  
 U tube sample  
 D disturbed sample  
 B bulk sample  
 LB large bulk sample  
 E environmental sample  
 HB hammer bouncing  
 SPT standard penetration test  
 PP pocket penetrometer reading (kPa)  
 FV field vane shear test (uncorrected peak shear strength, kPa)  
 DCP dynamic cone penetration test  
 CPT static cone penetration test

**COMPACTION:**

WC well compacted  
 MC moderately compacted  
 PC poorly compacted

**MOISTURE:**

D dry  
 M moist  
 W wet



# BOREHOLE: BH7

Sheet 1 OF 1

Client	Bathla Group	Contractor	Geotesta	Easting	As per Plan
Project	21-33 Owlpen Lane Farely NSW	Drill Rig	Hand Auger	Northing	As per Plan
Job No.	NE1165	Driller	VL	Grid Ref	MGA94 Zone 55
Location	21-33 Owlpen Lane Farely NSW	Inclination	-90°	Logged	VL Date 29/03/22
Date Drilled	29/03/22	Hole Depth	1.10m	Checked	MHB Date 29/03/22

METHOD	WATER	DEPTH (metres)	DEPTH RL	GRAPHIC LOG	GROUP SYMBOL	SOIL/ROCK MATERIAL DESCRIPTION	MOISTURE CONDITION	CONSISTENCY	DENSITY	DCP BLOWS PER 100mm	FIELD TESTING AND ADDITIONAL NOTES	SAMPLE	
AS	Not Encountered	0.00											0.00
		0.20			FILL	TOPSOIL/FILL: Silty CLAY, medium plasticity, brown	M	PC		1			
		0.60			CI	Silty CLAY: medium plasticity, orange brown.	M	F		2		AS 0.10m	
		1.00				Grades: low plasticity, becoming mottled red, trace grey clayey sand	D - M	St		2		B 0.20 - 0.60m	
		1.10				SHALE: grey, very low strength, extremely weathered.	M	VLS		7		ES 0.40m	
						Hole Terminated at 1.10 m Refusal				10		EBH7	1.00
										20	DCP refusal at 1.0m, 20 blows reached		
		2.00											2.00
		3.00											3.00
		4.00											4.00
		5.00											5.00

STANDARD: AS1726-2017

<b>CONSISTENCY:</b>	<b>RELATIVE DENSITY:</b>	<b>WATER:</b>	<b>SAMPLING/IN-SITU TESTING:</b>
VS very soft	VL very loose	☒ water level	C core sample
S soft	L loose	☐ water inflow	U tube sample
F firm	MD medium dense	☐ water loss	D disturbed sample
St stiff	D dense		B bulk sample
VSt very stiff	VD very dense		LB large bulk sample
H hard			E environmental sample
			HB hammer bouncing
<b>COMPACTION:</b>	<b>MOISTURE:</b>		SPT standard penetration test
WC well compacted	D dry		PP pocket penetrometer reading (kPa)
MC moderately compacted	M moist		FV field vane shear test (uncorrected peak shear strength, kPa)
PC poorly compacted	W wet		DCP dynamic cone penetration test
			CPT static cone penetration test



# BOREHOLE: BH8

Sheet 1 OF 1

Client	Bathla Group	Contractor	Geotesta	Easting	As per Plan
Project	21-33 Owlpen Lane Farelly NSW	Drill Rig	Hand Auger	Northing	As per Plan
Job No.	NE1165	Driller	VL	Grid Ref	MGA94 Zone 55
Location	21-33 Owlpen Lane Farelly NSW	Inclination	-90°	Logged	VL Date 29/03/22
Date Drilled	29/03/22	Hole Depth	1.40m	Checked	MHB Date 29/03/22

METHOD	WATER	DEPTH (metres)	DEPTH RL	GRAPHIC LOG	GROUP SYMBOL	SOIL/ROCK MATERIAL DESCRIPTION	MOISTURE CONDITION	CONSISTENCY	DENSITY	DCP BLOWS PER 100mm	FIELD TESTING AND ADDITIONAL NOTES	SAMPLE	
		0.00											0.00
AS	Not Encountered	0.20			FILL	TOPSOIL/FILL: Silty CLAY, medium plasticity, dark brown	M	PC				AS 0.10m AS8	
		1.00			CI	Silty CLAY: high plasticity, orange brown, mottled red grey.	M	F - St				ES 0.40m EBH8	
		1.30				Grades: trace sandstone pieces		St - VSt				D 0.60m Att8	
		1.40				SHALE: grey, low plasticity, very low strength, extremely weathered.	M	VLS				E 0.60m S8	1.00
		2.00				Hole Terminated at 1.40 m Refusal							2.00
		3.00											3.00
		4.00											4.00
		5.00											5.00

STANDARD: AS1726-2017

<b>CONSISTENCY:</b>	<b>RELATIVE DENSITY:</b>	<b>WATER:</b>	<b>SAMPLING/IN-SITU TESTING:</b>
VS very soft	VL very loose	water level	C core sample
S soft	L loose	water inflow	U tube sample
F firm	MD medium dense	water loss	D disturbed sample
St stiff	D dense		B bulk sample
VSt very stiff	VD very dense		LB large bulk sample
H hard			E environmental sample
			HB hammer bouncing
<b>COMPACTION:</b>	<b>MOISTURE:</b>		SPT standard penetration test
WC well compacted	D dry		PP pocket penetrometer reading (kPa)
MC moderately compacted	M moist		FV field vane shear test (uncorrected peak shear strength, kPa)
PC poorly compacted	W wet		DCP dynamic cone penetration test
			CPT static cone penetration test



# BOREHOLE: BH9

Sheet 1 OF 1

Client	Bathla Group	Contractor	Geotesta	Easting	As per Plan
Project	21-33 Owlpen Lane Farely NSW	Drill Rig	Hand Auger	Northing	As per Plan
Job No.	NE1165	Driller	VL	Grid Ref	MGA94 Zone 55
Location	21-33 Owlpen Lane Farely NSW	Inclination	-90°	Logged	VL Date 29/03/22
Date Drilled	29/03/22	Hole Depth	1.80m	Checked	MHB Date 29/03/202

METHOD	WATER	DEPTH (metres)	DEPTH RL	GRAPHIC LOG	GROUP SYMBOL	SOIL/ROCK MATERIAL DESCRIPTION	MOISTURE CONDITION	CONSISTENCY	DENSITY	DCP BLOWS PER 100mm	FIELD TESTING AND ADDITIONAL NOTES	SAMPLE	
		0.00											0.00
AS	Not Encountered	0.30			FILL	TOPSOIL/FILL: Silty CLAY, medium plasticity, dark brown	M	PC				AS 0.10m AS9	
		0.50			CI	Silty CLAY: high plasticity, brown. Grades: becoming mottled red grey	M	F - St				B 0.30 - 0.90m CBR9 ES 0.40m EBH9 D 0.60m Att9 E 0.60m S9	1.00
		0.90				Grades: trace gravel		St - VSt					
		1.50				Grades: becoming red brown, mottled grey Grades: trace shale fragments		VSt					
		1.80				Hole Terminated at 1.80 m Refusal							
		2.00											2.00
		3.00											3.00
		4.00											4.00
		5.00											5.00

STANDARD: AS1726-2017

<b>CONSISTENCY:</b>	<b>RELATIVE DENSITY:</b>	<b>WATER:</b>	<b>SAMPLING/IN-SITU TESTING:</b>
VS very soft	VL very loose	water level	C core sample
S soft	L loose	water inflow	U tube sample
F firm	MD medium dense	water loss	D disturbed sample
St stiff	D dense		B bulk sample
VSt very stiff	VD very dense		LB large bulk sample
H hard			E environmental sample
			HB hammer bouncing
<b>COMPACTION:</b>	<b>MOISTURE:</b>		SPT standard penetration test
WC well compacted	D dry		PP pocket penetrometer reading (kPa)
MC moderately compacted	M moist		FV field vane shear test (uncorrected peak shear strength, kPa)
PC poorly compacted	W wet		DCP dynamic cone penetration test
			CPT static cone penetration test



# BOREHOLE: BH10

Sheet 1 OF 1

Client	Bathla Group	Contractor	Geotesta	Easting	As per Plan
Project	21-33 Owlpen Lane Farelly NSW	Drill Rig	Hand Auger	Northing	As per Plan
Job No.	NE1165	Driller	VL	Grid Ref	MGA94 Zone 55
Location	21-33 Owlpen Lane Farelly NSW	Inclination	-90°	Logged	VL Date 29/03/22
Date Drilled	29/03/22	Hole Depth	1.00m	Checked	MHB Date 29/03/22

METHOD	WATER	DEPTH (metres)	DEPTH RL	GRAPHIC LOG	GROUP SYMBOL	SOIL/ROCK MATERIAL DESCRIPTION	MOISTURE CONDITION	CONSISTENCY	DENSITY	DCP BLOWS PER 100mm	FIELD TESTING AND ADDITIONAL NOTES	SAMPLE	
AS	Not Encountered	0.00											0.00
		0.30			FILL	TOPSOIL/FILL: Silty CLAY, medium plasticity, brown, trace gravel	M	PC		1		AS 0.10m AS10	
					CI	Silty CLAY: medium plasticity, orange brown.	M	F - St		3		B 0.30 - 0.80m CBR10 ES 0.40m EBH10	
		0.80				Grades: becoming mottled red grey, trace shale fragments		VSt		10			
		0.90				SHALE: grey, mottled red, very low strength, extremely weathered, trace sandstone and ironstone pieces.		H		11			
		1.00	1.00			Hole Terminated at 1.00 m Refusal	M	VLS		20	DCP refusal at 0.9m, 20 blows reached		1.00
		2.00											2.00
		3.00											3.00
		4.00											4.00
		5.00											5.00

STANDARD: AS1726-2017

<b>CONSISTENCY:</b>	<b>RELATIVE DENSITY:</b>	<b>WATER:</b>	<b>SAMPLING/IN-SITU TESTING:</b>
VS very soft	VL very loose	water level	C core sample
S soft	L loose	water inflow	U tube sample
F firm	MD medium dense	water loss	D disturbed sample
St stiff	D dense		B bulk sample
VSt very stiff	VD very dense		LB large bulk sample
H hard			E environmental sample
			HB hammer bouncing
<b>COMPACTION:</b>	<b>MOISTURE:</b>		SPT standard penetration test
WC well compacted	D dry		PP pocket penetrometer reading (kPa)
MC moderately compacted	M moist		FV field vane shear test (uncorrected peak shear strength, kPa)
PC poorly compacted	W wet		DCP dynamic cone penetration test
			CPT static cone penetration test



# BOREHOLE: BH11

Sheet 1 OF 1

Client	Bathla Group	Contractor	Geotesta	Easting	As per Plan
Project	21-33 Owlpen Lane Farely NSW	Drill Rig	Hand Auger	Northing	As per Plan
Job No.	NE1165	Driller	VL	Grid Ref	MGA94 Zone 55
Location	21-33 Owlpen Lane Farely NSW	Inclination	-90°	Logged	VL Date 29/03/22
Date Drilled	29/03/22	Hole Depth	1.70m	Checked	MHB Date 29/03/22

METHOD	WATER	DEPTH (metres)	DEPTH RL	GRAPHIC LOG	GROUP SYMBOL	SOIL/ROCK MATERIAL DESCRIPTION	MOISTURE CONDITION	CONSISTENCY DENSITY	DCP BLOWS PER 100mm	FIELD TESTING AND ADDITIONAL NOTES	SAMPLE	
AS	Not Encountered	0.00										0.00
		0.30			FILL	TOPSOIL/FILL: Silty CLAY, loose, brown	M-W	PC	1		AS 0.10m AS11	
		0.60			CI	Silty CLAY: medium plasticity, grey. Grades: becoming brown, mottled grey	M-W	F	1		B 0.30 - 1.00m CBR11 ES 0.40m EBH11	
		1.00						VSt	2			1.00
		1.50						H	3			
		1.70				SHALE: grey, very low strength, extremely weathered, trace sandstone, indistinct laminations.	M-W	VLS	5			
						Hole Terminated at 1.70 m Refusal			9	DCP refusal at 1.4m, 20 blows reached		
		2.00							10			
									11			
									11			
									20			
		3.00										
		4.00										
		5.00										

STANDARD: AS1726-2017

<b>CONSISTENCY:</b>	<b>RELATIVE DENSITY:</b>	<b>WATER:</b>	<b>SAMPLING/IN-SITU TESTING:</b>
VS very soft	VL very loose	☒ water level	C core sample
S soft	L loose	☐ water inflow	U tube sample
F firm	MD medium dense	☐ water loss	D disturbed sample
St stiff	D dense		B bulk sample
VSt very stiff	VD very dense		LB large bulk sample
H hard			E environmental sample
			HB hammer bouncing
<b>COMPACTION:</b>	<b>MOISTURE:</b>		SPT standard penetration test
WC well compacted	D dry		PP pocket penetrometer reading (kPa)
MC moderately compacted	M moist		FV field vane shear test (uncorrected peak shear strength, kPa)
PC poorly compacted	W wet		DCP dynamic cone penetration test
			CPT static cone penetration test



# BOREHOLE: BH12

Sheet 1 OF 1

Client	Bathla Group	Contractor	Geotesta	Easting	As per Plan
Project	21-33 Owlpen Lane Farelly NSW	Drill Rig	Hand Auger	Northing	As per Plan
Job No.	NE1165	Driller	VL	Grid Ref	MGA94 Zone 55
Location	21-33 Owlpen Lane Farelly NSW	Inclination	-90°	Logged	VL Date 29/03/22
Date Drilled	29/03/22	Hole Depth	0.80m	Checked	MHB Date 29/03/22

METHOD	WATER	DEPTH (metres)	DEPTH RL	GRAPHIC LOG	GROUP SYMBOL	SOIL/ROCK MATERIAL DESCRIPTION	MOISTURE CONDITION	CONSISTENCY	DENSITY	DCP BLOWS PER 100mm	FIELD TESTING AND ADDITIONAL NOTES	SAMPLE	
AS	Not Encountered	0.00											0.00
		0.20			FILL	TOPSOIL/FILL: Silty CLAY, medium plasticity, brown	M	PC				AS 0.10m AS12	
		0.50			CI	Silty CLAY: low - medium plasticity, yellow brown; trace sand.	M	St				EIL 0.40m	
		0.70				Grades: becoming grey, mottled brown, trace sandstone pieces		H				ES 0.40m	
		0.80				SANDSTONE: grey brown, very low strength, extremely weathered.	M	VLS				EBH12	
		1.00				Hole Terminated at 0.80 m Refusal							1.00
		2.00											2.00
		3.00											3.00
		4.00											4.00
		5.00											5.00

STANDARD: AS1726-2017

<b>CONSISTENCY:</b>	<b>RELATIVE DENSITY:</b>	<b>WATER:</b>	<b>SAMPLING/IN-SITU TESTING:</b>
VS very soft	VL very loose	water level	C core sample
S soft	L loose	water inflow	U tube sample
F firm	MD medium dense	water loss	D disturbed sample
St stiff	D dense		B bulk sample
VSt very stiff	VD very dense		LB large bulk sample
H hard			E environmental sample
			HB hammer bouncing
<b>COMPACTION:</b>	<b>MOISTURE:</b>		SPT standard penetration test
WC well compacted	D dry		PP pocket penetrometer reading (kPa)
MC moderately compacted	M moist		FV field vane shear test (uncorrected peak shear strength, kPa)
PC poorly compacted	W wet		DCP dynamic cone penetration test
			CPT static cone penetration test



# BOREHOLE: BH13

Sheet 1 OF 1

Client	Bathla Group	Contractor	Geotesta	Easting	As per Plan
Project	21-33 Owlpen Lane Farely NSW	Drill Rig	Hand Auger	Northing	As per Plan
Job No.	NE1165	Driller	VL	Grid Ref	MGA94 Zone 55
Location	21-33 Owlpen Lane Farely NSW	Inclination	-90°	Logged	VL Date 29/03/22
Date Drilled	29/03/22	Hole Depth	1.00m	Checked	MHB Date 29/03/22

METHOD	WATER	DEPTH (metres)	DEPTH RL	GRAPHIC LOG	GROUP SYMBOL	SOIL/ROCK MATERIAL DESCRIPTION	MOISTURE CONDITION	CONSISTENCY	DENSITY	DCP BLOWS PER 100mm	FIELD TESTING AND ADDITIONAL NOTES	SAMPLE	
AS	Not Encountered	0.00											0.00
		0.30			FILL	TOPSOIL/FILL: Silty CLAY, medium plasticity, brown	M	PC					
		0.60			CI	Silty CLAY: medium plasticity, brown.  Grades: becoming grey, mottled red, trace shale fragments	M	St				D 0.50m Att13 E 0.50m S13	
		0.90				SANDSTONE: grey brown, very low strength, extremely weathered.	M	VLS					1.00
		1.00				Hole Terminated at 1.00 m Refusal							
		2.00											2.00
		3.00											3.00
		4.00											4.00
		5.00											5.00

STANDARD: AS1726-2017

<b>CONSISTENCY:</b>	<b>RELATIVE DENSITY:</b>	<b>WATER:</b>	<b>SAMPLING/IN-SITU TESTING:</b>
VS very soft	VL very loose	water level	C core sample
S soft	L loose	water inflow	U tube sample
F firm	MD medium dense	water loss	D disturbed sample
St stiff	D dense		B bulk sample
VSt very stiff	VD very dense		LB large bulk sample
H hard			E environmental sample
			HB hammer bouncing
<b>COMPACTION:</b>	<b>MOISTURE:</b>		SPT standard penetration test
WC well compacted	D dry		PP pocket penetrometer reading (kPa)
MC moderately compacted	M moist		FV field vane shear test (uncorrected peak shear strength, kPa)
PC poorly compacted	W wet		DCP dynamic cone penetration test
			CPT static cone penetration test





# BOREHOLE: BH14

Sheet 1 OF 1

Client	Bathla Group	Contractor	Geotesta	Easting	As per Plan
Project	21-33 Owlpen Lane Farelly NSW	Drill Rig	Hand Auger	Northing	As per Plan
Job No.	NE1165	Driller	VL	Grid Ref	MGA94 Zone 55
Location	21-33 Owlpen Lane Farelly NSW	Inclination	-90°	Logged	VL Date 29/03/22
Date Drilled	29/03/22	Hole Depth	2.40m	Checked	MHB Date 29/03/22

METHOD	WATER	DEPTH (metres)	DEPTH RL	GRAPHIC LOG	GROUP SYMBOL	SOIL/ROCK MATERIAL DESCRIPTION	MOISTURE CONDITION	CONSISTENCY	DENSITY	DCP BLOWS PER 100mm	FIELD TESTING AND ADDITIONAL NOTES	SAMPLE	
AS	Not Encountered	0.00											0.00
		1.00	1.00		FILL	TOPSOIL/FILL: Silty CLAY, medium plasticity, brown black	M - W	PC					1.00
		1.30			CI	Silty CLAY: medium plasticity, brown, mottled red. Grade: trace gravel	M	St - VSt				B 1.00 - 1.50m CBR14	2.00
		2.00											3.00
		2.40				Hole Terminated at 2.40 m Refusal							4.00
		3.00											5.00

STANDARD: AS1726-2017

<b>CONSISTENCY:</b>	<b>RELATIVE DENSITY:</b>	<b>WATER:</b>	<b>SAMPLING/IN-SITU TESTING:</b>
VS very soft	VL very loose	water level	C core sample
S soft	L loose	water inflow	U tube sample
F firm	MD medium dense	water loss	D disturbed sample
St stiff	D dense		B bulk sample
VSt very stiff	VD very dense		LB large bulk sample
H hard			E environmental sample
			HB hammer bouncing
<b>COMPACTION:</b>	<b>MOISTURE:</b>		SPT standard penetration test
WC well compacted	D dry		PP pocket penetrometer reading (kPa)
MC moderately compacted	M moist		FV field vane shear test (uncorrected peak shear strength, kPa)
PC poorly compacted	W wet		DCP dynamic cone penetration test
			CPT static cone penetration test



# BOREHOLE: BH15

Sheet 1 OF 1

Client	Bathla Group	Contractor	Geotesta	Easting	As per Plan
Project	21-33 Owlpen Lane Farelly NSW	Drill Rig	Hand Auger	Northing	As per Plan
Job No.	NE1165	Driller	VL	Grid Ref	MGA94 Zone 55
Location	21-33 Owlpen Lane Farelly NSW	Inclination	-90°	Logged	VL Date 29/03/22
Date Drilled	29/03/22	Hole Depth	0.90m	Checked	MHB Date 29/03/22

METHOD	WATER	DEPTH (metres)	DEPTH RL	GRAPHIC LOG	GROUP SYMBOL	SOIL/ROCK MATERIAL DESCRIPTION	MOISTURE CONDITION	CONSISTENCY	DENSITY	DCP BLOWS PER 100mm	FIELD TESTING AND ADDITIONAL NOTES	SAMPLE
AS	Not Encountered	0.00										
		0.30			FILL	TOPSOIL/FILL: Silty CLAY, medium plasticity, brown	M	PC		1		
		0.80			CI	Silty CLAY: medium plasticity, yellow brown, mottled grey.	M	F - St		1		
		0.90				SANDSTONE: brown, very low strength, extremely weathered.	M	VSt		6		
		0.90				Hole Terminated at 0.90 m Refusal		VLS		8	DCP refusal at 0.9m, 20 blows reached	
		1.00								20		1.00
		2.00										2.00
		3.00										3.00
		4.00										4.00
		5.00										5.00

STANDARD: AS1726-2017

<b>CONSISTENCY:</b>	<b>RELATIVE DENSITY:</b>	<b>WATER:</b>	<b>SAMPLING/IN-SITU TESTING:</b>
VS very soft	VL very loose	water level	C core sample
S soft	L loose	water inflow	U tube sample
F firm	MD medium dense	water loss	D disturbed sample
St stiff	D dense		B bulk sample
VSt very stiff	VD very dense		LB large bulk sample
H hard			E environmental sample
			HB hammer bouncing
<b>COMPACTION:</b>	<b>MOISTURE:</b>		SPT standard penetration test
WC well compacted	D dry		PP pocket penetrometer reading (kPa)
MC moderately compacted	M moist		FV field vane shear test (uncorrected peak shear strength, kPa)
PC poorly compacted	W wet		DCP dynamic cone penetration test
			CPT static cone penetration test

Appendix B

Laboratory Test Results



# Atterberg Limits Plasticity Index & Linear Shrinkage Test Report

GEOTESTA Pty Ltd

9 Redwood Drive

Notting Hill, Vic 3168

Ph: 1300 852216

<b>Laboratory</b>	Geotesta	<b>Project Type</b>	Geotechnical Investigation	<b>Client</b>	Bathla Group
<b>Report No</b>	S0382	<b>Project No</b>	NE1165	<b>Client ID</b>	-
<b>Sample ID</b>	SL1053-S0382	<b>Project</b>	21-33 Owlpen Lane Farely	<b>Address</b>	7 Business Park Drive, Notting Hill VIC 3168
<b>Location ID</b>	BH13@0.50				

**Base Site:** 9 Redwood Drive, Notting Hill, VIC 3168

**Branch Site:** 6/20-22 Foundry Road, Seven Hills, NSW 2147

**Sample Description** Silty CLAY, Medium plasticity, Light brown

**Sampling Method** CLIENT

## Results

Liquid limit	36 %	AS 1289-3.1.2
Plastic limit	20 %	AS 1289-3.2.1
Plasticity index	16 %	AS 1289-3.3.1
Linear shrinkage	6.5 %	AS 1289-3.4.1
Shrinkage type	Cracked	

## Preparation

History of sample:	Oven-dried $\leq 50$ °C
Method of preparation:	Dry Sieving
Linear shrinkage mould:	250 mm

## Comments

Test methods: AS 1289, 2.1.1, 3.1.2, 3.2.1, 3.3.1, 3.4.1



NATA Accredited Facility No. 19167

Accredited for compliance with  
ISO/IEC 17025 - Testing

The results obtained in this report  
correspond exclusively to the  
sample(s) tested.

**Report issued by:**

**Date issued:**

Chandana Linayage

5/4/2022



# Atterberg Limits Plasticity Index & Linear Shrinkage Test Report

GEOTESTA Pty Ltd

9 Redwood Drive

Notting Hill, Vic 3168

Ph: 1300 852216

<b>Laboratory</b>	Geotesta	<b>Project Type</b>	Geotechnical Investigation	<b>Client</b>	Bathla Group
<b>Report No</b>	S0381	<b>Project No</b>	NE1165	<b>Client ID</b>	-
<b>Sample ID</b>	SL1053-S0381	<b>Project</b>	21-33 Owlpen Lane Farely	<b>Address</b>	7 Business Park Drive, Notting Hill VIC 3168
<b>Location ID</b>	BH9@0.60				

**Base Site:** 9 Redwood Drive, Notting Hill, VIC 3168

**Branch Site:** 6/20-22 Foundry Road, Seven Hills, NSW 2147

**Sample Description** Silty CLAY, high plasticity, brown

**Sampling Method** CLIENT

## Results

Liquid limit	69 %	AS 1289-3.1.2
Plastic limit	32 %	AS 1289-3.2.1
Plasticity index	37 %	AS 1289-3.3.1
Linear shrinkage	18 %	AS 1289-3.4.1
Shrinkage type	Cracked	

## Preparation

History of sample:	Oven-dried $\leq 50$ °C
Method of preparation:	Dry Sieving
Linear shrinkage mould:	250 mm

## Comments

Test methods: AS 1289, 2.1.1, 3.1.2, 3.2.1, 3.3.1, 3.4.1



NATA Accredited Facility No. 19167

Accredited for compliance with  
ISO/IEC 17025 - Testing

The results obtained in this report  
correspond exclusively to the  
sample(s) tested.

**Report issued by:**

Chandana Liyanage

**Date issued:**

5/4/2022



# Atterberg Limits Plasticity Index & Linear Shrinkage Test Report

GEOTESTA Pty Ltd

9 Redwood Drive

Notting Hill, Vic 3168

Ph: 1300 852216

<b>Laboratory</b>	Geotesta	<b>Project Type</b>	Geotechnical Investigation	<b>Client</b>	Bathla Group
<b>Report No</b>	S0380	<b>Project No</b>	NE1165	<b>Client ID</b>	-
<b>Sample ID</b>	SL1053-S0380	<b>Project</b>	21-33 Owlpen Lane Farely	<b>Address</b>	7 Business Park Drive, Notting Hill VIC 3168
<b>Location ID</b>	BH8@0.60				

**Base Site:** 9 Redwood Drive, Notting Hill, VIC 3168

**Branch Site:** 6/20-22 Foundry Road, Seven Hills, NSW 2147

**Sample Description** Silty CLAY, high plasticity, brown

**Sampling Method** CLIENT

## Results

Liquid limit	89 %	AS 1289-3.1.2
Plastic limit	36 %	AS 1289-3.2.1
Plasticity index	53 %	AS 1289-3.3.1
Linear shrinkage	15 %	AS 1289-3.4.1
Shrinkage type	Curling/Cracked	

## Preparation

History of sample:	Oven-dried $\leq 50$ °C
Method of preparation:	Dry Sieving
Linear shrinkage mould:	250 mm

## Comments

Test methods: AS 1289, 2.1.1, 3.1.2, 3.2.1, 3.3.1, 3.4.1



NATA Accredited Facility No. 19167

Accredited for compliance with  
ISO/IEC 17025 - Testing

The results obtained in this report  
correspond exclusively to the  
sample(s) tested.

**Report issued by:**

Chandana Liyanage

**Date issued:**

5/4/2022



# Atterberg Limits Plasticity Index & Linear Shrinkage Test Report

GEOTESTA Pty Ltd

9 Redwood Drive

Notting Hill, Vic 3168

Ph: 1300 852216

<b>Laboratory</b>	Geotesta	<b>Project Type</b>	Geotechnical Investigation	<b>Client</b>	Bathla Group
<b>Report No</b>	S0379	<b>Project No</b>	NE1165	<b>Client ID</b>	-
<b>Sample ID</b>	SL1053-S0379	<b>Project</b>	21-33 Owlpen Lane Farely	<b>Address</b>	7 Business Park Drive, Notting Hill VIC 3168
<b>Location ID</b>	BH6@0.50				

**Base Site:** 9 Redwood Drive, Notting Hill, VIC 3168

**Branch Site:** 6/20-22 Foundry Road, Seven Hills, NSW 2147

**Sample Description** Silty CLAY, high plasticity, Brown

**Sampling Method** CLIENT

## Results

Liquid limit	86 %	AS 1289-3.1.2
Plastic limit	32 %	AS 1289-3.2.1
Plasticity index	54 %	AS 1289-3.3.1
Linear shrinkage	20.5 %	AS 1289-3.4.1
Shrinkage type	Curling/Cracked	

## Preparation

History of sample:	Oven-dried $\leq 50$ °C
Method of preparation:	Dry Sieving
Linear shrinkage mould:	250 mm

## Comments

Test methods: AS 1289, 2.1.1, 3.1.2, 3.2.1, 3.3.1, 3.4.1



NATA Accredited Facility No. 19167

Accredited for compliance with  
ISO/IEC 17025 - Testing

The results obtained in this report  
correspond exclusively to the  
sample(s) tested.

**Report issued by:**

**Date issued:**

Chandana Liyanage

5/4/2022



# Atterberg Limits Plasticity Index & Linear Shrinkage Test Report

GEOTESTA Pty Ltd

9 Redwood Drive

Notting Hill, Vic 3168

Ph: 1300 852216

<b>Laboratory</b>	Geotesta	<b>Project Type</b>	Geotechnical Investigation	<b>Client</b>	Bathla Group
<b>Report No</b>	S0378	<b>Project No</b>	NE1165	<b>Client ID</b>	-
<b>Sample ID</b>	SL1053-S0378	<b>Project</b>	21-33 Owlpen Lane Farely	<b>Address</b>	7 Business Park Drive, Notting Hill VIC 3168
<b>Location ID</b>	BH5@0.50				

**Base Site:** 9 Redwood Drive, Notting Hill, VIC 3168

**Branch Site:** 6/20-22 Foundry Road, Seven Hills, NSW 2147

**Sample Description** Silty CLAY, High plasticity, Light brown

**Sampling Method** CLIENT

## Results

Liquid limit	52 %	AS 1289-3.1.2
Plastic limit	25 %	AS 1289-3.2.1
Plasticity index	27 %	AS 1289-3.3.1
Linear shrinkage	13 %	AS 1289-3.4.1
Shrinkage type	Cracked	

## Preparation

History of sample:	Oven-dried $\leq 50$ °C
Method of preparation:	Dry Sieving
Linear shrinkage mould:	250 mm

## Comments

Test methods: AS 1289, 2.1.1, 3.1.2, 3.2.1, 3.3.1, 3.4.1



NATA Accredited Facility No. 19167

Accredited for compliance with  
ISO/IEC 17025 - Testing

The results obtained in this report  
correspond exclusively to the  
sample(s) tested.

**Report issued by:**

Chandana Liyanage

**Date issued:**

5/4/2022





# Atterberg Limits Plasticity Index & Linear Shrinkage Test Report

GEOTESTA Pty Ltd

9 Redwood Drive

Notting Hill, Vic 3168

Ph: 1300 852216

<b>Laboratory</b>	Geotesta	<b>Project Type</b>	Geotechnical Investigation	<b>Client</b>	Bathla Group
<b>Report No</b>	S0377	<b>Project No</b>	NE1165	<b>Client ID</b>	-
<b>Sample ID</b>	SL1053-S0377	<b>Project</b>	21-33 Owlpen Lane Farely	<b>Address</b>	7 Business Park Drive, Notting Hill VIC 3168
<b>Location ID</b>	BH1@1.40				

**Base Site:** 9 Redwood Drive, Notting Hill, VIC 3168

**Branch Site:** 6/20-22 Foundry Road, Seven Hills, NSW 2147

**Sample Description** Silty CLAY, medium plasticity, brown

**Sampling Method** CLIENT

## Results

Liquid limit	42 %	AS 1289-3.1.2
Plastic limit	20 %	AS 1289-3.2.1
Plasticity index	22 %	AS 1289-3.3.1
Linear shrinkage	9.5 %	AS 1289-3.4.1
Shrinkage type	Curling/Cracked	

## Preparation

History of sample:	Oven-dried $\leq 50$ °C
Method of preparation:	Dry Sieving
Linear shrinkage mould:	250 mm

## Comments

Test methods: AS 1289, 2.1.1, 3.1.2, 3.2.1, 3.3.1, 3.4.1



NATA Accredited Facility No. 19167

Accredited for compliance with  
ISO/IEC 17025 - Testing

The results obtained in this report  
correspond exclusively to the  
sample(s) tested.

**Report issued by:**

**Date issued:**

Chandana Liyanage

5/4/2022

Geotesta Pty Ltd (NSW)  
Unit 6, 20/22 Foundry Road  
Seven Hills  
NSW 2147



**NATA Accredited**  
**Accreditation Number 1261**  
**Site Number 18217**

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

**Attention:** **Vic Le**

**Report** **875993-S**  
Project name **21-33 OWLPEN LANE FARELY NSW**  
Project ID **NE1165**  
Received Date **Mar 30, 2022**

Client Sample ID			<b>S1</b>	<b>S5</b>	<b>S6</b>	<b>S8</b>
Sample Matrix			<b>Soil</b>	<b>Soil</b>	<b>Soil</b>	<b>Soil</b>
Eurofins Sample No.			<b>S22-Ma65667</b>	<b>S22-Ma65668</b>	<b>S22-Ma65669</b>	<b>S22-Ma65670</b>
Date Sampled			<b>Mar 28, 2022</b>	<b>Mar 28, 2022</b>	<b>Mar 28, 2022</b>	<b>Mar 28, 2022</b>
Test/Reference	LOR	Unit				
Conductivity (1:5 aqueous extract at 25°C as rec.)	10	uS/cm	62	46	39	61
pH (1:5 Aqueous extract at 25°C as rec.)	0.1	pH Units	6.0	5.8	5.9	5.8
Sulphate (as SO4)	10	mg/kg	33	35	24	14
% Moisture	1	%	22	18	24	25

Client Sample ID			<b>S9</b>	<b>S13</b>
Sample Matrix			<b>Soil</b>	<b>Soil</b>
Eurofins Sample No.			<b>S22-Ma65671</b>	<b>S22-Ma65672</b>
Date Sampled			<b>Mar 28, 2022</b>	<b>Mar 28, 2022</b>
Test/Reference	LOR	Unit		
Conductivity (1:5 aqueous extract at 25°C as rec.)	10	uS/cm	40	50
pH (1:5 Aqueous extract at 25°C as rec.)	0.1	pH Units	5.8	6.4
Sulphate (as SO4)	10	mg/kg	35	15
% Moisture	1	%	22	16

**Sample History**

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

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

<b>Description</b>	<b>Testing Site</b>	<b>Extracted</b>	<b>Holding Time</b>
Conductivity (1:5 aqueous extract at 25°C as rec.) - Method: LTM-INO-4030 Conductivity	Sydney	Apr 05, 2022	7 Days
pH (1:5 Aqueous extract at 25°C as rec.) - Method: LTM-GEN-7090 pH by ISE	Sydney	Apr 05, 2022	7 Days
Sulphate (as SO <sub>4</sub> ) - Method: In-house method LTM-INO-4270 Sulphate by Ion Chromatograph	Sydney	Apr 05, 2022	28 Days
% Moisture - Method: LTM-GEN-7080 Moisture	Sydney	Mar 31, 2022	14 Days

<b>Company Name:</b>	Geotesta Pty Ltd (NSW)	<b>Order No.:</b>		<b>Received:</b>	Mar 30, 2022 5:00 PM
<b>Address:</b>	Unit 6, 20/22 Foundry Road Seven Hills NSW 2147	<b>Report #:</b>	875993	<b>Due:</b>	Apr 6, 2022
<b>Project Name:</b>	21-33 OWLPEN LANE FARELY NSW	<b>Phone:</b>	1300852 216	<b>Priority:</b>	5 Day
<b>Project ID:</b>	NE1165	<b>Fax:</b>		<b>Contact Name:</b>	Vic Le
<b>Eurofins Analytical Services Manager : Asim Khan</b>					

Sample Detail						Conductivity (1:5 aqueous extract at 25°C as rec.)	pH (1:5 Aqueous extract at 25°C as rec.)	Sulphate (as SO4)	Moisture Set
Melbourne Laboratory - NATA # 1261 Site # 1254									
Sydney Laboratory - NATA # 1261 Site # 18217						X	X	X	X
Brisbane Laboratory - NATA # 1261 Site # 20794									
Mayfield Laboratory - NATA # 1261 Site # 25079									
Perth Laboratory - NATA # 2377 Site # 2370									
External Laboratory									
No	Sample ID	Sample Date	Sampling Time	Matrix	LAB ID				
1	S1	Mar 28, 2022		Soil	S22-Ma65667	X	X	X	X
2	S5	Mar 28, 2022		Soil	S22-Ma65668	X	X	X	X
3	S6	Mar 28, 2022		Soil	S22-Ma65669	X	X	X	X
4	S8	Mar 28, 2022		Soil	S22-Ma65670	X	X	X	X
5	S9	Mar 28, 2022		Soil	S22-Ma65671	X	X	X	X
6	S13	Mar 28, 2022		Soil	S22-Ma65672	X	X	X	X
<b>Test Counts</b>						6	6	6	6

## Internal Quality Control Review and Glossary

### General

- Laboratory QC results for Method Blanks, Duplicates, Matrix Spikes, and Laboratory Control Samples follows guidelines delineated in the National Environment Protection (Assessment of Site Contamination) Measure 1999, as amended May 2013 and are included in this QC report where applicable. Additional QC data may be available on request.
- All soil/sediment/solid results are reported on a dry basis, unless otherwise stated.
- All biota/food results are reported on a wet weight basis on the edible portion, unless otherwise stated.
- Actual LORs are matrix dependant. Quoted LORs may be raised where sample extracts are diluted due to interferences.
- Results are uncorrected for matrix spikes or surrogate recoveries except for PFAS compounds.
- SVOC analysis on waters are performed on homogenised, unfiltered samples, unless noted otherwise.
- Samples were analysed on an 'as received' basis.
- Information identified on this report with blue colour, indicates data provided by customer that may have an impact on the results.
- This report replaces any interim results previously issued.

### Holding Times

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

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

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

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

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

### Units

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

### Terms

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

### QC - Acceptance Criteria

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

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

Results <10 times the LOR: No Limit

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

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

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

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

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

### QC Data General Comments

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

**Quality Control Results**

Test				Units	Result 1		Acceptance Limits	Pass Limits	Qualifying Code
<b>Method Blank</b>									
Conductivity (1:5 aqueous extract at 25°C as rec.)				uS/cm	< 10		10	Pass	
Sulphate (as SO4)				mg/kg	< 10		10	Pass	
<b>LCS - % Recovery</b>									
Conductivity (1:5 aqueous extract at 25°C as rec.)				%	94		70-130	Pass	
Sulphate (as SO4)				%	93		70-130	Pass	
Test	Lab Sample ID	QA Source	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
<b>Spike - % Recovery</b>									
					Result 1				
Sulphate (as SO4)		S22-Ma65670	CP	%	91		70-130	Pass	
Test	Lab Sample ID	QA Source	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
<b>Duplicate</b>									
					Result 1	Result 2	RPD		
Conductivity (1:5 aqueous extract at 25°C as rec.)		S22-Ma65668	CP	uS/cm	46	52	12	30%	Pass
pH (1:5 Aqueous extract at 25°C as rec.)		S22-Ma65668	CP	pH Units	5.8	5.8	<1	30%	Pass
<b>Duplicate</b>									
					Result 1	Result 2	RPD		
% Moisture		S22-Ma65672	CP	%	16	13	20	30%	Pass

**Comments****Sample Integrity**

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

**Authorised by:**

Asim Khan

Analytical Services Manager

**Glenn Jackson**  
**General Manager**

Final Report – this report replaces any previously issued Report

- Indicates Not Requested

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

Measurement uncertainty of test data is available on request or please [click here](#).

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