# Geotechnical Assessment

## Prepared For:

Hoover Group Pty Ltd

## Site Address:

Lots 1-3 (124) New England Highway, Lochinvar

## Ref No:

73003-IDF

## Date:

October 2024


Accredited for compliance
With ISO/IEC 17025
NATA Accreditation No.
19226

16-18 Sammut Street
Smithfield NSW 2164
PO Box 2270 Smithfield
NSW
Phone:
02 9725 5522
Email:
info@idealcorp.com.au
Website:
www.idealgeotech.com.au


idealgeotech

Contents

# 1.0 INTRODUCTION

Ideal Geotech has prepared this report to discuss the results of the geotechnical investigation undertaken for the proposed residential development at Lots 1-3 (124) New England Highway, Lochinvar.

The proposed development indicated on the plans provided by the client comprises of subdivision of residential address 124 New England Highway into three (3) lots. It is understood minimal cut and fill will be undertaken initially, with possible cut and/or fill to take place for future developments.

# 2.0 SITE DETAILS

| | |
|---|---|
| **Site Address** | Lots 1-3 (124) New England Highway, Lochinvar |
| **Client** | Hoover Group Pty Ltd |
| **Council Area** | Maitland City Council |

## 2.1 Geology

Reference to the Singleton 1:250,000 geological map (Geological Series Sheet SI 56-1) indicates that the site is underlain by the Lochinvar Formation of the Dalwood Group consisting of siltstone, sandstone, basic lava, tuff and soils derived from the weathering of these rocks.

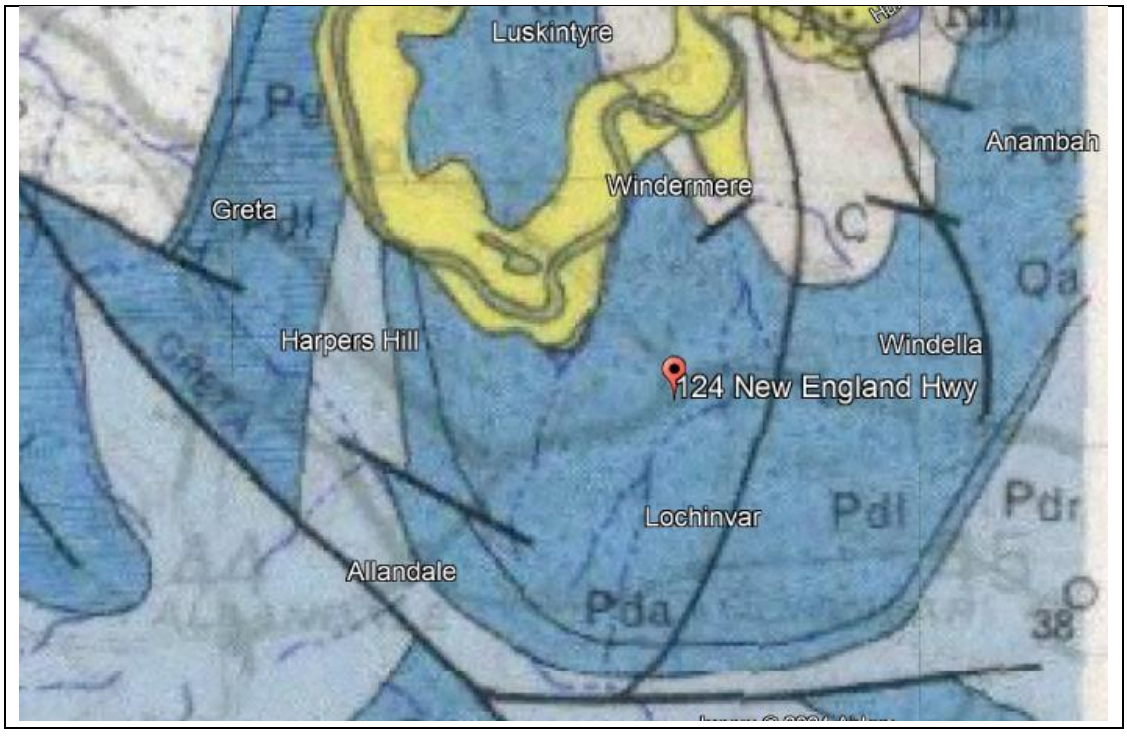



**Image 1: Geological Series Map**

## 2.2 Site Description

The subject site is irregular in shape and is approximately 2,910m$^2$ in area. The lot has been subdivided into 3 lots; 2 rectangular lots to the north and one irregular shaped lot to the south and is currently bound by the New England Highway to the south, exiting residential lots to the east and west and by farm paddocks to the north.

The proposed location is occupied by an existing single-storey fibro dwelling, a detached garage, shed and aviary. The site is located on gently sloping terrain with slopes falling towards the north east at a gradient of approximately 3º with vegetation consisting of grass cover.

**Image 2: Site Location**

# 3.0 GEOTECHNICAL INVESTIGATION

Fieldwork was undertaken on 10 October 2024 and included drilling four boreholes (BH1-BH4) using a 4wd mounted drill rig using solid flight spiral augers to a maximum depth of 4.5m at the locations shown on Figure 1, attached in Appendix A. The Boreholes were supplemented with Dynamic Cone Penetrometer (DCP) tests for the measurement of soil strength properties.

Borehole logs and field observations are presented in Appendix B.

## 3.1 Soil Profiles

A general summary of the subsurface conditions encountered across the site is presented in Table 2 below.

**Table 2: Summary of Subsurface Conditions**

| Borehole | Depth of fill/topsoil (m) | Depth to rock (m) | Termination depth (m) | Summary of sub-surface profiles |
|---|---|---|---|---|
| BH1 | 0.3 | NE | 4.5 | Topsoil- Silty CLAY / Silty CLAY |
| BH2 | 0.2 | NE | 4.5 | Topsoil- Silty CLAY / Silty CLAY |
| BH3 | 0.5 | NE | 4.5 | Fill- Sandy GRAVEL / Silty CLAY |
| BH4 | 0.3 | NE | 4.5 | Topsoil- Silty CLAY / Silty CLAY / Silty Sandy CLAY |

*NE Not Encountered*

Groundwater was not observed at the time of investigation. It should be noted that groundwater levels are likely to fluctuate with variations in climatic and site conditions.

# 4.0 RECOMMENDATIONS

## 4.1 Site Classifications

This site is classified as Class H1 in accordance with AS2870 – 2011:

As defined in AS 2870-2011, Table 2.1 and section 2.2.3, this site will be classified as Class H1, Highly Reactive based on laboratory testing and natural soil profile as encountered on this limited scope investigation. The site is estimated to have a Characteristic Surface Movement (ys) in the range between 40mm and 60mm.

It must be emphasized that the soil movement (heave) mentioned and recommendations referred to in this report are based solely on the soil profile observed at the time of the investigation for this report, without taking into account any abnormal moisture conditions 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. 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.

This type of investigation (as per our commission) is not designed or capable of locating all soil conditions. Therefore, it is recommended that the builder engage the service of this company (Ideal Geotech) to confirm the soil profile and “Site Classification” at footing excavation stage if required.

## 4.2 Footings - Allowable Bearing Capacity

All footings should be founded below any uncontrolled fill or deleterious materials. All footings for the same structure should be founded on strata of similar density and reactivity to minimise the risk of differential movements.

All footing excavations should be inspected prior to installation of structural steel by Ideal Geotech or a suitably experienced engineer or geotechnical consultant to confirm that the founding conditions are as described in this report. All loose material should be cleared from the footing excavations before concrete is poured.

### 4.2.1 High Level Footings

High-level footing alternatives could be expected to comprise slabs-on-ground with edge beams or pad footings for the support of concentrated loads. Such footings designed in accordance with engineering principles and founded in the very stiff clays (below uncontrolled fill or other deleterious material) may be proportioned on an allowable bearing capacity of 150kPa. The founding conditions should be assessed by a geotechnical consultant or experienced engineer to confirm suitable conditions.

### 4.2.2 Piered Footings

Piered footings are considered as an alternative to deep edge beams or high-level footings. Piered footings, founded in the hard clays could be proportioned on an end bearing pressure of 250kPa.

The potential for volume change in the subsurface profile should be considered by the designer as the piered footing may move with the soil and undergo differential settlement or heaving.

## 4.3 Batter Slopes

We understand that excavation will be required during the construction phase. Excavations or trenches in the clay soils could be expected to stand vertical in the short-term. Where personnel are to enter excavations, options for short-term excavations include benching or battering back of excavations to 1H:1V.

Unsupported permanent excavations (where not supporting existing structures) in the in-situ material batters should be sloped back at gradients not steeper than 2.5H:1V, subject to inspection of the strata exposed in the faces by a geotechnical professional.

Un-retained excavations should not extend below the “zone of influence” of adjacent structures. That is, a line drawn 45° down from the foundation level of adjacent structures or features (including paths, fences, stairs etc). If excavations are to extend below this line, proposed excavations are to be retained prior to excavation.

## 4.4 Excavation Conditions and Retaining Walls

Excavations should be readily achievable with conventional earthmoving equipment such as backhoes and excavators with bucket attachment up to the depths of the boreholes.

We would recommend that the method and size of proposed excavation equipment are advised and inspected prior to excavation.

All structural retaining walls should be engineer designed. Design of retaining walls should:

- Consider surcharge loading from slopes and structures above the wall;
- Take into account loading from any proposed compaction of fill behind the wall;
- Provide adequate surface and subsurface drainage behind retaining walls;
- Utilise materials that are not susceptible to deterioration;
- Ensure walls are founded in materials appropriate for the loading conditions.

## 4.5 Filling/Earthworks

In the event fill is to be placed Ideal Geotech recommends the placement of engineered fill be carried out in accordance with AS3798-2007 “Guidelines on Earthworks for commercial and residential developments”.

In summary, engineered fill should comprise the following:

- Prior to filling, any soft material and vegetation should be removed down to a firm base.
- Suitable fill material shall be placed in loose horizontal layers not exceeding 250mm in thickness.
- The fill shall be compacted to a Dry Density Ratio of at least 95% Standard (AS1289: 5.1.1, 5.4.1 or 5.7.1);
- The fill should be compacted to within +/-2% of the soil’s optimum moisture content
- The fill material shall not contain greater than 20%, by volume, of particles coarser than 37.5mm and no particle over 200mm in any dimension.
- Under no circumstances should any additional fill contain significant amount of organic matter or be a mixture of greatly different particle sizes.

# 5.0 LIMITATIONS

This type of investigation (as per our commission) is not designed or capable of locating all ground conditions, which can vary even over short distances. The advice given in this report is based on the assumption that the test results are representative of the overall ground conditions. However, it should be noted that actual conditions in some parts of the site might differ from those found. If excavations

reveal ground conditions significantly different from those shown in our findings, Ideal Geotech must be consulted.

The scope and the period of Ideal Geotech services are described in the report and are subject to restrictions and limitations. Ideal Geotech did not perform a complete assessment of all possible conditions or circumstances that may exist at the Site. If a service is not expressly indicated, do not assume it has been provided. If a matter is not addressed, do not assume that any determination has been made by Ideal Geotech in regards to it.

Where data has been supplied by the client or a third party, it is assumed that the information is correct unless otherwise stated. No responsibility is accepted by Ideal Geotech for incomplete or inaccurate data supplied by others.

Any drawings or figures presented in this report should be considered only as pictorial evidence of our work. Therefore, unless otherwise stated, any dimensions should not be used for accurate calculations or dimensioning.

## 6.0 REFERENCES


- *Geological Series Sheet SI 56-1, Map of Singleton, scale 1:250,000*
- *AS 2870-2011 Residential Slabs and footings*
- *AS3798-2007 Guidelines on earthworks for commercial and residential developments*
- *AS1289: 5.1.1, 5.4.1 or 5.7.1 Methods of testing soils for engineering purposes – Soil compaction and density tests*


For and on behalf of

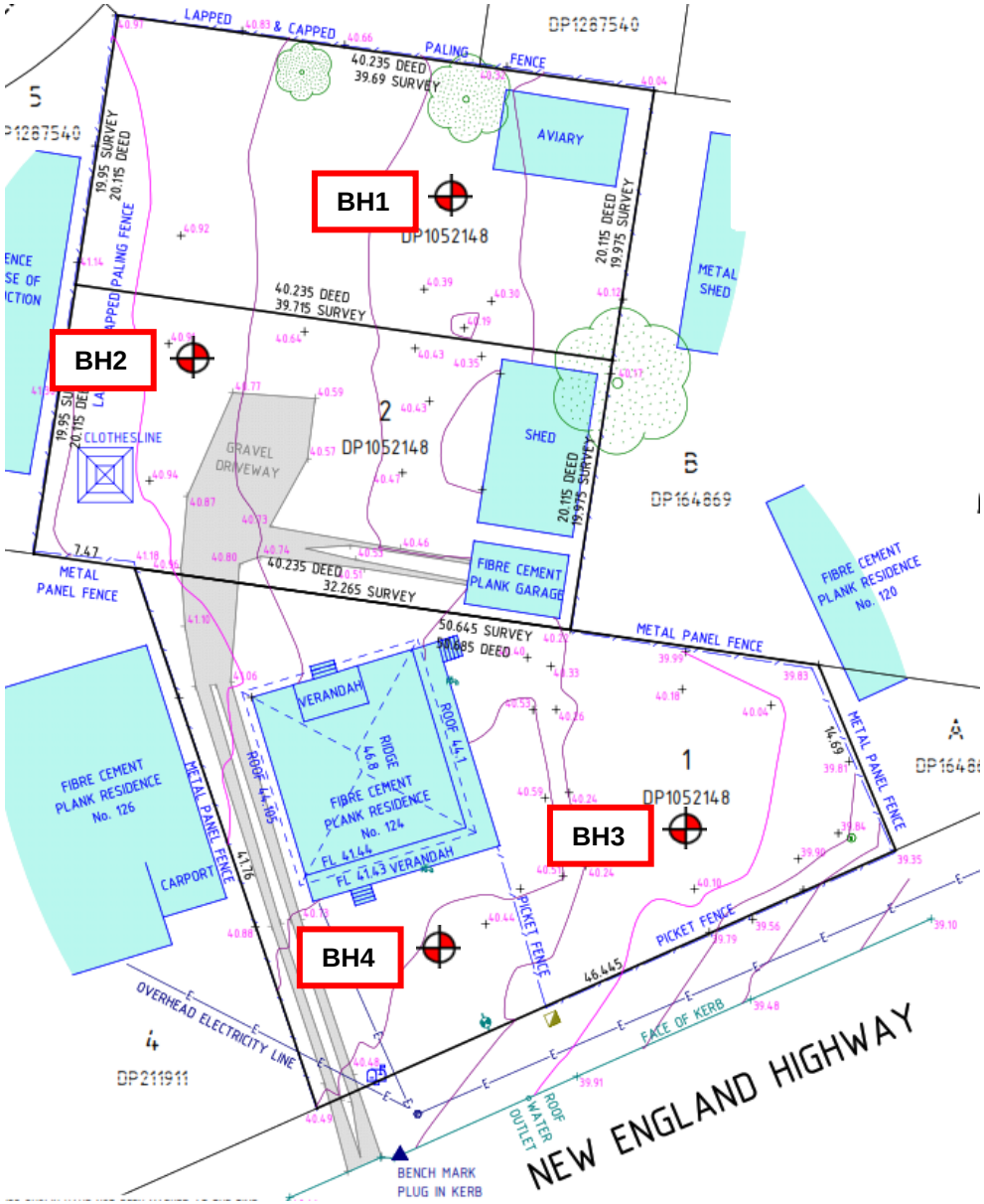
**Ideal Geotech**

D. Dwyer

**Dane Dwyer**
*Geotechnical Engineer*

# 7.0 APPENDICES

## 7.1 Appendix A – Borehole Location Plan




| | | | | | |
|---|---|---|---|---|---|
| **Title** | Borehole Location Plan | **Council** | Maitland City Council | **Drawn By** | Ben |
| **Project** | Geotechnical Assessment | **Job Number** | 73003-IDF | **Checked By** | Dane |
| **Site Address** | Lots 1-3 (124) New England Highway, Lochinvar | **Figure Number** | Figure 1 | **Date** | Oct-24 |

**NORTH POINT**

## 7.2 Appendix B – Borehole Logs

idealgeotech
a division of idealcorp

# 5.1 FIELD LOG

**Date:** 10/10/2024
**Customer Job:** Signed Quote
**Ideal Job:** 7056-73003
**Site Address:** Lots 1-3 (124) New England Highway, LOCHINVAR, NSW, 2321

**Borehole:** BH1
**Surface RL:**
**Easting:**
**Northing:**

| Water | DCP Blows/100mm (10 20 30 40) | Samples | Depth | Material Origin | FILL Depth | Classification Code | Material Description | Moisture | Density / Consistency |
|---|---|---|---|---|---|---|---|---|---|
| No water observed | 1 2 2 | | | TOPSOIL | | CI | Silty CLAY with trace Gravel Brown | Slightly Moist m<Wp | Soft |
| | 1 2 2 3 3 4 3 | | 0.5 1.0 | NATURAL | | CH | Silty CLAY with trace Sand Brown | Slightly Moist m<Wp | Very Stiff |
| | 5 6 6 5 7 8 8 9 11 11 | | 1.5 2.0 | | | | | | |
| | 13 12 12 15 13 11 16 17 | | 2.5 | | | | | | |
| | 20 21 25 | | 3.0 3.5 4.0 4.5 | RESIDUAL | | CI | Silty CLAY with trace Sand Grey mottled Brown | Slightly Moist m<Wp | Very Stiff |
| | | | 5.0 5.5 | | | | End Bore 4.5m | | |

▼ Water Table **UTP** - Unable to penetrate **DCP** - 9kg Dynamic Cone Penetrometer **PP** - Pocket Penetrometer

**SAND** – Density Index vs Approx. Penetrometer results

| **DENSITY** | | **Density Index** | **DCP Blow Count** (blows/100mm) |
|---|---|---|---|
| VL | Very Loose | < 15 % | < 1 |
| L | Loose | 15 – 35 % | 1 – 3 |
| MD | Medium Dense | 35 – 65 % | 3 – 9 |
| D | Dense | 65 – 85 % | 9 – 15 |
| VD | Very Dense | > 85 % | > 15 |

**SILTS & CLAY** – Cu vs Approx. Penetrometer results

| **CONSISTENCY** | | **Undrained Shear Strength** (kPa) | **DCP Blow Count** (blows/100mm) |
|---|---|---|---|
| VS | Very Soft | 0 – 12 | < 1 |
| S | Soft | 12 – 25 | 1 – 2 |
| F | Firm | 25 – 50 | 2 – 3 |
| St | Stiff | 50 – 100 | 3 – 5 |
| VSt | Very Stiff | 100 – 200 | 5 – 8 |
| H | Hard | > 200 | > 8 |

**MOISTURE**

| | |
|---|---|
| D | Dry |
| M | Moist |
| W | Wet |
| $W_P$ | Plastic Limit |
| $W_L$ | Liquid Limit |
| m | Moisture |

idealgeotech
a division of idealcorp

# 5.2 FIELD LOG

**Date:** 10/10/2024
**Customer Job:** Signed Quote
**Ideal Job:** 7056-73003
**Site Address:** Lots 1-3 (124) New England Highway, LOCHINVAR, NSW, 2321

**Borehole:** BH2
**Surface RL:**
**Easting:**
**Northing:**

| Water | DCP Blows/100mm (10 20 30 40) | Samples | Depth | Material Origin | FILL Depth | Classification Code | Material Description | Moisture | Density / Consistency |
|---|---|---|---|---|---|---|---|---|---|
| | 1 2 | | | TOPSOIL | | CI | Silty CLAY with trace Gravel Brown | Slightly Moist m<Wp | Soft |
| No water observed | 2 2 2 3 4 5 5 7 | | 0.5 1.0 | NATURAL | | CH | Silty CLAY with trace Sand Brown | Slightly Moist m<Wp | Very Stiff |
| | 6 5 8 11 12 12 15 12 12 13 | | 1.5 2.0 | | | | | | |
| | 15 18 20 22 25 | | 2.5 | | | | | | |
| | | | 3.0 | RESIDUAL | | CI | Silty CLAY with trace Sand Grey mottled Brown | Slightly Moist m<Wp | Very Stiff |
| | | | 3.5 4.0 4.5 | | | | | | |
| | | | 5.0 5.5 | | | | End Bore 4.5m | | |

▼ Water Table **UTP** - Unable to penetrate **DCP** - 9kg Dynamic Cone Penetrometer **PP** - Pocket Penetrometer

**SAND** – Density Index vs Approx. Penetrometer results

| | DENSITY | Density Index | DCP Blow Count (blows/100mm) |
|---|---|---|---|
| VL | Very Loose | < 15 % | < 1 |
| L | Loose | 15 – 35 % | 1 – 3 |
| MD | Medium Dense | 35 – 65 % | 3 – 9 |
| D | Dense | 65 – 85 % | 9 – 15 |
| VD | Very Dense | > 85 % | > 15 |

**SILTS & CLAY** – Cu vs Approx. Penetrometer results

| | CONSISTENCY | Undrained Shear Strength (kPa) | DCP Blow Count (blows/100mm) |
|---|---|---|---|
| VS | Very Soft | 0 – 12 | < 1 |
| S | Soft | 12 – 25 | 1 – 2 |
| F | Firm | 25 – 50 | 2 – 3 |
| St | Stiff | 50 – 100 | 3 – 5 |
| VSt | Very Stiff | 100 – 200 | 5 – 8 |
| H | Hard | > 200 | > 8 |

**MOISTURE**

| | |
|---|---|
| D | Dry |
| M | Moist |
| W | Wet |
| $W_P$ | Plastic Limit |
| $W_L$ | Liquid Limit |
| m | Moisture |

idealgeotech
a division of idealcorp

# 5.3 FIELD LOG

**Date:** 10/10/2024
**Customer Job:** Signed Quote
**Ideal Job:** 7056-73003
**Site Address:** Lots 1-3 (124) New England Highway, LOCHINVAR, NSW, 2321

**Borehole:** BH3
**Surface RL:**
**Easting:**
**Northing:**

| Water | DCP Blows/100mm (10 20 30 40) | Samples | Depth | Material Origin | FILL Depth | Classification Code | Material Description | Moisture | Density / Consistency |
|---|---|---|---|---|---|---|---|---|---|
| No water observed | 1 1 1 1 1 | | 0.5 | FILL | | | Sandy GRAVEL Floating Boulder | Slightly Moist m<Wp | Stiff |
| | 1 2 2 3 3 | | 1.0 | NATURAL | | CH | Silty CLAY with trace Sand Brown | Slightly Moist m<Wp | Very Stiff |
| | 5 6 8 11 15 12 13 16 17 17 | | 1.5 2.0 | | | | | | |
| | 19 20 20 22 | | 2.5 3.0 | RESIDUAL | | CI | Silty CLAY with trace Sand Grey mottled Brown | Slightly Moist m<Wp | Very Stiff |
| | | | 3.5 4.0 4.5 | | | | | | |
| | | | 5.0 5.5 | | | | End Bore 4.5m | | |

▼ Water Table **UTP** - Unable to penetrate **DCP** - 9kg Dynamic Cone Penetrometer **PP** - Pocket Penetrometer

**SAND** – Density Index vs Approx. Penetrometer results

| DENSITY | | Density Index | DCP Blow Count (blows/100mm) |
|---|---|---|---|
| VL | Very Loose | < 15 % | < 1 |
| L | Loose | 15 – 35 % | 1 – 3 |
| MD | Medium Dense | 35 – 65 % | 3 – 9 |
| D | Dense | 65 – 85 % | 9 – 15 |
| VD | Very Dense | > 85 % | > 15 |

**SILTS & CLAY** – Cu vs Approx. Penetrometer results

| CONSISTENCY | | Undrained Shear Strength (kPa) | DCP Blow Count (blows/100mm) |
|---|---|---|---|
| VS | Very Soft | 0 – 12 | < 1 |
| S | Soft | 12 – 25 | 1 – 2 |
| F | Firm | 25 – 50 | 2 – 3 |
| St | Stiff | 50 – 100 | 3 – 5 |
| VSt | Very Stiff | 100 – 200 | 5 – 8 |
| H | Hard | > 200 | > 8 |

**MOISTURE**

| | |
|---|---|
| D | Dry |
| M | Moist |
| W | Wet |
| $W_P$ | Plastic Limit |
| $W_L$ | Liquid Limit |
| m | Moisture |

idealgeotech
a division of idealcorp

# 5.4 FIELD LOG

**Date:** 10/10/2024
**Customer Job:** Signed Quote
**Ideal Job:** 7056-73003
**Site Address:** Lots 1-3 (124) New England Highway, LOCHINVAR, NSW, 2321

**Borehole:** BH4
**Surface RL:**
**Easting:**
**Northing:**

| Water | DCP Blows/100mm (10 20 30 40) | Samples | Depth | Material Origin | FILL Depth | Classification Code | Material Description | Moisture | Density / Consistency |
|---|---|---|---|---|---|---|---|---|---|
| No water observed | 3 8 2 | | | TOPSOIL | | CI | Silty CLAY with trace Gravel Brown | Slightly Moist m<Wp | Stiff |
| | 2 2 3 3 5 7 11 | | 0.5 1.0 | NATURAL | | CH | Silty CLAY with trace Sand Brown | Slightly Moist m<Wp | Very Stiff |
| | 13 19 17 10 13 13 | | 1.5 | | | | | | |
| | 16 15 15 17 | | 2.0 | NATURAL | | CI | Silty Sandy CLAY with trace Gravel Brown mottled Grey | Slightly Moist m<Wp | Very Stiff |
| | 18 18 15 20 | | 2.5 3.0 3.5 4.0 4.5 | | | | | | |
| | | | 5.0 5.5 | | | | End Bore 4.5m | | |

▼ Water Table **UTP** - Unable to penetrate **DCP** - 9kg Dynamic Cone Penetrometer **PP** - Pocket Penetrometer

**SAND** – Density Index vs Approx. Penetrometer results

| | DENSITY | Density Index | DCP Blow Count (blows/100mm) |
|---|---|---|---|
| VL | Very Loose | < 15 % | < 1 |
| L | Loose | 15 – 35 % | 1 – 3 |
| MD | Medium Dense | 35 – 65 % | 3 – 9 |
| D | Dense | 65 – 85 % | 9 – 15 |
| VD | Very Dense | > 85 % | > 15 |

**SILTS & CLAY** – Cu vs Approx. Penetrometer results

| | CONSISTENCY | Undrained Shear Strength (kPa) | DCP Blow Count (blows/100mm) |
|---|---|---|---|
| VS | Very Soft | 0 – 12 | < 1 |
| S | Soft | 12 – 25 | 1 – 2 |
| F | Firm | 25 – 50 | 2 – 3 |
| St | Stiff | 50 – 100 | 3 – 5 |
| VSt | Very Stiff | 100 – 200 | 5 – 8 |
| H | Hard | > 200 | > 8 |

**MOISTURE**

| | |
|---|---|
| D | Dry |
| M | Moist |
| W | Wet |
| $W_P$ | Plastic Limit |
| $W_L$ | Liquid Limit |
| m | Moisture |

## 7.3 Appendix C – Laboratory Test Results

IdealCorp Pty Ltd t/as
**Ideal Geotech**
16-18 Sammut Street Smithfield NSW 2164
PO Box 2270 Smithfield NSW 2164
Ph: (02) 9725 5522 Fax: (02) 87866300

# Liquid Limit and Linear Shrinkage Test Results

| | | | |
|---|---|---|---|
| Customer: | **Ellie Tilse** | **Ideal Job No.:** | **73003** |
| Address: | **Lots 1-3 (124) New England Highway, LOCHINVAR, NSW, 232'** | Test Date: | **17/10/24** |

| | | | | | |
|---|---|---|---|---|---|
| Test No: | L1 | Depth (m): | 0.7m | Borehole No: | 3 |

| Sample No | Depth (m) | Material Description (visual) | Codes | Liquid Limit % | Linear Shrinkage % |
|---|---|---|---|---|---|
| L1 | 0.7m | Brown Silty Clay with trace Gravel | 1,6,** | 59 | 14.5 |

**CODES/LEGEND**

NO - Not Obtainable

**Sample History**

1 - Air Dried 2 - Low Temperatures (<50C) Oven Dried 3 - Oven (105C) Dried 4 - Unknown 5 - Natural

**Method of Preparation**

6 - Dry Sieved 7 - Wet Sieved

**Shrinkage sample**

(CR) - Crumbled (CU) - Curled

** Mould Length is 125mm *** Mould Length is 150mm

**Test Methods**

Linear Shrinkage AS1289.3.4.1 & Liquid Limit AS1289.3.1.2

NATA ACCREDITED FOR TECHNICAL COMPETENCE

Accredited for compliance with ISO/IEC 17025
Accreditation No 19226

Checked By D. Dwyer
Dated 22-Oct-24
D.Dwyer
Approved Signatory