

Our Ref: PSM4010-010L

7 December 2020

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Attention: David Lousick

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Dear David

**RE: 44 CLUNIES ROSS STREET, PROSPECT  
RESULTS OF GEOTECHNICAL INVESTIGATION ON EXISTING SEWER AND WATER MAIN**

**1. Introduction**

This letter presents the results of geotechnical investigations and testing undertaken by PSM on the existing sewer and water main alignment at 44 Clunies Ross Street, Prospect. The work has been undertaken in accordance with the fee proposal PSM4010-007L, dated 20 October 2020 and approved on 6 November 2020 by David Lousick.

This geotechnical investigation is to inform a utility impact assessment for both existing sewer and water main. The utility impact assessment will be undertaken by others.

**2. Background**

We have previously issued the following letters at the site:

- Preliminary geotechnical investigation at Boral House (Ref: PSM3470-002L, dated 23 October 2017)
- Desktop study and interim geotechnical design advice at Boral House (Ref: PSM3470-300L Rev1, dated 7 June 2019)
- Desktop study and results of geotechnical investigation (Ref: PSM4010-003L Rev 2, dated 7 December 2020).

To assist in the geotechnical investigation, we were provided with and reviewed the following documents:

- A sketch of the proposed geotechnical test locations on the sewer and water main provided by Costin Roe, dated 8 October 2020
- Civil engineering report incorporating water cycle management strategy (Ref: CO13251.06-03A, dated 4 June 2020)
- Costin Roe's drawing package issued for state significant development application (Ref: CO13251.06-DA10D to F02B, dated 3 June 2020)
- Sydney Water main information plan and section (Ref: CO13251.06-SK01B to SK02B, dated 8 July 2020)
- Sydney Water asset protection report (Ref: A2-74855SWAPR-A, dated 17 January 2020)
- Latest survey contour CAD file (Ref: SVY\_DTM\_BDY\_combined surveys 15-5-20.dwg, dated 15 May 2020).

Based on the provided information, PSM understand the following:

- A 375 mm diameter vitrified clay gravity sewer main is located on the northern site boundary at a depth of about 3 to 5 m below ground
- A 1,200 mm diameter water main is located underneath the proposed access road between Warehouse 2 and 7
- A 10 m high retaining wall is proposed to be constructed parallel to the northern site boundary with a minimum horizontal offset to the existing sewer main of 1.5 m.

Figure 1 presents the site locality plan with the sewer and water main.

### **3. Geotechnical Investigation**

#### **3.1 Fieldwork**

The fieldwork was undertaken on 11, 13 and 23 November 2020 under the full-time supervision of PSM geotechnical engineers, who undertook the following tasks:

- Directing the test locations and drilling
- Preparing engineering logs of material encountered
- Collection of disturbed soil samples for laboratory testing
- Measuring groundwater levels on 13 and 23 November 2020
- Undertaking a slug test at one of the boreholes.

The test locations were recorded with a hand-held GPS unit with a horizontal accuracy of approximately +/- 5 m. The borehole collar levels were interpolated in the survey plan (Ref: SVY\_DTM\_BDY\_combined surveys 15-5-20.dwg, dated 15 May 2020).

Prior to testing, on-site service location “scans” were undertaken by a service locator in the presence of a PSM geotechnical engineer to assess the existing services.

#### **3.2 Boreholes**

The proposed test locations shown in the sketch provided by Costin Roe are within the Austral site, which was inaccessible during the fieldwork such that PSM relocated the boreholes adjacent to the sewer main to the nearest accessible locations on the Council reserve. A total of four (4) boreholes (2020/BH13 to 2020/BH16) were drilled by using 6.5 tonne and 3.5 tonne track mounted drill rigs. Augering through soil and weathered rock was undertaken using a V-bit to refusal and continued with a TC-bit in rock until refusal or target depth was achieved.

With regards to the water main within the Austral site, we have previously completed two (2) boreholes (2020/BH09 and 2020/BH11) in vicinity of the water main in early 2020 (Ref: PSM4010-003L Rev 2 dated 7 December 2020). Furthermore, borehole 2020/BH10 was drilled in close proximity to the sewer easement, Figure 1.

Soil samples for laboratory testing were taken directly from the auger.

Figures 2 to 7 present selected site photos showing the general site conditions and some typical soil/rock samples encountered in the boreholes.

Appendix A presents the engineering borehole logs including 2020/BH09 to BH11 previously undertaken in early 2020.

#### **3.3 Groundwater Monitoring Wells**

A standpipe piezometer was installed in each of BH13 to BH16 upon completion to allow ongoing monitoring of groundwater levels. Appendix B presents the piezometer construction records.

After installation of standpipe piezometers on 11 and 13 November 2020, PSM engineer returned to site on 23 November 2020 to measure the groundwater levels. A HOBO device was installed to monitor the groundwater level and a slug test was completed at 2020/BH15 on 13 November 2020.

### 3.4 Laboratory Testing

Table 1 summarises the list of laboratory testing undertaken at 2020/BH09 to BH11 and BH13 to BH16.

Atterberg limit testing results are provided in Appendix D with a summary in Table 2 and Figure 8. PSD testing results are provided in Appendix E with a summary in Figure 9. Moisture content results are provided in Appendix F with a summary in Table 3.

**Table 1 – Summary of laboratory testing**

| Borehole ID              | Sample Depth (m) | Inferred Material | Laboratory Testing |                                 |                  |
|--------------------------|------------------|-------------------|--------------------|---------------------------------|------------------|
|                          |                  |                   | PSD <sup>(1)</sup> | Atterberg Limits <sup>(2)</sup> | Moisture Content |
| 2020/BH09 <sup>(3)</sup> | 2.0 to 3.0       | NATURAL SOIL      | X                  | X                               |                  |
| 2020/BH10 <sup>(3)</sup> | 2.0 to 3.5       | NATURAL SOIL      | X                  | X                               |                  |
| 2020/BH11 <sup>(3)</sup> | 3.0 to 4.0       | NATURAL SOIL      | X                  | X                               |                  |
| 2020/BH13                | 0.5              | NATURAL SOIL      |                    |                                 | X                |
|                          | 1.0 to 1.5       | NATURAL SOIL      | X                  | X                               |                  |
|                          | 1.5              | NATURAL SOIL      |                    |                                 | X                |
|                          | 2.5              | NATURAL SOIL      |                    |                                 | X                |
|                          | 3.5              | NATURAL SOIL      |                    |                                 | X                |
|                          | 4.5              | NATURAL SOIL      |                    |                                 | X                |
|                          | 5.5              | NATURAL SOIL      |                    |                                 | X                |
| 2020/BH14                | 0.5              | FILL              |                    |                                 | X                |
|                          | 1.5              | FILL              |                    |                                 | X                |
|                          | 2.0 to 2.5       | FILL              | X                  | X                               |                  |
|                          | 2.5              | FILL              |                    |                                 | X                |
|                          | 3.5              | FILL              |                    |                                 | X                |
|                          | 4.5              | NATURAL SOIL      |                    |                                 | X                |
|                          | 5.5              | NATURAL SOIL      |                    |                                 | X                |
|                          | 6.5              | NATURAL SOIL      |                    |                                 | X                |
|                          | 7.5              | NATURAL SOIL      |                    |                                 | X                |
|                          | 8.5              | NATURAL SOIL      |                    |                                 | X                |
|                          | 9.5              | NATURAL SOIL      |                    |                                 | X                |
| 2020/BH15                | 0.5              | NATURAL SOIL      |                    |                                 | X                |
|                          | 1.5              | NATURAL SOIL      |                    |                                 | X                |
|                          | 2.5              | NATURAL SOIL      |                    |                                 | X                |
|                          | 2.5 to 3.0       | NATURAL SOIL      | X                  | X                               |                  |
|                          | 3.5              | NATURAL SOIL      |                    |                                 | X                |
|                          | 4.5              | NATURAL SOIL      |                    |                                 | X                |
|                          | 5.5              | NATURAL SOIL      |                    |                                 | X                |

Notes:

1. Particle size distribution testing
2. Atterberg limit testing including linear shrinkage
3. Previous boreholes undertaken in January 2020 (Ref: PSM4010-003L Rev2, dated 7 December 2020)



**Table 2 – Results of Atterberg limit testing**

| Sample ID (Depth)                          | Liquid Limit (%) | Plastic Limit (%) | Plasticity Index (%) | Linear Shrinkage (%) |
|--------------------------------------------|------------------|-------------------|----------------------|----------------------|
| 2020/BH09 <sup>(1)</sup><br>(2.0 to 3.0 m) | 52               | 15                | 37                   | 17.0                 |
| 2020/BH10 <sup>(1)</sup><br>(2.0 to 3.5 m) | 70               | 16                | 54                   | 21.0                 |
| 2020/BH11 <sup>(1)</sup><br>(3.0 to 4.0 m) | 52               | 13                | 39                   | 15.5                 |
| 2020/BH13<br>(1.0 to 1.5 m)                | 80               | 21                | 59                   | 22.5                 |
| 2020/BH14<br>(2.0 to 2.5 m)                | 51               | 18                | 33                   | 12.0                 |
| 2020/BH15<br>(2.5 to 3.0 m)                | 67               | 19                | 48                   | 20.0                 |

Notes:

1. Previous boreholes undertaken in January 2020 (Ref: PSM4010-003L Rev 2, dated 7 December 2020)

**Table 3 – Results of soil moisture content**

| Borehole ID | Moisture Content (%) at Depth (m) below Ground |      |      |      |      |      |      |      |      |      |
|-------------|------------------------------------------------|------|------|------|------|------|------|------|------|------|
|             | 0.5                                            | 1.5  | 2.5  | 3.5  | 4.5  | 5.5  | 6.5  | 7.5  | 8.5  | 9.5  |
| 2020/BH13   | 23.8                                           | 26.9 | 19.8 | 18.6 | 28.4 | 24.7 | -    | -    | -    | -    |
| 2020/BH14   | 9.6                                            | 10.6 | 15.6 | 17.9 | 13.5 | 14.8 | 17.0 | 23.3 | 23.3 | 19.7 |
| 2020/BH15   | 17.0                                           | 21.1 | 18.2 | 17.8 | 15.7 | 21.2 | -    | -    | -    | -    |

## 4. Site Conditions

### 4.1 Surface Conditions

The surface conditions in proximity to the sewer easement include:

- Well vegetated and grassed areas, Photos 1 to 5
- Existing stormwater infrastructure, Photo 6
- Large stormwater basin running sub-parallel to Girraween Creek and the sewer easement.
- Slopes are generally convergent towards the existing stormwater detention basin and Girraween Creek.

The surface conditions in proximity to the water easement include:

- Existing hardstand pavements and light industrial sheds along the majority of the alignment, Figure 1
- Vegetated slopes that fall towards the north are noted at the northern end of the alignment, Figure 1.

### 4.2 Subsurface Conditions

The subsurface conditions are summarised in Table 4. Table 5 presents the elevation of the inferred geotechnical units encountered in the PSM boreholes (2020/BH09 to BH11, BH13 to BH16) during the geotechnical site investigations.

Figures 10 to 13 present the geological long sections along the sewer and water main.

**Table 4 – Summary of inferred subsurface conditions encountered in boreholes**

| Inferred Unit | Inferred Depth to Top of Unit below Ground (m) | Description                                                                                                                                                                                                                                                                                                                                                                                               |
|---------------|------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| TOPSOIL       | 0                                              | CLAY; medium to high plasticity, dark brown and grey; with silt and gravel, gravel sub-angular sized up to 30 mm; dry to moist; firm to stiff consistency.                                                                                                                                                                                                                                                |
| PAVEMENT      | 0                                              | Brick wearing course, typically 100 mm thick.                                                                                                                                                                                                                                                                                                                                                             |
| FILL          | 0 to 0.4                                       | Silty SAND; fine grained, pale grey; with gravel, angular up to 20 mm; dry; loose density.<br>Silty CLAY/CLAY; low to medium plasticity; dark grey, dark brown and grey; with gravel, angular/sub-angular up to 60 mm; dry to moist; firm to stiff consistency.                                                                                                                                           |
| NATURAL SOIL  | 0.2 to 4.2                                     | CLAY; variable plasticity from low near surface to high plasticity (typically high); yellow and brown and pale brown and grey; trace gravel sub-angular dolerite up to 10 mm dry to moist near surface becoming wet with depth; firm to very stiff consistency (typically increasing with depth).<br>Lateritic layers observed. Unit typically includes Alluvial Clays overlying Residual Clays at depth. |
| BEDROCK A     | 6.3 to 10                                      | SHALE; fine grained, brown, red, pale to dark grey; very low to low strength; highly weathered; iron stained.                                                                                                                                                                                                                                                                                             |
| BEDROCK C     | 6.2                                            | SANDSTONE; pale yellow; low strength; highly weathered.                                                                                                                                                                                                                                                                                                                                                   |

**Table 5 – Elevation of top of inferred geotechnical units encountered in boreholes**

| Borehole ID              | RLs of Top of Inferred Unit (m AHD) |          |      |              |           |           |                    |
|--------------------------|-------------------------------------|----------|------|--------------|-----------|-----------|--------------------|
|                          | TOPSOIL                             | PAVEMENT | FILL | NATURAL SOIL | BEDROCK A | BEDROCK C | EOH <sup>(1)</sup> |
| 2020/BH09 <sup>(3)</sup> | N.E.                                | 56.9     | 56.8 | 55.4         | 49.5      | N.E.      | 48.9               |
| 2020/BH10 <sup>(3)</sup> | 54.5                                | N.E.     | N.E. | 54.2         | 48.4      | N.E.      | 46.5               |
| 2020/BH11 <sup>(3)</sup> | N.E.                                | N.E.     | 56.8 | 55.8         | N.E.      | 50.6      | 48.8               |
| 2020/BH13                | 51.4                                | N.E.     | N.E. | 51.2         | 44.3      | N.E.      | 44.1               |
| 2020/BH14                | 56.7                                | N.E.     | 56.3 | 52.5         | 46.7      | N.E.      | 46.3               |
| 2020/BH15                | 51.7                                | N.E.     | N.E. | 51.5         | 46.1      | N.E.      | 44.6               |
| 2020/BH16                | 53.7                                | N.E.     | 53.4 | 52.7         | 43.7      | N.E.      | 42.9               |

Notes:

1. EOH – End of hole
2. N.E. – Not encountered
3. Previous boreholes undertaken in January 2020 (Ref: PSM4010-003L Rev 2, dated 7 December 2020)

### 4.3 Groundwater

Table 6 presents a summary of groundwater observations. Appendix C presents the results of piezometric monitoring at 2020/BH15 from 13 to 23 November 2020.

**Table 6 – Summary of groundwater observations**

| Borehole ID | At the Time of Piezometer Installation |            | 10 days after Piezometer Installation |            | PSM Comments                                                                                                                                                |
|-------------|----------------------------------------|------------|---------------------------------------|------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------|
|             | Depth below ground (m)                 | RL (m AHD) | Depth below ground (m)                | RL (m AHD) |                                                                                                                                                             |
| 2020/BH09   | -                                      | -          | -                                     | -          | No piezometer installed. Groundwater seepage encountered at 5.5 m below ground or RL 51.4 m AHD during drilling.                                            |
| 2020/BH10   | -                                      | -          | -                                     | -          | No piezometer installed. Groundwater seepage encountered at 4.0 m below ground or RL 50.5 m AHD during drilling.                                            |
| 2020/BH11   | -                                      | -          | -                                     | -          | No piezometer installed. No groundwater seepage observed during drilling.                                                                                   |
| 2020/BH13   | 3.0                                    | 48.4       | 3.2                                   | 48.2       | -                                                                                                                                                           |
| 2020/BH14   | 7.4                                    | 49.3       | 7.5                                   | 49.2       | -                                                                                                                                                           |
| 2020/BH15   | 1.5                                    | 50.2       | 1.6                                   | 50.1       | Water in the piezometer was pumped out. Groundwater level was observed to be at RL 50 m 4 minutes after dewatering during slug test. A HOBOT was installed. |
| 2020/BH16   | 1.3                                    | 52.4       | 1.9                                   | 51.8       | -                                                                                                                                                           |

## 5. Discussion

### 5.1 Groundwater

The designer shall consider that groundwater may influence excavations for bulk earthworks, underground services, retaining walls and footing systems and that dewatering may be required.

### 5.2 Utility Assessment

The parameters provided in Table 1 of the Interim Geotechnical Design Advice (IGDA) may be used for settlement assessments (ref. PSM4010-004L REV1, 26 November 2020), Appendix G

With regards to the proposed Warehouse 7 retaining wall the designer shall consider that potential horizontal deflections of the sewer may control the retaining wall design.

The designer shall consider total and differential settlements during and post construction that may influence the performance of the Sydney water assets due to:

- Construction methodology and equipment
- Variable loads and mixed foundation system (e.g. different footing types, different pavement loading scenarios)
- Variable change in net effective stress due to the proposed excavation and placement of engineered FILL.
- Variability of:
  - The thickness of existing FILL unit
  - Depth to BEDROCK units
  - Groundwater levels.
- Sensitivity to changes in engineering parameters.

### 5.3 Foundations

We have updated the IGDA to include advice on piled footing systems, refer to Table 1 and Section 3.2 of the IGDA, Appendix G

Should there be any queries, please contact the undersigned.

For and on behalf of

**PELLS SULLIVAN MEYNINK**



**DANE POPE**  
**ASSOCIATE GEOTECHNICAL ENGINEER**

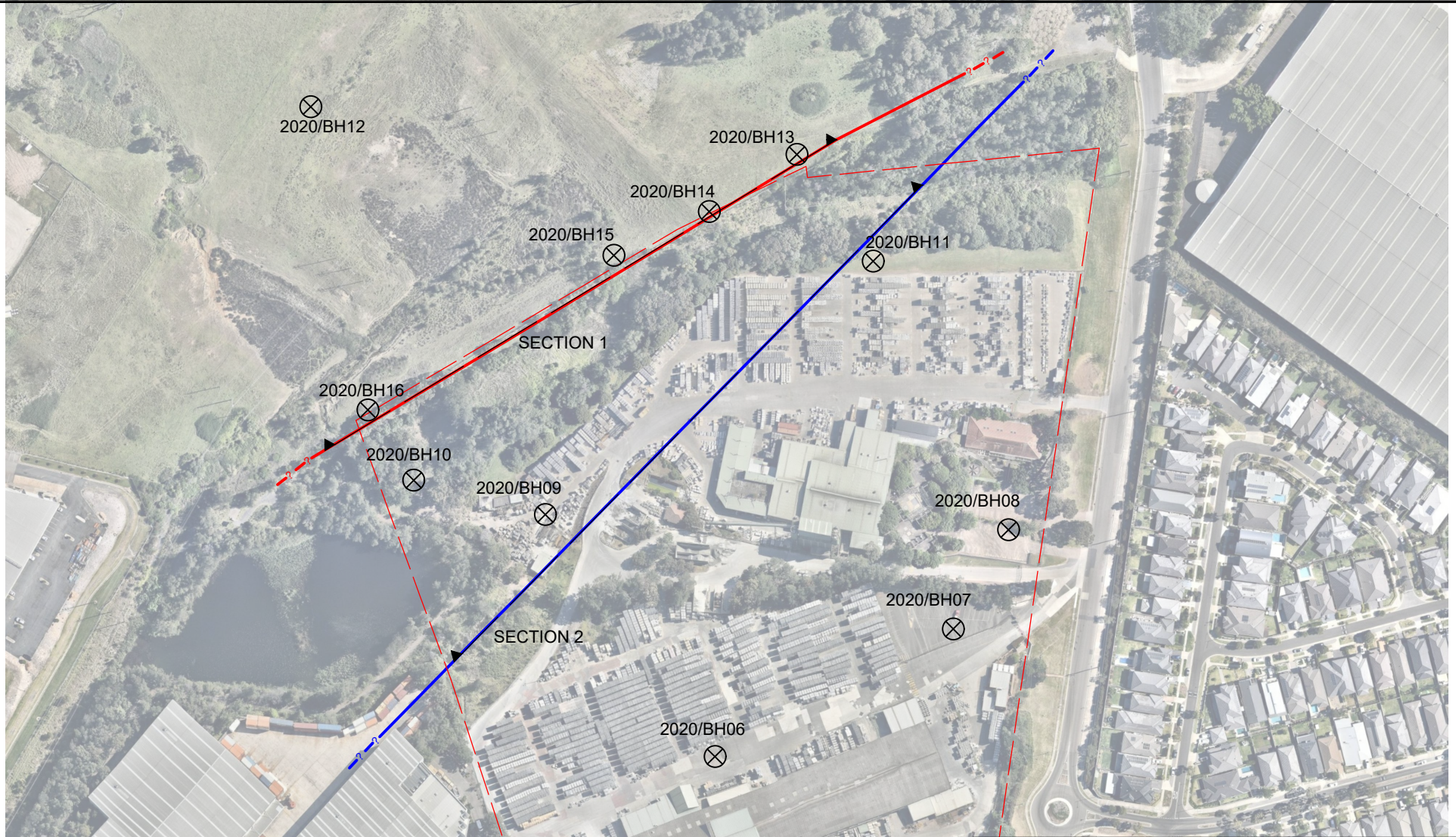


**AGUSTRIA SALIM**  
**PRINCIPAL**

Encl.

|            |                                                         |
|------------|---------------------------------------------------------|
| Figure 1   | Site locality plan                                      |
| Figure 2   | Selected site photos (1 of 6)                           |
| Figure 3   | Selected site photos (2 of 6)                           |
| Figure 4   | Selected site photos (3 of 6)                           |
| Figure 5   | Selected site photos (4 of 6)                           |
| Figure 6   | Selected site photos (5 of 6)                           |
| Figure 7   | Selected site photos (6 of 6)                           |
| Figure 8   | Results of Atterberg limit and linear shrinkage testing |
| Figure 9   | Results of PSD testing                                  |
| Figure 10  | Section 1 Part 1- sewer main                            |
| Figure 11  | Section 1 Part 2- sewer main                            |
| Figure 12  | Section 2 Part 1- water main                            |
| Figure 13  | Section 2 Part 2- water main                            |
| Appendix A | Engineering borehole logs                               |
| Appendix B | Piezometer construction records                         |
| Appendix C | Results of piezometric monitoring at 2020/BH15          |
| Appendix D | Result of Atterberg limit and linear shrinkage testing  |
| Appendix E | Results of PSD testing                                  |
| Appendix F | Results of soil moisture content                        |
| Appendix G | Interim Geotechnical Design Advice – PSM4010-004L REV1  |





**Legend:**

-  Boreholes location  
 Approximate Property boundary  
 Ø750 mm stormwater pipe  
 Section lines  
 Ø375 mm sewer

**Notes:**

1. Base map aerial photo retrieved from nearmap.com dated 07/01/2020
2. Service locations are indicative only and shall be confirmed on site.
3. Refer to Figure 10 - 13 for the relevant sections



100m

|                                                                                                                                                                |          |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------|----------|
| Aliro Group<br>44 Clunies Ross Street, Prospect NSW<br><b>RESULTS OF GEOTECHNICAL INVESTIGATION<br/>ON EXISTING SEWER AND WATER MAIN</b><br>SITE LOCALITY PLAN |          |
| PSM4010-010L                                                                                                                                                   | Figure 1 |





Photo 1: General Site Condition near BH13 looking north west



Photo 2: General Site Condition adjacent to BH14 Looking north east



**Aliro Group**  
**44 Clunies Ross Street, Prospect NSW**  
**RESULTS OF GEOTECHNICAL INVESTIGATION**  
**ON EXISTING SEWER AND WATER MAIN**

**SELECTED SITE PHOTOS (1 of 6)**

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**Figure 2**





Photo 3: General Site Condition adjacent to BH15 Looking West



Photo 4: General Site Condition adjacent to BH16 Looking North



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**RESULTS OF GEOTECHNICAL INVESTIGATION**  
**ON EXISTING SEWER AND WATER MAIN**  
**SELECTED SITE PHOTOS (2 of 6)**

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**Figure 3**





Photo 5: Existing Sewer Mainhole adjacent to Site Boundary Fence



Photo 6: Existing Stormwater Channel adjacent to BH16



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**44 Clunies Ross Street, Prospect NSW**  
**RESULTS OF GEOTECHNICAL INVESTIGATION**  
**ON EXISTING SEWER AND WATER MAIN**  
**SELECTED SITE PHOTOS (3 of 6)**

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**Figure 4**





Photo 7: Typical Drill Rig Setup



Photo 8: Typical Piezometer Setup with a HOBO



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**RESULTS OF GEOTECHNICAL INVESTIGATION**  
**ON EXISTING SEWER AND WATER MAIN**

**SELECTED SITE PHOTOS (4 of 6)**

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**Figure 5**





Photo 9: Typical Photo of NATURAL SOIL Unit



Photo 10: Typical Photo of Deep FILL Unit at Regional Basin Bund Weir



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**44 Clunies Ross Street, Prospect NSW**

**RESULTS OF GEOTECHNICAL INVESTIGATION  
ON EXISTING SEWER AND WATER MAIN**

**SELECTED SITE PHOTOS (5 of 6)**

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**Figure 6**





Photo 11: Typical Photo of lateritic CLAY (ironstone)



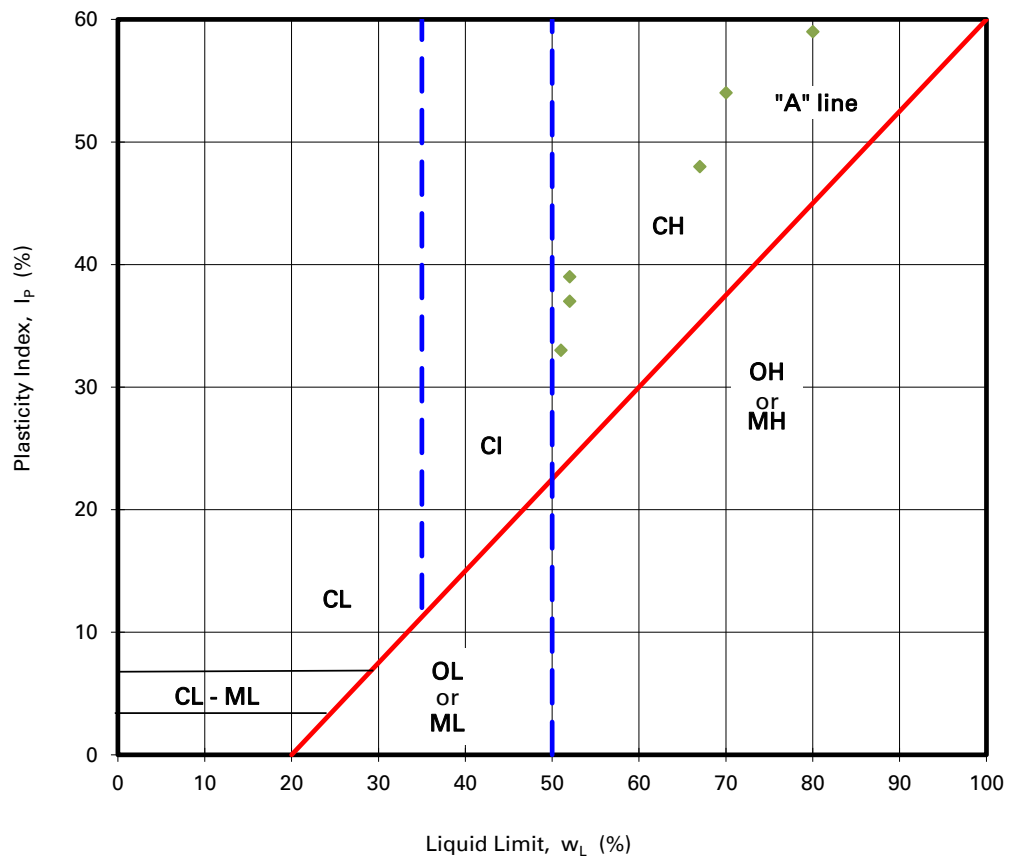
Photo 12: Typical Photo of SHALE Bedrock



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**RESULTS OF GEOTECHNICAL INVESTIGATION**  
**ON EXISTING SEWER AND WATER MAIN**  
**SELECTED SITE PHOTOS (6 of 6)**

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**Figure 7**



Notes:

- 1 Based on the test reports provided by Soil test Services (Ref: PSM4010-010L Appendix D)

**Aliro Management**  
**44 Clunies Ross Street**  
**Prospect NSW**

**ATTERBERG LIMITS**

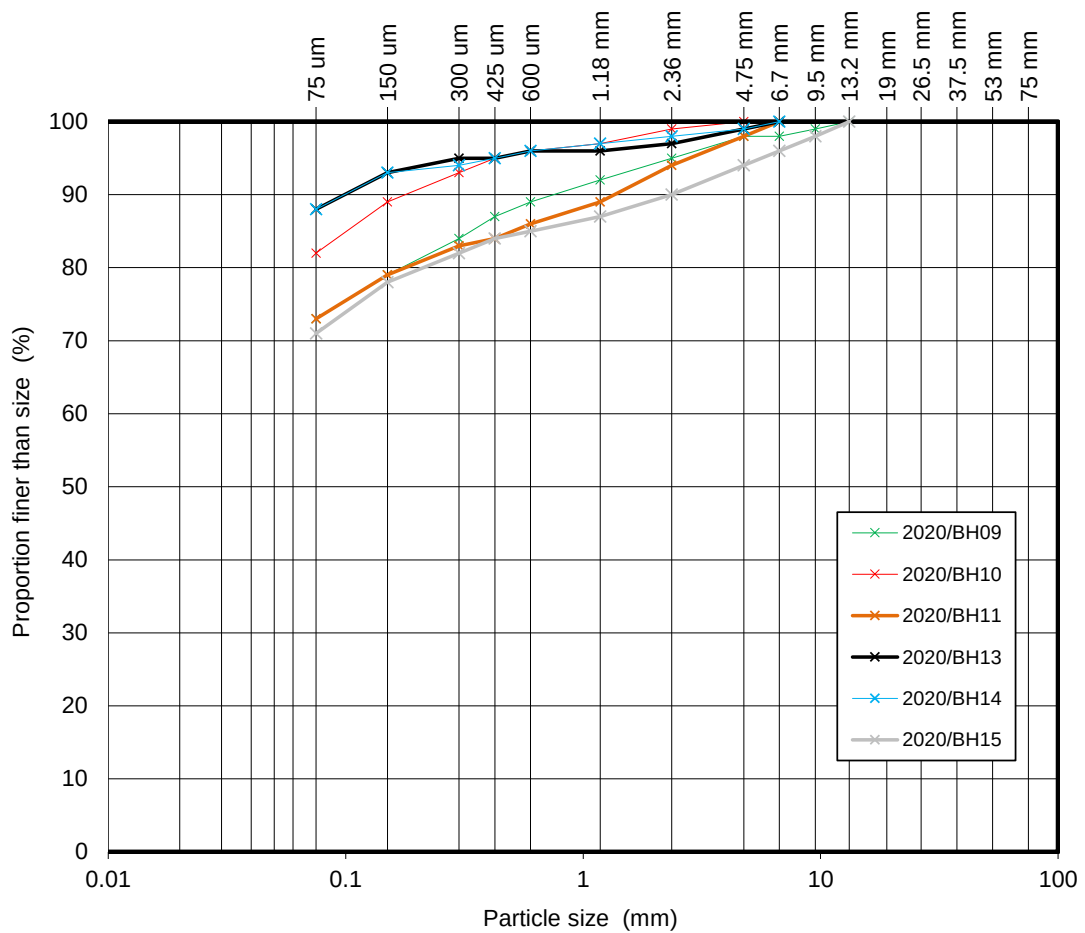


**Pells Sullivan Meynink**

**PSM4010-010L**

**FIGURE 8**





Particle Size Distribution of SOIL Samples

Notes:

- 1 Based on the test reports provided by Soil Test Services (Ref: PSM4010-010L Appendix E)

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**44 Clunies Ross Street**  
**Prospect NSW**

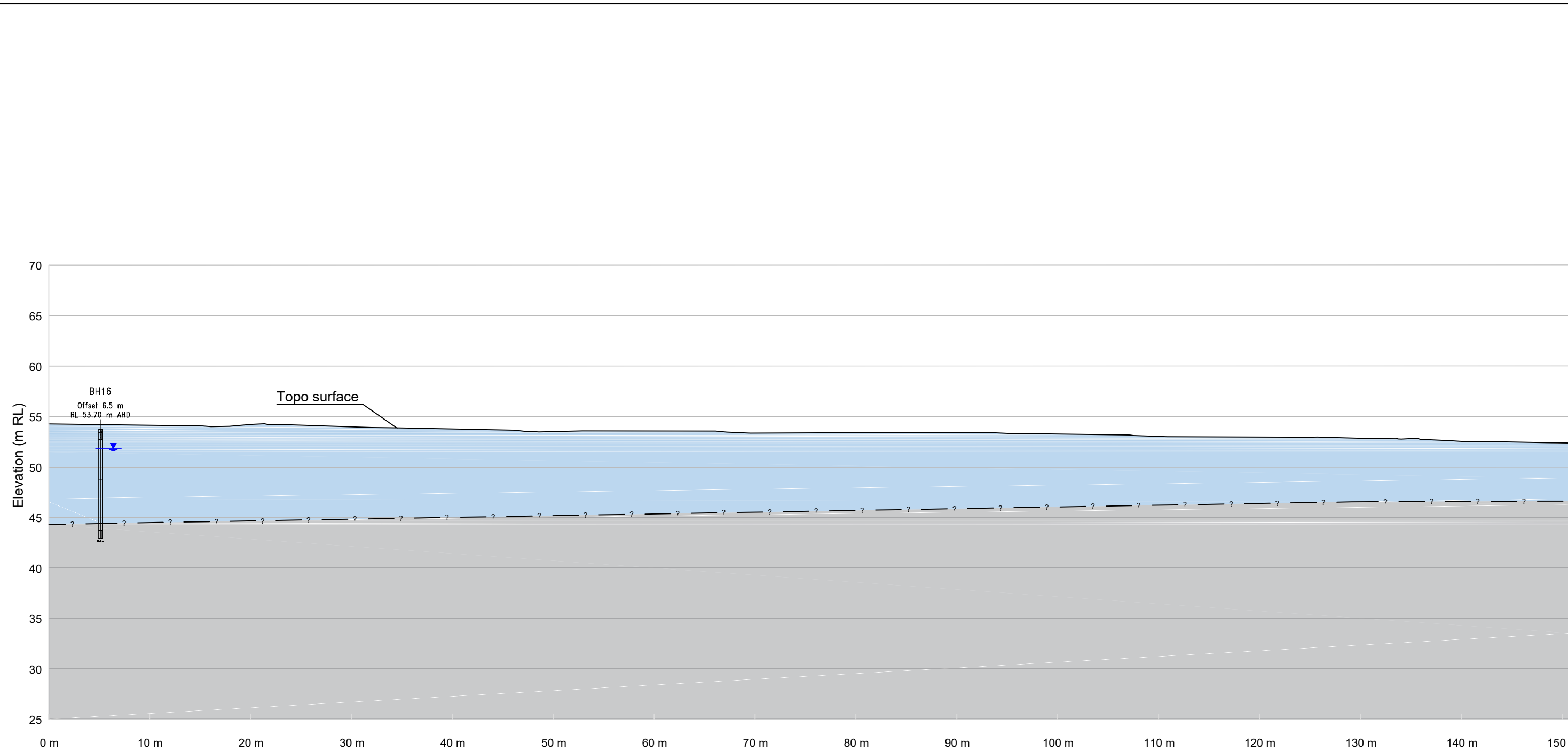
**PARTICLE SIZE DISTRIBUTION**



**Pells Sullivan Meynink**

**PSM4010-010L**

**FIGURE 9**



Legends:

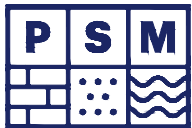
— ? — Inferred Geological Boundaries

Material Graphics:

|                                        |                          |
|----------------------------------------|--------------------------|
| FILL                                   | CL - Low Plasticity CLAY |
| CH - High Plasticity CLAY              | SANDSTONE                |
| CI - Medium Plasticity CLAY            | SHALE                    |
| CI-CH - Medium to High Plasticity CLAY |                          |

Interpreted Geological Units:

|                                                               |
|---------------------------------------------------------------|
| NATURAL SOIL                                                  |
| BEDROCK - Typically SHALE                                     |
| GROUNDWATER LEVEL (Measured 10 days after piezometer install) |
| GROUNDWATER SEEPAGE LEVEL (Measured during drilling)          |



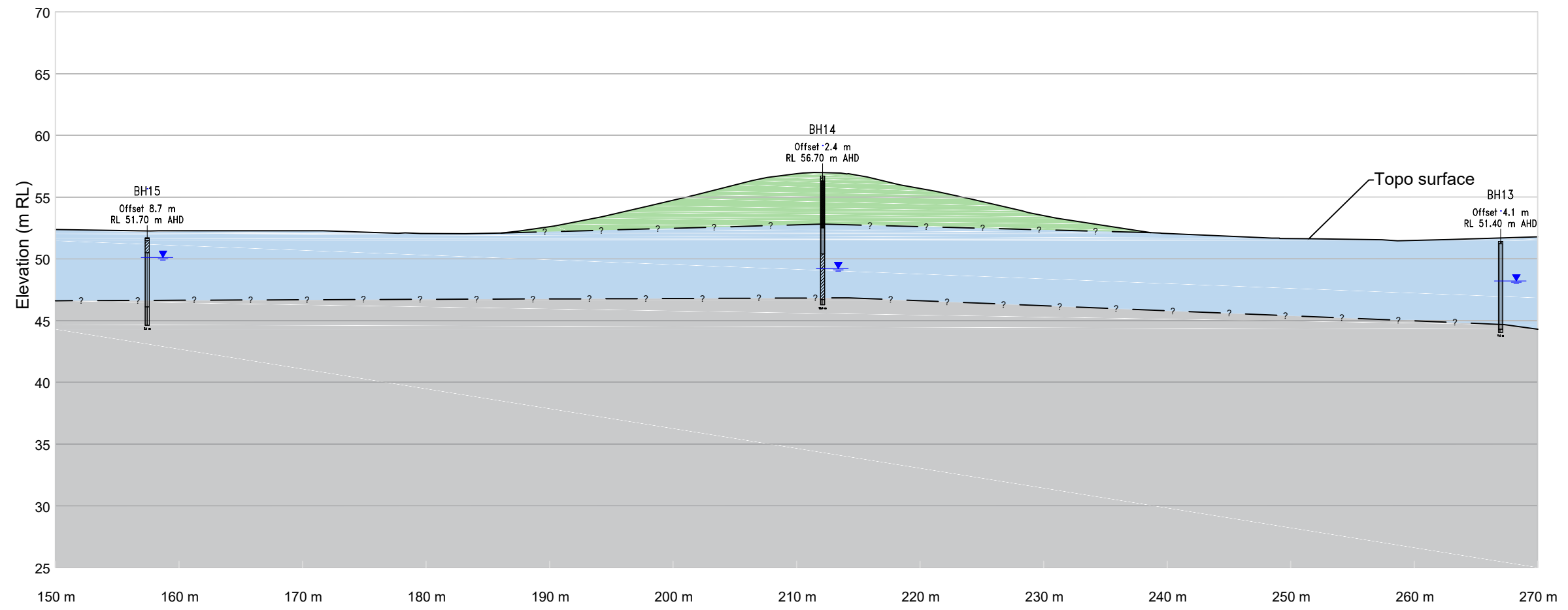
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RESULTS OF GEOTECHNICAL INVESTIGATION  
ON EXISTING SEWER AND WATER MAIN

SECTION 1 PART 1 - SEWER MAIN

PSM4010-010L

Figure 10





Legends:

— ? — Inferred Geological Boundaries

Material Graphics:

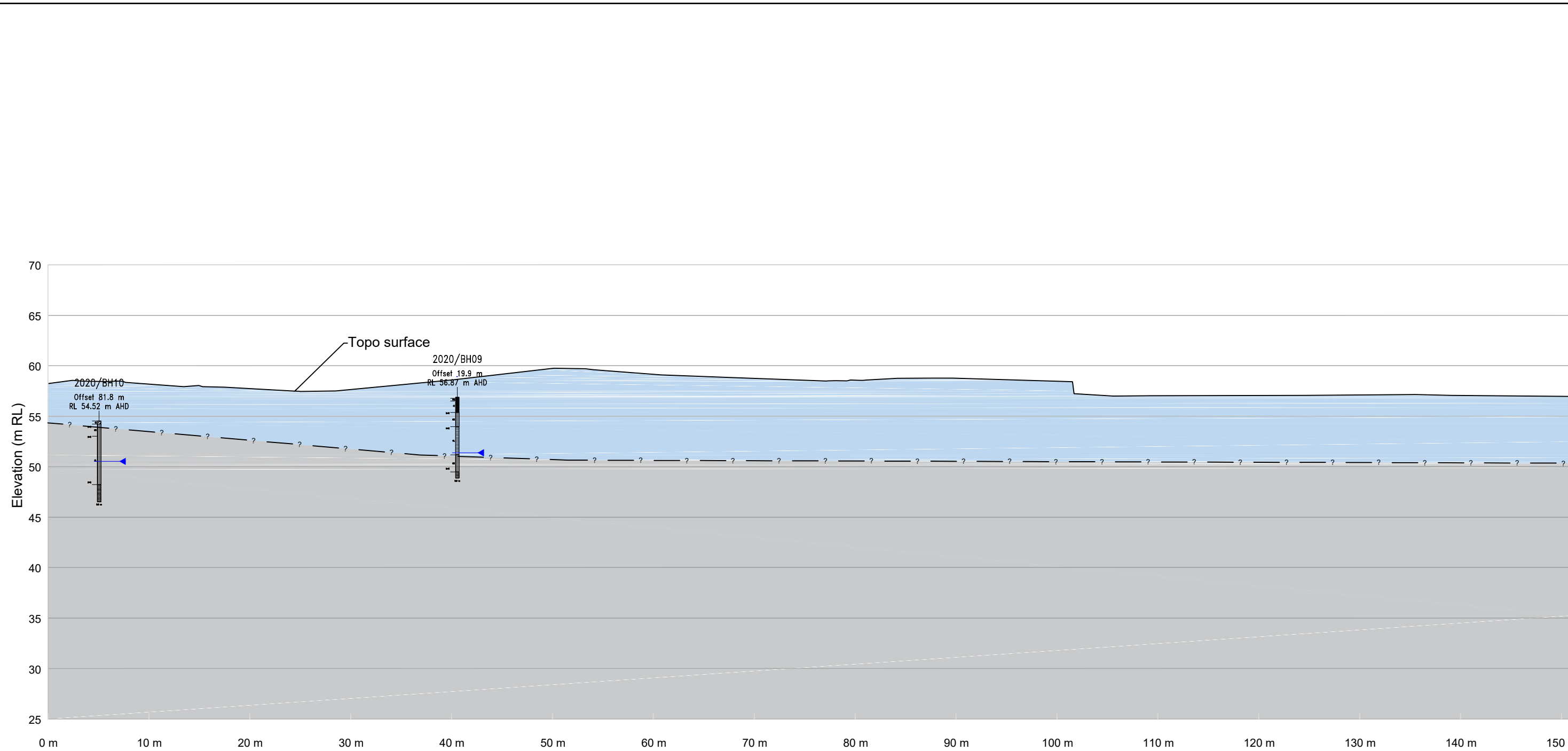
|                                        |                          |
|----------------------------------------|--------------------------|
| FILL                                   | CL - Low Plasticity CLAY |
| CH - High Plasticity CLAY              | SANDSTONE                |
| CI - Medium Plasticity CLAY            | SHALE                    |
| CI-CH - Medium to High Plasticity CLAY |                          |

Interpreted Geological Units:

|                                                               |
|---------------------------------------------------------------|
| FILL                                                          |
| NATURAL SOIL                                                  |
| BEDROCK - Typically SHALE                                     |
| GROUNDWATER LEVEL (Measured 10 days after piezometer install) |
| GROUNDWATER SEEPAGE LEVEL (Measured during drilling)          |



|                                                                           |           |
|---------------------------------------------------------------------------|-----------|
| ALIRO GROUP                                                               |           |
| 44 CLUNIES ROSS STREET, PROSPECT                                          |           |
| RESULTS OF GEOTECHNICAL INVESTIGATION<br>ON EXISTING SEWER AND WATER MAIN |           |
| SECTION 1 PART 2 - SEWER MAIN                                             |           |
| PSM4010-010L                                                              | Figure 11 |

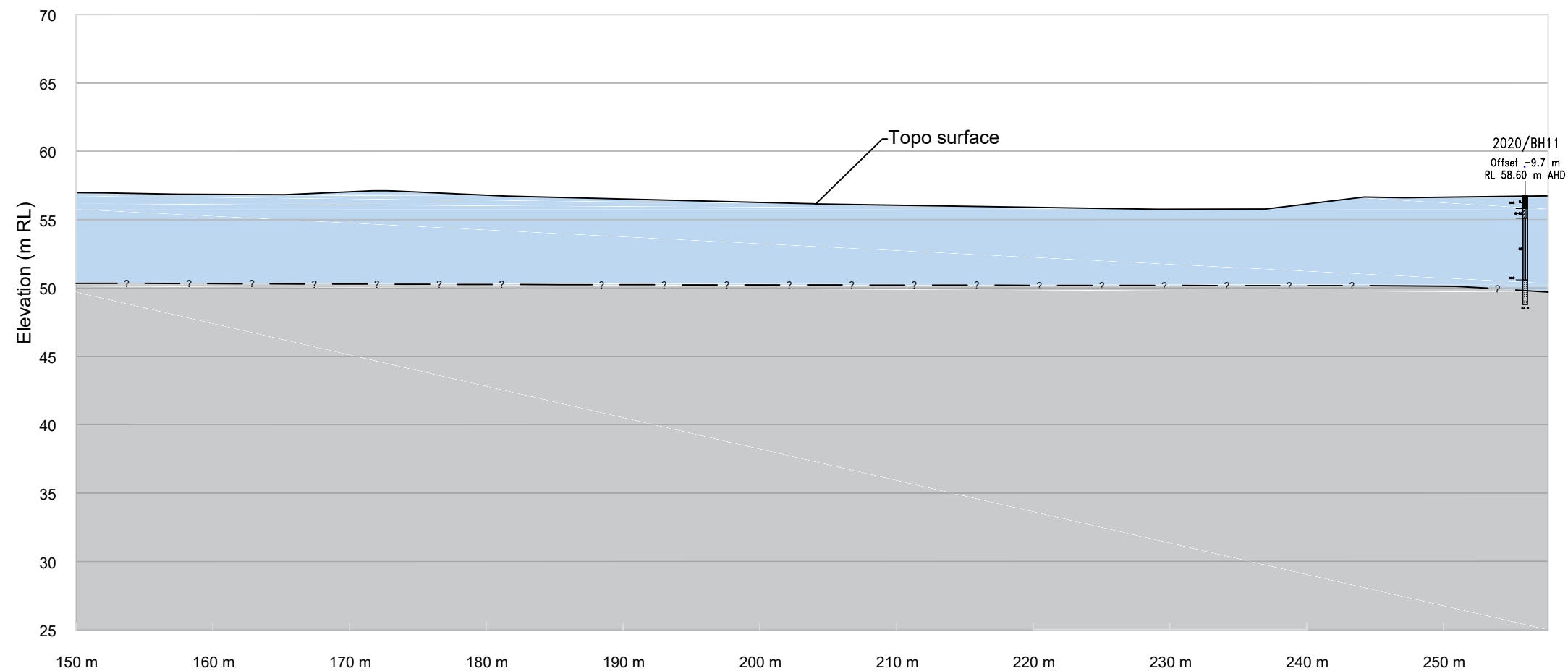


Legends:  
— ? — Inferred Geological Boundaries

Material Graphics:  
■ FILL  
■ CL - Low Plasticity CLAY  
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■ SANDSTONE  
■ SHALE

Interpreted Geological Units:  
■ FILL  
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▼ GROUNDWATER LEVEL (Measured 10 days after piezometer install)  
▶ GROUNDWATER SEEPAGE LEVEL (Measured during drilling)





Legends:

— ? — Inferred Geological Boundaries

Material Graphics:

|                                        |                          |
|----------------------------------------|--------------------------|
| FILL                                   | CL - Low Plasticity CLAY |
| CH - High Plasticity CLAY              | SANDSTONE                |
| CI - Medium Plasticity CLAY            | SHALE                    |
| CI-CH - Medium to High Plasticity CLAY |                          |

Interpreted Geological Units:

|                                                               |
|---------------------------------------------------------------|
| NATURAL SOIL                                                  |
| BEDROCK - Typically SHALE                                     |
| GROUNDWATER LEVEL (Measured 10 days after piezometer install) |
| GROUNDWATER SEEPAGE LEVEL (Measured during drilling)          |



|                                                                                                                                                               |           |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------|
| ALIRO GROUP<br>44 CLUNIES ROSS STREET, PROSPECT<br>RESULTS OF GEOTECHNICAL INVESTIGATION<br>ON EXISTING SEWER AND WATER MAIN<br>SECTION 2 PART 2 - WATER MAIN |           |
| PSM4010-010L                                                                                                                                                  | Figure 13 |



## **Appendix A**

### **Engineering borehole logs**



Borehole ID

2020/BH09

Page 1 of 2

## Engineering Log - Non Cored Borehole

Project No.: PSM4010

|                                                                                                                                                          |             |                       |       |                                                        |          |        |           |                                                     |                       |                                                                                                                                                                                                                                 |                    |                                                                                                                                                                   |                             |     |     |                                 |                                                    |                                                                                                                                   |   |                                                                                                                                                                                                           |  |  |  |
|----------------------------------------------------------------------------------------------------------------------------------------------------------|-------------|-----------------------|-------|--------------------------------------------------------|----------|--------|-----------|-----------------------------------------------------|-----------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------|-----|-----|---------------------------------|----------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------|---|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|--|--|
| Client: Aliro Management Pty Ltd                                                                                                                         |             | Commenced: 09/01/2020 |       |                                                        |          |        |           |                                                     |                       |                                                                                                                                                                                                                                 |                    |                                                                                                                                                                   |                             |     |     |                                 |                                                    |                                                                                                                                   |   |                                                                                                                                                                                                           |  |  |  |
| Project Name: 44 Clunies Ross Street, Prospect                                                                                                           |             | Completed: 09/01/2020 |       |                                                        |          |        |           |                                                     |                       |                                                                                                                                                                                                                                 |                    |                                                                                                                                                                   |                             |     |     |                                 |                                                    |                                                                                                                                   |   |                                                                                                                                                                                                           |  |  |  |
| Hole Location: Pad 7                                                                                                                                     |             | Logged By: MT/JL      |       |                                                        |          |        |           |                                                     |                       |                                                                                                                                                                                                                                 |                    |                                                                                                                                                                   |                             |     |     |                                 |                                                    |                                                                                                                                   |   |                                                                                                                                                                                                           |  |  |  |
| Hole Position: 307873.0 m E 6257011.0 m N MGA94 Zone 56                                                                                                  |             | Checked By: DP        |       |                                                        |          |        |           |                                                     |                       |                                                                                                                                                                                                                                 |                    |                                                                                                                                                                   |                             |     |     |                                 |                                                    |                                                                                                                                   |   |                                                                                                                                                                                                           |  |  |  |
| Drill Model and Mounting: Geoprobe 78 22DT                                                                                                               |             | Inclination: -90°     |       |                                                        |          |        |           |                                                     |                       |                                                                                                                                                                                                                                 |                    |                                                                                                                                                                   |                             |     |     |                                 |                                                    |                                                                                                                                   |   |                                                                                                                                                                                                           |  |  |  |
| Hole Diameter: 125 mm                                                                                                                                    |             | RL Surface: 56.87 m   |       |                                                        |          |        |           |                                                     |                       |                                                                                                                                                                                                                                 |                    |                                                                                                                                                                   |                             |     |     |                                 |                                                    |                                                                                                                                   |   |                                                                                                                                                                                                           |  |  |  |
|                                                                                                                                                          |             | Datum: AHD            |       |                                                        |          |        |           |                                                     |                       |                                                                                                                                                                                                                                 |                    |                                                                                                                                                                   |                             |     |     |                                 |                                                    |                                                                                                                                   |   |                                                                                                                                                                                                           |  |  |  |
|                                                                                                                                                          |             | Operator: Terratest   |       |                                                        |          |        |           |                                                     |                       |                                                                                                                                                                                                                                 |                    |                                                                                                                                                                   |                             |     |     |                                 |                                                    |                                                                                                                                   |   |                                                                                                                                                                                                           |  |  |  |
| Drilling Information                                                                                                                                     |             |                       |       |                                                        |          |        |           | Soil Description                                    |                       |                                                                                                                                                                                                                                 |                    |                                                                                                                                                                   |                             |     |     | Observations                    |                                                    |                                                                                                                                   |   |                                                                                                                                                                                                           |  |  |  |
| Method                                                                                                                                                   | Penetration | Support               | Water | Samples Tests Remarks                                  | Recovery | RL (m) | Depth (m) | Graphic Log                                         | Classification Symbol | Material Description<br>SOIL NAME: Plasticity, behaviour or particle characteristics of primary component, colour, secondary components, additional observations                                                                | Moisture Condition | Consistency / Relative Density                                                                                                                                    | Hand Penetrometer UCS (kPa) |     |     |                                 | Structure, Zoning, Origin, Additional Observations |                                                                                                                                   |   |                                                                                                                                                                                                           |  |  |  |
| AD/T                                                                                                                                                     |             |                       |       |                                                        |          |        |           |                                                     |                       |                                                                                                                                                                                                                                 |                    |                                                                                                                                                                   | 100                         | 200 | 300 | 400                             |                                                    | 500                                                                                                                               |   |                                                                                                                                                                                                           |  |  |  |
| AD/V                                                                                                                                                     |             |                       |       | SPT<br>0.50-0.95 m<br>6,6,5<br>N=11<br><br>PP +170 kPa |          | 55.9   | 1         |                                                     | SM                    | PAVEMENT                                                                                                                                                                                                                        | D                  | L                                                                                                                                                                 |                             |     |     |                                 |                                                    | 0.00: 100mm BRICK PAVEMENT<br>0.10: INFERRED FILL<br><br>0.50: SPT recovery 450mm<br>SPT encountered crushed shale (fill) at 0.6m |   |                                                                                                                                                                                                           |  |  |  |
|                                                                                                                                                          |             |                       |       |                                                        |          |        |           |                                                     | CI                    | Silty SAND with gravel: fine grained, pale grey; gravel angular up to 20mm.<br>CLAY with gravel: medium plasticity, dark brown & grey; gravel angular up to 60mm.<br>0.5m - Becomes high plasticity. Some ripped shale observed |                    |                                                                                                                                                                   |                             |     |     |                                 |                                                    |                                                                                                                                   | F |                                                                                                                                                                                                           |  |  |  |
|                                                                                                                                                          |             |                       |       |                                                        |          |        |           |                                                     |                       |                                                                                                                                                                                                                                 |                    |                                                                                                                                                                   |                             |     |     |                                 |                                                    |                                                                                                                                   |   |                                                                                                                                                                                                           |  |  |  |
|                                                                                                                                                          |             |                       |       |                                                        |          |        |           |                                                     |                       |                                                                                                                                                                                                                                 |                    |                                                                                                                                                                   |                             |     |     |                                 |                                                    |                                                                                                                                   |   |                                                                                                                                                                                                           |  |  |  |
|                                                                                                                                                          |             |                       |       |                                                        |          |        |           |                                                     |                       |                                                                                                                                                                                                                                 |                    |                                                                                                                                                                   |                             |     |     |                                 |                                                    |                                                                                                                                   |   |                                                                                                                                                                                                           |  |  |  |
|                                                                                                                                                          |             |                       |       | SPT<br>1.50-1.80 m<br>2,2,6<br>N=8<br><br>PP +310 kPa  |          | 54.9   | 2         |                                                     | CH                    | CLAY: high plasticity, yellow & brown.                                                                                                                                                                                          | D to M             |                                                                                                                                                                   |                             |     |     |                                 | 1.50: INFERRED RESIDUAL<br>SPT recovery 300mm      |                                                                                                                                   |   |                                                                                                                                                                                                           |  |  |  |
|                                                                                                                                                          |             |                       |       |                                                        |          |        |           |                                                     |                       |                                                                                                                                                                                                                                 |                    |                                                                                                                                                                   |                             |     |     |                                 |                                                    |                                                                                                                                   |   |                                                                                                                                                                                                           |  |  |  |
|                                                                                                                                                          |             |                       |       |                                                        |          |        |           |                                                     |                       |                                                                                                                                                                                                                                 |                    |                                                                                                                                                                   |                             |     |     |                                 |                                                    |                                                                                                                                   |   |                                                                                                                                                                                                           |  |  |  |
|                                                                                                                                                          |             |                       |       | SPT<br>3.00-3.38 m<br>3,8,16<br>N=24                   |          | 53.9   | 3         |                                                     | CL                    | CLAY trace gravel: low plasticity, yellow & brown; gravel sub-angular dolerite up to 10mm.                                                                                                                                      |                    | VSt                                                                                                                                                               |                             |     |     |                                 | 3.00: SPT recovery 380mm                           |                                                                                                                                   |   |                                                                                                                                                                                                           |  |  |  |
|                                                                                                                                                          |             |                       |       |                                                        |          |        |           |                                                     |                       |                                                                                                                                                                                                                                 |                    |                                                                                                                                                                   |                             |     |     |                                 |                                                    |                                                                                                                                   |   |                                                                                                                                                                                                           |  |  |  |
|                                                                                                                                                          |             |                       |       | SPT<br>4.00-4.45 m<br>6,5,6<br>N=11<br>PP +120 kPa     |          | 52.9   | 4         |                                                     |                       |                                                                                                                                                                                                                                 | M to W             |                                                                                                                                                                   |                             |     |     |                                 | 4.00: SPT recovery 450mm                           |                                                                                                                                   |   |                                                                                                                                                                                                           |  |  |  |
|                                                                                                                                                          |             |                       |       |                                                        |          |        |           |                                                     |                       |                                                                                                                                                                                                                                 |                    | St                                                                                                                                                                |                             |     |     |                                 |                                                    |                                                                                                                                   |   |                                                                                                                                                                                                           |  |  |  |
| Method                                                                                                                                                   |             |                       |       | Penetration                                            |          |        |           | Water                                               |                       |                                                                                                                                                                                                                                 |                    | Samples and Tests                                                                                                                                                 |                             |     |     | Moisture Condition              |                                                    |                                                                                                                                   |   | Consistency/Relative Density                                                                                                                                                                              |  |  |  |
| AD/T - Auger drilling TC bit<br>AD/V - Auger drilling V bit<br>WB - Washbore<br>SPT - Standard penetration test<br>PT - Push tube<br>AS - Auger Screwing |             |                       |       | <br>No resistance<br><br>Refusal                       |          |        |           | <br>Inflow<br><br>Partial Loss<br><br>Complete Loss |                       |                                                                                                                                                                                                                                 |                    | U - Undisturbed Sample<br>D - Disturbed Sample<br>SPT - Standard Penetration Test<br>ES - Environmental Sample<br>TW - Thin Walled<br>LB - Large Disturbed Sample |                             |     |     | D - Dry<br>M - Moist<br>W - Wet |                                                    |                                                                                                                                   |   | VS - Very soft<br>S - Soft<br>F - Firm<br>St - Stiff<br>VSt - Very stiff<br>H - Hard<br>VL - Very loose<br>L - Loose<br>MD - Medium dense<br>D - Dense<br>VD - Very dense<br>Ce - Cemented<br>C - Compact |  |  |  |



Borehole ID

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## Engineering Log - Non Cored Borehole

Project No.: PSM4010

| Client: Aliro Management Pty Ltd                                                                                                                         |                                                                                     | Commenced: 09/01/2020                                                                                                                                                                            |                                                                                     |                                                                                                                                                                                                                                                                                                     |                                                                                     |                                                                                                                                                                   |           |                                                                                     |                       |                                                                                                                                                                                                           |                    |                                |                             |                                                           |
|----------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------|-------------------------------------------------------------------------------------|-----------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------|--------------------------------|-----------------------------|-----------------------------------------------------------|
| Project Name: 44 Clunies Ross Street, Prospect                                                                                                           |                                                                                     | Completed: 09/01/2020                                                                                                                                                                            |                                                                                     |                                                                                                                                                                                                                                                                                                     |                                                                                     |                                                                                                                                                                   |           |                                                                                     |                       |                                                                                                                                                                                                           |                    |                                |                             |                                                           |
| Hole Location: Pad 7                                                                                                                                     |                                                                                     | Logged By: MT/JL                                                                                                                                                                                 |                                                                                     |                                                                                                                                                                                                                                                                                                     |                                                                                     |                                                                                                                                                                   |           |                                                                                     |                       |                                                                                                                                                                                                           |                    |                                |                             |                                                           |
| Hole Position: 307873.0 m E 6257011.0 m N MGA94 Zone 56                                                                                                  |                                                                                     | Checked By: DP                                                                                                                                                                                   |                                                                                     |                                                                                                                                                                                                                                                                                                     |                                                                                     |                                                                                                                                                                   |           |                                                                                     |                       |                                                                                                                                                                                                           |                    |                                |                             |                                                           |
| Drill Model and Mounting: Geoprobe 78 22DT                                                                                                               |                                                                                     | Inclination: -90°                                                                                                                                                                                | RL Surface: 56.87 m                                                                 |                                                                                                                                                                                                                                                                                                     |                                                                                     |                                                                                                                                                                   |           |                                                                                     |                       |                                                                                                                                                                                                           |                    |                                |                             |                                                           |
| Hole Diameter: 125 mm                                                                                                                                    |                                                                                     | Bearing:                                                                                                                                                                                         | Datum: AHD Operator: Terratest                                                      |                                                                                                                                                                                                                                                                                                     |                                                                                     |                                                                                                                                                                   |           |                                                                                     |                       |                                                                                                                                                                                                           |                    |                                |                             |                                                           |
| Drilling Information                                                                                                                                     |                                                                                     |                                                                                                                                                                                                  |                                                                                     | Soil Description                                                                                                                                                                                                                                                                                    |                                                                                     |                                                                                                                                                                   |           |                                                                                     |                       | Observations                                                                                                                                                                                              |                    |                                |                             |                                                           |
| Method                                                                                                                                                   | Penetration                                                                         | Support                                                                                                                                                                                          | Water                                                                               | Samples Tests Remarks                                                                                                                                                                                                                                                                               | Recovery                                                                            | RL (m)                                                                                                                                                            | Depth (m) | Graphic Log                                                                         | Classification Symbol | Material Description<br>SOIL NAME: Plasticity, behaviour or particle characteristics of primary component, colour, secondary components, additional observations                                          | Moisture Condition | Consistency / Relative Density | Hand Penetrometer UCS (kPa) | Structure, Zoning, Origin, Additional Observations        |
| AD/V                                                                                                                                                     |    | N                                                                                                                                                                                                |    | SPT<br>5.50-5.95 m<br>6,10,14<br>N=24<br>PP +430 kPa                                                                                                                                                                                                                                                |    | 50.9                                                                                                                                                              | 6         |  | CL                    | CLAY trace gravel: low plasticity, yellow & brown; gravel sub-angular dolerite up to 10mm. (continued)                                                                                                    | M to W             | St                             |                             | 5.50: SPT recovery 450mm                                  |
|                                                                                                                                                          |                                                                                     |                                                                                                                                                                                                  |                                                                                     |                                                                                                                                                                                                                                                                                                     |                                                                                     |                                                                                                                                                                   |           |                                                                                     | CH                    | CLAY: high plasticity, pale grey.                                                                                                                                                                         | W                  | VSt to H                       |                             |                                                           |
|                                                                                                                                                          |                                                                                     |                                                                                                                                                                                                  |                                                                                     |                                                                                                                                                                                                                                                                                                     |                                                                                     |                                                                                                                                                                   |           |                                                                                     |                       |                                                                                                                                                                                                           |                    |                                |                             |                                                           |
| AD/T                                                                                                                                                     |  | N                                                                                                                                                                                                |  | SPT<br>7.00-7.37 m<br>18,30,Refusal                                                                                                                                                                                                                                                                 |  | 49.9                                                                                                                                                              | 7         |  |                       | SHALE: dark grey, very low strength, highly weathered, iron staining.                                                                                                                                     |                    |                                |                             | 7.00: SPT recovery 370mm<br>SPT encountered shale at 7.4m |
|                                                                                                                                                          |                                                                                     |                                                                                                                                                                                                  |                                                                                     |                                                                                                                                                                                                                                                                                                     |                                                                                     | 48.9                                                                                                                                                              | 8         |  |                       | Hole Terminated at 8.00 m<br>Target depth                                                                                                                                                                 |                    |                                |                             | 7.40: INFERRED BEDROCK                                    |
|                                                                                                                                                          |                                                                                     |                                                                                                                                                                                                  |                                                                                     |                                                                                                                                                                                                                                                                                                     |                                                                                     | 47.9                                                                                                                                                              | 9         |                                                                                     |                       |                                                                                                                                                                                                           |                    |                                |                             |                                                           |
| Method                                                                                                                                                   |                                                                                     | Penetration                                                                                                                                                                                      |                                                                                     | Water                                                                                                                                                                                                                                                                                               |                                                                                     | Samples and Tests                                                                                                                                                 |           | Moisture Condition                                                                  |                       | Consistency/Relative Density                                                                                                                                                                              |                    |                                |                             |                                                           |
| AD/T - Auger drilling TC bit<br>AD/V - Auger drilling V bit<br>WB - Washbore<br>SPT - Standard penetration test<br>PT - Push tube<br>AS - Auger Screwing |                                                                                     |  No resistance<br> Refusal |                                                                                     |  Inflow<br> Partial Loss<br> Complete Loss |                                                                                     | U - Undisturbed Sample<br>D - Disturbed Sample<br>SPT - Standard Penetration Test<br>ES - Environmental Sample<br>TW - Thin Walled<br>LB - Large Disturbed Sample |           | D - Dry<br>M - Moist<br>W - Wet                                                     |                       | VS - Very soft<br>S - Soft<br>F - Firm<br>St - Stiff<br>VSt - Very stiff<br>H - Hard<br>VL - Very loose<br>L - Loose<br>MD - Medium dense<br>D - Dense<br>VD - Very dense<br>Ce - Cemented<br>C - Compact |                    |                                |                             |                                                           |





Borehole ID  
**2020/BH10**

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## Engineering Log - Non Cored Borehole

Project No.: PSM4010

|                |                                          |             |            |
|----------------|------------------------------------------|-------------|------------|
| Client:        | Aliro Management Pty Ltd                 | Commenced:  | 09/01/2020 |
| Project Name:  | 44 Clunies Ross Street, Prospect         | Completed:  | 09/01/2020 |
| Hole Location: | Pad 7                                    | Logged By:  | MT/JL      |
| Hole Position: | 307804.0 m E 6257029.0 m N MGA94 Zone 56 | Checked By: | DP         |

|                           |                  |              |      |             |         |           |           |
|---------------------------|------------------|--------------|------|-------------|---------|-----------|-----------|
| Drill Model and Mounting: | Geoprobe 78 22DT | Inclination: | -90° | RL Surface: | 54.52 m |           |           |
| Hole Diameter:            | 125 mm           | Bearing:     |      | Datum:      | AHD     | Operator: | Terratest |

| Drilling Information |             |         |       |                                     |          |        | Soil Description |             |                       |                                                                                                                                                                      |                    |                                |                             | Observations |     |                                                               |                                                    |
|----------------------|-------------|---------|-------|-------------------------------------|----------|--------|------------------|-------------|-----------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------|--------------------------------|-----------------------------|--------------|-----|---------------------------------------------------------------|----------------------------------------------------|
| Method               | Penetration | Support | Water | Samples Tests Remarks               | Recovery | RL (m) | Depth (m)        | Graphic Log | Classification Symbol | Material Description<br><br>SOIL NAME: Plasticity, behaviour or particle characteristics of primary component, colour, secondary components, additional observations | Moisture Condition | Consistency / Relative Density | Hand Penetrometer UCS (kPa) |              |     |                                                               | Structure, Zoning, Origin, Additional Observations |
|                      |             |         |       |                                     |          |        |                  |             |                       |                                                                                                                                                                      |                    |                                | 100                         | 200          | 300 | 400                                                           |                                                    |
| AD/V                 |             |         |       | SPT<br>0.50-0.80 m<br>5,4,4<br>N=8  |          | 53.5   | 1                |             | CI                    | Silty CLAY with gravel: low to medium plasticity, dark brown; gravel sub-angular up to 10mm.                                                                         |                    | S                              |                             |              |     | 0.00: INFERRED TOPSOIL                                        |                                                    |
|                      |             |         |       |                                     |          |        |                  |             | CH                    | Gravelly CLAY: high plasticity, dark brown; gravel rounded up to 6mm.                                                                                                |                    | F                              |                             |              |     |                                                               | 0.30: INFERRED ALLUVIUM                            |
|                      |             |         |       |                                     |          |        |                  |             | CH                    | Silty CLAY trace gravel: high plasticity, dark brown; gravel rounded up to 6mm.                                                                                      |                    |                                |                             |              |     |                                                               | 0.50: SPT recovery 270mm                           |
|                      |             |         |       |                                     |          |        |                  |             | CL                    | CLAY with sand: high plasticity, red & brown; sand fine to coarse grained.                                                                                           |                    | D to M                         |                             |              |     |                                                               | 1.20: Rootlets observed                            |
|                      |             |         |       |                                     |          |        |                  |             |                       |                                                                                                                                                                      |                    |                                |                             |              |     |                                                               | 1.50: INFERRED RESIDUAL<br>SPT recovery 400mm      |
| N                    |             |         |       | SPT<br>1.50-1.90 m<br>3,5,7<br>N=12 |          | 52.5   | 2                |             |                       |                                                                                                                                                                      | D to M             |                                |                             | x            |     |                                                               |                                                    |
|                      |             |         |       |                                     |          |        |                  |             |                       |                                                                                                                                                                      |                    |                                |                             |              |     |                                                               |                                                    |
|                      |             |         |       |                                     |          |        |                  |             |                       |                                                                                                                                                                      |                    |                                |                             |              |     |                                                               |                                                    |
|                      |             |         |       | SPT<br>3.00-3.45 m<br>3,4,7<br>N=11 |          | 51.5   | 3                |             |                       |                                                                                                                                                                      | St                 |                                |                             |              |     | 3.00: SPT recovery 450mm                                      |                                                    |
|                      |             |         |       |                                     |          |        |                  |             |                       |                                                                                                                                                                      |                    |                                |                             |              |     |                                                               |                                                    |
|                      |             |         |       | SPT<br>4.50-4.95 m<br>5,5,7<br>N=11 |          | 50.5   | 4                |             |                       | 4.0m - Becomes red & grey. Iron staining                                                                                                                             | M to W             |                                |                             |              |     |                                                               |                                                    |
|                      |             |         |       |                                     |          |        |                  |             |                       |                                                                                                                                                                      |                    |                                |                             |              |     |                                                               |                                                    |
|                      |             |         |       |                                     |          |        |                  |             |                       |                                                                                                                                                                      | W                  |                                |                             |              |     | 4.50: SPT recovery 450mm<br>SPT encountered ironstone at 4.5m |                                                    |

| Method                                                                                                                                                   | Penetration              | Water                                         | Samples and Tests                                                                                                                                                 | Moisture Condition              | Consistency/Relative Density                                                                                                                                                                              |
|----------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------|-----------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| AD/T - Auger drilling TC bit<br>AD/V - Auger drilling V bit<br>WB - Washbore<br>SPT - Standard penetration test<br>PT - Push tube<br>AS - Auger Screwing | No resistance<br>Refusal | ▽ Inflow<br>▽ Partial Loss<br>◀ Complete Loss | U - Undisturbed Sample<br>D - Disturbed Sample<br>SPT - Standard Penetration Test<br>ES - Environmental Sample<br>TW - Thin Walled<br>LB - Large Disturbed Sample | D - Dry<br>M - Moist<br>W - Wet | VS - Very soft<br>S - Soft<br>F - Firm<br>St - Stiff<br>VSt - Very stiff<br>H - Hard<br>VL - Very loose<br>L - Loose<br>MD - Medium dense<br>D - Dense<br>VD - Very dense<br>Ce - Cemented<br>C - Compact |



Borehole ID

2020/BH10

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## Engineering Log - Non Cored Borehole

Project No.: PSM4010

|                                                         |  |                       |  |
|---------------------------------------------------------|--|-----------------------|--|
| Client: Aliro Management Pty Ltd                        |  | Commenced: 09/01/2020 |  |
| Project Name: 44 Clunies Ross Street, Prospect          |  | Completed: 09/01/2020 |  |
| Hole Location: Pad 7                                    |  | Logged By: MT/JL      |  |
| Hole Position: 307804.0 m E 6257029.0 m N MGA94 Zone 56 |  | Checked By: DP        |  |
| Drill Model and Mounting: Geoprobe 78 22DT              |  | Inclination: -90°     |  |
| Hole Diameter: 125 mm                                   |  | RL Surface: 54.52 m   |  |
|                                                         |  | Datum: AHD            |  |
|                                                         |  | Operator: Terratest   |  |

| Drilling Information |             |         |       | Soil Description              |          |        |           |             |                       | Observations                                                                           |                    |                                |                             |                                                           |  |  |  |
|----------------------|-------------|---------|-------|-------------------------------|----------|--------|-----------|-------------|-----------------------|----------------------------------------------------------------------------------------|--------------------|--------------------------------|-----------------------------|-----------------------------------------------------------|--|--|--|
| Method               | Penetration | Support | Water | Samples Tests Remarks         | Recovery | RL (m) | Depth (m) | Graphic Log | Classification Symbol | Material Description                                                                   | Moisture Condition | Consistency / Relative Density | Hand Penetrometer UCS (kPa) | Structure, Zoning, Origin, Additional Observations        |  |  |  |
| AD/V                 |             | N       |       | SPT 6.00-6.42 m 11,19,Refusal |          | 48.5   | 6         |             | CL                    | CLAY with sand: high plasticity, red & brown; sand fine to coarse grained. (continued) | W                  | St                             |                             | 6.00: SPT recovery 420mm<br>SPT encountered shale at 6.3m |  |  |  |
|                      |             |         |       |                               |          |        |           |             |                       |                                                                                        |                    |                                |                             |                                                           |  |  |  |
|                      |             |         |       |                               |          |        |           |             |                       |                                                                                        |                    |                                |                             |                                                           |  |  |  |
|                      |             |         |       |                               |          | 47.5   | 7         |             |                       | SHALE: pale grey, very low strength, highly weathered.                                 |                    |                                |                             | 6.30: INFERRED BEDROCK                                    |  |  |  |
|                      |             |         |       |                               |          | 46.5   | 8         |             |                       | Hole Terminated at 8.00 m Target depth                                                 |                    |                                |                             |                                                           |  |  |  |
|                      |             |         |       |                               |          | 45.5   | 9         |             |                       |                                                                                        |                    |                                |                             |                                                           |  |  |  |

|                                                                                                                                                                           |                                                |                                                               |                                                                                                                                                                                               |                                                              |                                                                                                                                                                                                                                                  |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------|---------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Method</b><br>AD/T - Auger drilling TC bit<br>AD/V - Auger drilling V bit<br>WB - Washbore<br>SPT - Standard penetration test<br>PT - Push tube<br>AS - Auger Screwing | <b>Penetration</b><br>No resistance<br>Refusal | <b>Water</b><br>▽ Inflow<br>▽ Partial Loss<br>▲ Complete Loss | <b>Samples and Tests</b><br>U - Undisturbed Sample<br>D - Disturbed Sample<br>SPT - Standard Penetration Test<br>ES - Environmental Sample<br>TW - Thin Walled<br>LB - Large Disturbed Sample | <b>Moisture Condition</b><br>D - Dry<br>M - Moist<br>W - Wet | <b>Consistency/Relative Density</b><br>VS - Very soft<br>S - Soft<br>F - Firm<br>St - Stiff<br>VSt - Very stiff<br>H - Hard<br>VL - Very loose<br>L - Loose<br>MD - Medium dense<br>D - Dense<br>VD - Very dense<br>Ce - Cemented<br>C - Compact |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------|---------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|



Borehole ID

2020/BH11

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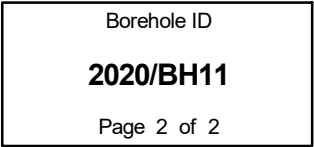
## Engineering Log - Non Cored Borehole

Project No.: PSM4010

| Client: Aliro Management Pty Ltd                        |                                                | Commenced: 10/01/2020 |              |                                                 |               |                   |                             |                    |                       |                                                                                                                                                                      |                    |                                |                             |                                                    |
|---------------------------------------------------------|------------------------------------------------|-----------------------|--------------|-------------------------------------------------|---------------|-------------------|-----------------------------|--------------------|-----------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------|--------------------------------|-----------------------------|----------------------------------------------------|
| Project Name: 44 Clunies Ross Street, Prospect          |                                                | Completed: 10/01/2020 |              |                                                 |               |                   |                             |                    |                       |                                                                                                                                                                      |                    |                                |                             |                                                    |
| Hole Location: Pad 1                                    |                                                | Logged By: MT/JL      |              |                                                 |               |                   |                             |                    |                       |                                                                                                                                                                      |                    |                                |                             |                                                    |
| Hole Position: 308045.0 m E 6257144.0 m N MGA94 Zone 56 |                                                | Checked By: DP        |              |                                                 |               |                   |                             |                    |                       |                                                                                                                                                                      |                    |                                |                             |                                                    |
| Drill Model and Mounting: Geoprobe 78 22DT              |                                                | Inclination: -90°     |              |                                                 |               |                   |                             |                    |                       |                                                                                                                                                                      |                    |                                |                             |                                                    |
| Hole Diameter: 125 mm                                   |                                                | RL Surface: 56.80 m   |              |                                                 |               |                   |                             |                    |                       |                                                                                                                                                                      |                    |                                |                             |                                                    |
|                                                         |                                                | Datum: AHD            |              |                                                 |               |                   |                             |                    |                       |                                                                                                                                                                      |                    |                                |                             |                                                    |
|                                                         |                                                | Operator: Terratest   |              |                                                 |               |                   |                             |                    |                       |                                                                                                                                                                      |                    |                                |                             |                                                    |
| Drilling Information                                    |                                                |                       |              |                                                 |               |                   | Soil Description            |                    |                       |                                                                                                                                                                      |                    |                                |                             | Observations                                       |
| Method                                                  | Penetration                                    | Support               | Water        | Samples Tests Remarks                           | Recovery      | RL (m)            | Depth (m)                   | Graphic Log        | Classification Symbol | Material Description<br><br>SOIL NAME: Plasticity, behaviour or particle characteristics of primary component, colour, secondary components, additional observations | Moisture Condition | Consistency / Relative Density | Hand Penetrometer UCS (kPa) | Structure, Zoning, Origin, Additional Observations |
| ADV                                                     |                                                | N                     |              | SPT 0.50-0.84 m<br>8,9,9<br>N=18                |               | 55.8              | 1                           |                    | CL                    | Silty CLAY trace gravel: low plasticity, dark grey & brown; gravel sub-angular up to 10mm.                                                                           | D                  | F                              |                             | 0.00: INFERRED FILL                                |
|                                                         |                                                |                       |              |                                                 |               |                   |                             |                    | CL                    | Silty CLAY trace gravel: low to medium plasticity, dark grey; gravel sub-angular up to 6mm.                                                                          |                    | VSt                            |                             | 0.50: SPT recovery 340mm                           |
| AD/T                                                    |                                                | N                     |              | SPT 1.50-1.95 m<br>5,6,8<br>N=14                |               | 54.8              | 2                           |                    | CI-CH                 | CLAY: medium to high plasticity, dark grey & brown.                                                                                                                  |                    |                                |                             | 1.00: INFERRED RESIDUAL                            |
|                                                         |                                                |                       |              |                                                 |               |                   |                             |                    | CH                    | CLAY with gravel: high plasticity, dark brown; gravel sub-angular up to 20mm.                                                                                        |                    |                                |                             |                                                    |
| ADV                                                     |                                                | N                     | Not Observed | SPT 3.00-3.45 m<br>3,4,6<br>N=10<br>PP +180 kPa |               | 53.8              | 3                           |                    |                       | 3.5m - Becomes pale brown and grey                                                                                                                                   | D to M             | St                             | ×                           | 3.00: SPT recovery 450mm                           |
|                                                         |                                                |                       |              |                                                 |               |                   |                             |                    |                       |                                                                                                                                                                      |                    |                                |                             |                                                    |
|                                                         |                                                |                       |              | PP +140 kPa                                     |               | 52.8              | 4                           |                    |                       |                                                                                                                                                                      |                    |                                | ×                           |                                                    |
|                                                         |                                                |                       |              | SPT 4.50-4.95 m<br>3,4,6<br>N=10                |               |                   |                             |                    |                       |                                                                                                                                                                      |                    |                                |                             | 4.50: SPT recovery 450mm                           |
| Method                                                  |                                                | Penetration           |              | Water                                           |               | Samples and Tests |                             | Moisture Condition |                       | Consistency/Relative Density                                                                                                                                         |                    |                                |                             |                                                    |
| AD/T                                                    | - Auger drilling TC bit                        |                       |              | ▽                                               | Inflow        | U                 | - Undisturbed Sample        | D                  | - Dry                 | VS                                                                                                                                                                   | - Very soft        |                                |                             |                                                    |
| AD/V                                                    | - Auger drilling V bit                         |                       |              | ▽                                               | Partial Loss  | D                 | - Disturbed Sample          | M                  | - Moist               | S                                                                                                                                                                    | - Soft             |                                |                             |                                                    |
| WB                                                      | - Washbore                                     |                       |              | ▲                                               | Complete Loss | SPT               | - Standard Penetration Test | W                  | - Wet                 | F                                                                                                                                                                    | - Firm             |                                |                             |                                                    |
| SPT                                                     | - Standard penetration test                    |                       |              |                                                 |               | ES                | - Environmental Sample      |                    |                       | St                                                                                                                                                                   | - Stiff            |                                |                             |                                                    |
| PT                                                      | - Push tube                                    |                       |              |                                                 |               | TW                | - Thin Walled               |                    |                       | VSt                                                                                                                                                                  | - Very stiff       |                                |                             |                                                    |
| AS                                                      | - Auger screwing                               |                       |              |                                                 |               | LB                | - Large Disturbed Sample    |                    |                       | H                                                                                                                                                                    | - Hard             |                                |                             |                                                    |
| CT                                                      | - Continuous push tube 1.5m long 76mm diameter |                       |              |                                                 |               |                   |                             |                    |                       | VL                                                                                                                                                                   | - Very loose       |                                |                             |                                                    |
|                                                         |                                                |                       |              |                                                 |               |                   |                             |                    |                       | L                                                                                                                                                                    | - Loose            |                                |                             |                                                    |
|                                                         |                                                |                       |              |                                                 |               |                   |                             |                    |                       | MD                                                                                                                                                                   | - Medium dense     |                                |                             |                                                    |
|                                                         |                                                |                       |              |                                                 |               |                   |                             |                    |                       | D                                                                                                                                                                    | - Dense            |                                |                             |                                                    |
|                                                         |                                                |                       |              |                                                 |               |                   |                             |                    |                       | VD                                                                                                                                                                   | - Very dense       |                                |                             |                                                    |
|                                                         |                                                |                       |              |                                                 |               |                   |                             |                    |                       | Ce                                                                                                                                                                   | - Cemented         |                                |                             |                                                    |
|                                                         |                                                |                       |              |                                                 |               |                   |                             |                    |                       | C                                                                                                                                                                    | - Compact          |                                |                             |                                                    |

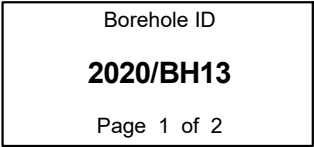
Logged in accordance with AS 1726:2017 Geotechnical site investigations





## Project No.: PSM4010

PSM 3.02.0 2019-02-24



## Project No.: PSM4010

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PSM 3.02.2 LIB GLB Log PSM AU NONCORE BHNZAU PSM4010.GPJ <<DrawingFile>> 23/11/2020 16:57 10.01.00.01 Dabbel Fence and Map Tool | Lib: PSM 3.02.1 2019-03-06 Proj: PSM 3.02.0 2019-02-24
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Borehole ID

2020/BH13

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## Engineering Log - Non Cored Borehole

Project No.: PSM4010

|                                                         |  |                           |  |
|---------------------------------------------------------|--|---------------------------|--|
| Client: Altro Management Pty Ltd                        |  | Commenced: 11/11/2020     |  |
| Project Name:                                           |  | Completed: 11/11/2020     |  |
| Hole Location: 44 Clunies Ross Street                   |  | Logged By: JL             |  |
| Hole Position: 308005.0 m E 6257200.0 m N MGA94 Zone 56 |  | Checked By: AS            |  |
| Drill Model and Mounting: 6.5t Track Mounted            |  | Inclination: -90°         |  |
| Hole Diameter: 125 mm                                   |  | RL Surface: 51.40 m       |  |
|                                                         |  | Datum: AHD                |  |
|                                                         |  | Operator: Matrix Drilling |  |

| Drilling Information |             |         |       | Soil Description                            |          |        |           |             |                       | Observations                                                                                                                                                     |                    |                                |                             |                                                                                                            |
|----------------------|-------------|---------|-------|---------------------------------------------|----------|--------|-----------|-------------|-----------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------|--------------------------------|-----------------------------|------------------------------------------------------------------------------------------------------------|
| Method               | Penetration | Support | Water | Samples Tests Remarks                       | Recovery | RL (m) | Depth (m) | Graphic Log | Classification Symbol | Material Description<br>SOIL NAME: Plasticity, behaviour or particle characteristics of primary component, colour, secondary components, additional observations | Moisture Condition | Consistency / Relative Density | Hand Penetrometer UCS (kPa) | Structure, Zoning, Origin, Additional Observations                                                         |
| AD/V                 |             | N       |       | SPT @ 5.5m<br>5 9 11<br>N = 20<br>ES 5.50 m |          | 45.4   | 6         |             | CH                    | CLAY: high plasticity, brown and red; iron stained.<br><br>Becoming brown and pale grey                                                                          | W                  | VSt                            |                             | 5.50: Crushed ironstone observed as gravel<br><br>SPT recovery 450 mm                                      |
| AD/T                 |             | N       |       | SPT @ 7m<br>13 40 14 /<br>35 mm<br>Refusal  |          | 44.4   | 7         |             |                       | SHALE; fine grained, dark grey, highly weathered, low strength.                                                                                                  |                    |                                |                             | 6.95: V-bit refusal<br>7.00: SPT recovery 335 mm<br>7.10: Inferred BEDROCK<br><br>SHALE encountered in SPT |
|                      |             |         |       |                                             |          | 43.4   | 8         |             |                       | Hole Terminated at 7.35 m<br>Target depth                                                                                                                        |                    |                                |                             |                                                                                                            |
|                      |             |         |       |                                             |          | 42.4   | 9         |             |                       |                                                                                                                                                                  |                    |                                |                             |                                                                                                            |

|                                                                                                                                                                                                                                |                                                |                                                         |                                                                                                                                                                                               |                                                              |                                                                                                                                                                                                                                                  |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------|---------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Method</b><br>AD/T - Auger drilling TC bit<br>AD/V - Auger drilling V bit<br>WB - Washbore<br>SPT - Standard penetration test<br>PT - Push tube<br>AS - Auger screwing<br>CT - Continuous push tube 1.5m long 76mm diameter | <b>Penetration</b><br>No resistance<br>Refusal | <b>Water</b><br>Inflow<br>Partial Loss<br>Complete Loss | <b>Samples and Tests</b><br>U - Undisturbed Sample<br>D - Disturbed Sample<br>SPT - Standard Penetration Test<br>ES - Environmental Sample<br>TW - Thin Walled<br>LB - Large Disturbed Sample | <b>Moisture Condition</b><br>D - Dry<br>M - Moist<br>W - Wet | <b>Consistency/Relative Density</b><br>VS - Very soft<br>S - Soft<br>F - Firm<br>St - Stiff<br>VSt - Very stiff<br>H - Hard<br>VL - Very loose<br>L - Loose<br>MD - Medium dense<br>D - Dense<br>VD - Very dense<br>Ce - Cemented<br>C - Compact |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------|---------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|



Borehole ID

2020/BH14

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## Engineering Log - Non Cored Borehole

Project No.: PSM4010

| Client: Altro Management Pty Ltd                                                                                                                                                                              |             | Commenced: 11/11/2020    |                                      |                                             |          |                                                                                                                                                                   |           |                                 |                       |                                                                                                                                                                                                           |                    |                                |                             |                                                           |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------|--------------------------|--------------------------------------|---------------------------------------------|----------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------|---------------------------------|-----------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------|--------------------------------|-----------------------------|-----------------------------------------------------------|
| Project Name:                                                                                                                                                                                                 |             | Completed: 11/11/2020    |                                      |                                             |          |                                                                                                                                                                   |           |                                 |                       |                                                                                                                                                                                                           |                    |                                |                             |                                                           |
| Hole Location: 44 Clunies Ross Street                                                                                                                                                                         |             | Logged By: JL            |                                      |                                             |          |                                                                                                                                                                   |           |                                 |                       |                                                                                                                                                                                                           |                    |                                |                             |                                                           |
| Hole Position: 307959.0 m E 6257170.0 m N MGA94 Zone 56                                                                                                                                                       |             | Checked By: AS           |                                      |                                             |          |                                                                                                                                                                   |           |                                 |                       |                                                                                                                                                                                                           |                    |                                |                             |                                                           |
| Drill Model and Mounting: 6.5t Track Mounted                                                                                                                                                                  |             | Inclination: -90°        | RL Surface: 56.70 m                  |                                             |          |                                                                                                                                                                   |           |                                 |                       |                                                                                                                                                                                                           |                    |                                |                             |                                                           |
| Hole Diameter: 125 mm                                                                                                                                                                                         |             | Bearing:                 | Datum: AHD Operator: Matrix Drilling |                                             |          |                                                                                                                                                                   |           |                                 |                       |                                                                                                                                                                                                           |                    |                                |                             |                                                           |
| Drilling Information                                                                                                                                                                                          |             |                          |                                      | Soil Description                            |          |                                                                                                                                                                   |           |                                 |                       | Observations                                                                                                                                                                                              |                    |                                |                             |                                                           |
| Method                                                                                                                                                                                                        | Penetration | Support                  | Water                                | Samples Tests Remarks                       | Recovery | RL (m)                                                                                                                                                            | Depth (m) | Graphic Log                     | Classification Symbol | Material Description<br>SOIL NAME: Plasticity, behaviour or particle characteristics of primary component, colour, secondary components, additional observations                                          | Moisture Condition | Consistency / Relative Density | Hand Penetrometer UCS (kPa) | Structure, Zoning, Origin, Additional Observations        |
| AD/V                                                                                                                                                                                                          | Z           |                          |                                      | 0.40 m<br>ES 0.50 m                         |          |                                                                                                                                                                   |           |                                 | CL                    | Silty CLAY with gravel: low to medium plasticity, dark brown; gravel sub-angular sized up to 30 mm.                                                                                                       | M                  | F to St                        |                             | 0.00: TOPSOIL; grass and rootlets observed                |
|                                                                                                                                                                                                               |             |                          |                                      | SPT @ 1.0 m<br>5 7 9<br>N = 16              |          | 55.7                                                                                                                                                              | 1         |                                 | CI                    | Silty CLAY with gravel: medium plasticity, dark brown; gravel sub-angular sized up to 20 mm.                                                                                                              | M to W             | St                             |                             | 0.40: Inferred FILL                                       |
|                                                                                                                                                                                                               |             |                          |                                      | ES 1.50 m<br>PP =300 kPa                    |          |                                                                                                                                                                   |           |                                 | CI                    | CLAY with crushed shale; medium to high plasticity, brown and grey.                                                                                                                                       |                    |                                | *                           | 1.00: Perched groundwater observed<br>SPT recovery 400 mm |
|                                                                                                                                                                                                               |             |                          |                                      | B 2.00-2.50 m                               |          | 54.7                                                                                                                                                              | 2         |                                 |                       |                                                                                                                                                                                                           | D to M             |                                |                             | 1.40: Crushed shale observed                              |
|                                                                                                                                                                                                               |             |                          |                                      | SPT @ 2.5 m<br>4 7 9<br>N = 16<br>ES 2.50 m |          | 53.7                                                                                                                                                              | 3         |                                 | CI                    | CLAY with gravel and crushed shale; medium plasticity, red and grey, iron stained; gravel sized up to 30 mm, shale sized up to 50 mm.                                                                     |                    | VSt                            |                             | 2.50: SPT recovery 450 mm                                 |
|                                                                                                                                                                                                               |             |                          |                                      | ES 3.50 m                                   |          |                                                                                                                                                                   |           |                                 | CI                    | CLAY trace gravel: medium plasticity, dark brown and grey; gravel sized up to 20 mm.                                                                                                                      |                    |                                |                             |                                                           |
|                                                                                                                                                                                                               |             |                          |                                      | SPT @ 4.0 m<br>4 7 8<br>N = 15              |          | 52.7                                                                                                                                                              | 4         |                                 |                       |                                                                                                                                                                                                           |                    |                                |                             | 4.00: SPT recovery 450 mm                                 |
|                                                                                                                                                                                                               |             |                          |                                      | ES 4.50 m                                   |          |                                                                                                                                                                   |           |                                 | CH                    | CLAY: high plasticity, pale brown and grey.                                                                                                                                                               | D to M             | St to VSt                      |                             | 4.20: Inferred NATURAL SOIL                               |
| Method                                                                                                                                                                                                        |             | Penetration              |                                      | Water                                       |          | Samples and Tests                                                                                                                                                 |           | Moisture Condition              |                       | Consistency/Relative Density                                                                                                                                                                              |                    |                                |                             |                                                           |
| AD/T - Auger drilling TC bit<br>AD/V - Auger drilling V bit<br>WB - Washbore<br>SPT - Standard penetration test<br>PT - Push tube<br>AS - Auger screwing<br>CT - Continuous push tube 1.5m long 76mm diameter |             | No resistance<br>Refusal |                                      | Inflow<br>Partial Loss<br>Complete Loss     |          | U - Undisturbed Sample<br>D - Disturbed Sample<br>SPT - Standard Penetration Test<br>ES - Environmental Sample<br>TW - Thin Walled<br>LB - Large Disturbed Sample |           | D - Dry<br>M - Moist<br>W - Wet |                       | VS - Very soft<br>S - Soft<br>F - Firm<br>St - Stiff<br>VSt - Very stiff<br>H - Hard<br>VL - Very loose<br>L - Loose<br>MD - Medium dense<br>D - Dense<br>VD - Very dense<br>Ce - Cemented<br>C - Compact |                    |                                |                             |                                                           |

Logged in accordance with AS 1726:2017 Geotechnical site investigations





Borehole ID  
**2020/BH14**

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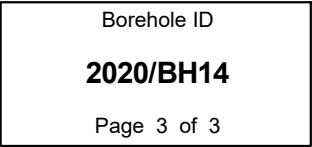
## Engineering Log - Non Cored Borehole

Project No.: PSM4010

|                                                         |  |                           |  |
|---------------------------------------------------------|--|---------------------------|--|
| Client: Altro Management Pty Ltd                        |  | Commenced: 11/11/2020     |  |
| Project Name:                                           |  | Completed: 11/11/2020     |  |
| Hole Location: 44 Clunies Ross Street                   |  | Logged By: JL             |  |
| Hole Position: 307959.0 m E 6257170.0 m N MGA94 Zone 56 |  | Checked By: AS            |  |
| Drill Model and Mounting: 6.5t Track Mounted            |  | Inclination: -90°         |  |
| Hole Diameter: 125 mm                                   |  | RL Surface: 56.70 m       |  |
|                                                         |  | Datum: AHD                |  |
|                                                         |  | Operator: Matrix Drilling |  |

| Drilling Information |             |         |       | Soil Description                            |          |        |           |             |                       | Observations                                                                                                                                    |                    |                                |                                         |                                                    |
|----------------------|-------------|---------|-------|---------------------------------------------|----------|--------|-----------|-------------|-----------------------|-------------------------------------------------------------------------------------------------------------------------------------------------|--------------------|--------------------------------|-----------------------------------------|----------------------------------------------------|
| Method               | Penetration | Support | Water | Samples Tests Remarks                       | Recovery | RL (m) | Depth (m) | Graphic Log | Classification Symbol | Material Description                                                                                                                            | Moisture Condition | Consistency / Relative Density | Hand Penetrometer UCS (kPa)             | Structure, Zoning, Origin, Additional Observations |
| ADV                  |             |         | N     | SPT @ 5.5 m<br>3 5 6<br>N = 11<br>ES 5.50 m |          | 50.7   | 6         |             | CH                    | CLAY: high plasticity, pale brown and grey.<br>(continued)                                                                                      | St to VSt          |                                |                                         | 5.50: SPT recovery 450 mm                          |
|                      |             |         |       | ES 6.50 m                                   |          |        |           |             | CI                    | Silty CLAY with gravel: medium plasticity, pale grey; gravel sub-angular sized up to 20 mm.                                                     | D to M             |                                |                                         |                                                    |
|                      |             |         |       | SPT @ 7.0 m<br>4 5 6<br>N = 11<br>ES 7.50 m |          | 49.7   | 7         |             |                       |                                                                                                                                                 |                    |                                | 7.00: SPT recovery 450 mm               |                                                    |
|                      |             |         |       |                                             |          |        |           |             |                       |                                                                                                                                                 |                    |                                | 7.20: SPT encountered crushed ironstone |                                                    |
|                      |             |         |       | ES 7.50 m                                   |          | 48.7   | 8         |             |                       | Sandy CLAY with gravel: medium plasticity, dark brown and red; gravel sub-angular sized up to 20 mm.<br>Becoming pale brown and grey from 7.7 m | M                  | St                             |                                         |                                                    |
|                      |             |         |       | SPT @ 8.5 m<br>3 4 7<br>N = 11<br>ES 8.50 m |          | 47.7   | 9         |             |                       |                                                                                                                                                 | W                  |                                |                                         | 8.50: SPT recovery 350 mm                          |
|                      |             |         |       | ES 9.50 m                                   |          |        |           |             |                       |                                                                                                                                                 |                    |                                |                                         |                                                    |

|                                                                                                                                                                                                                                |                                                |                                                         |                                                                                                                                                                                               |                                                              |                                                                                                                                                                                                                                                  |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------|---------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Method</b><br>AD/T - Auger drilling TC bit<br>AD/V - Auger drilling V bit<br>WB - Washbore<br>SPT - Standard penetration test<br>PT - Push tube<br>AS - Auger screwing<br>CT - Continuous push tube 1.5m long 76mm diameter | <b>Penetration</b><br>No resistance<br>Refusal | <b>Water</b><br>Inflow<br>Partial Loss<br>Complete Loss | <b>Samples and Tests</b><br>U - Undisturbed Sample<br>D - Disturbed Sample<br>SPT - Standard Penetration Test<br>ES - Environmental Sample<br>TW - Thin Walled<br>LB - Large Disturbed Sample | <b>Moisture Condition</b><br>D - Dry<br>M - Moist<br>W - Wet | <b>Consistency/Relative Density</b><br>VS - Very soft<br>S - Soft<br>F - Firm<br>St - Stiff<br>VSt - Very stiff<br>H - Hard<br>VL - Very loose<br>L - Loose<br>MD - Medium dense<br>D - Dense<br>VD - Very dense<br>Ce - Cemented<br>C - Compact |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------|---------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|



## Project No.: PSM4010

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PSM 3.02.2 LIB GLB Log PSM AU NONCORE BHNZAU PSM4010.GPJ <<DrawingFile>> 23/11/2020 16:57 10.01.00.01 Dabbel Fence and Map Tool | Lib: PSM 3.02.1 2019-03-06 Proj: PSM 3.02.0 2019-02-24
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Borehole ID

2020/BH15

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## Engineering Log - Non Cored Borehole

Project No.: PSM4010

|                                                         |  |                           |  |
|---------------------------------------------------------|--|---------------------------|--|
| Client: Altro Management Pty Ltd                        |  | Commenced: 11/11/2020     |  |
| Project Name:                                           |  | Completed: 11/11/2020     |  |
| Hole Location: 44 Clunies Ross Street                   |  | Logged By: JL             |  |
| Hole Position: 307909.0 m E 6257147.0 m N MGA94 Zone 56 |  | Checked By: AS            |  |
| Drill Model and Mounting: 6.5t Track Mounted            |  | Inclination: -90°         |  |
| Hole Diameter: 125 mm                                   |  | RL Surface: 51.70 m       |  |
|                                                         |  | Datum: AHD                |  |
|                                                         |  | Operator: Matrix Drilling |  |

| Drilling Information |             |         |       | Soil Description                                              |          |        |           |             |                       | Observations                                                                                                                                                     |                                            |                                |                             |                                                    |
|----------------------|-------------|---------|-------|---------------------------------------------------------------|----------|--------|-----------|-------------|-----------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------|--------------------------------|-----------------------------|----------------------------------------------------|
| Method               | Penetration | Support | Water | Samples Tests Remarks                                         | Recovery | RL (m) | Depth (m) | Graphic Log | Classification Symbol | Material Description<br>SOIL NAME: Plasticity, behaviour or particle characteristics of primary component, colour, secondary components, additional observations | Moisture Condition                         | Consistency / Relative Density | Hand Penetrometer UCS (kPa) | Structure, Zoning, Origin, Additional Observations |
| AD/V                 | N           |         |       | ES 0.50 m                                                     |          |        |           |             | CL                    | Silty CLAY trace gravel: low plasticity, brown and grey; gravel sub-angular sized up to 20 mm.                                                                   | D to M                                     | F                              |                             | 0.00: TOPSOIL; grass and rootlets observed         |
|                      |             |         |       | SPT @ 1.0 m<br>2 3 4<br>N = 7                                 |          |        |           |             | CI                    | Silty CLAY with gravel: medium plasticity, brown and grey; gravel sub-angular sized up to 20 mm.                                                                 |                                            |                                |                             | 0.20: Inferred NATURAL SOIL                        |
|                      |             |         |       | ES 1.50 m                                                     |          |        |           |             | CH                    | CLAY: high plasticity, pale brown and grey.                                                                                                                      |                                            |                                |                             | 1.00: SPT recovery 420 mm                          |
|                      |             |         |       | B 2.50-3.00 m<br>SPT @ 2.5 m<br>9 10 8<br>N = 18<br>ES 2.50 m |          |        |           |             |                       |                                                                                                                                                                  | Becoming red and dark brown, iron stained. | M                              | F to St                     |                                                    |
|                      |             |         |       | ES 3.50 m                                                     |          |        |           |             |                       |                                                                                                                                                                  |                                            |                                |                             |                                                    |
|                      |             |         |       | SPT @ 4.0 m<br>10 12 9<br>N = 21                              |          |        |           |             |                       |                                                                                                                                                                  |                                            |                                |                             | 4.00: SPT recovery 450 mm                          |
|                      |             |         |       | ES 4.50 m                                                     |          |        |           |             |                       |                                                                                                                                                                  |                                            |                                |                             | 4.20: Crushed ironstone observed                   |

|                                                                                                                                                                                                                                |                                                |                                                         |                                                                                                                                                                                               |                                                              |                                                                                                                                                                                                                                                  |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------|---------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Method</b><br>AD/T - Auger drilling TC bit<br>AD/V - Auger drilling V bit<br>WB - Washbore<br>SPT - Standard penetration test<br>PT - Push tube<br>AS - Auger screwing<br>CT - Continuous push tube 1.5m long 76mm diameter | <b>Penetration</b><br>No resistance<br>Refusal | <b>Water</b><br>Inflow<br>Partial Loss<br>Complete Loss | <b>Samples and Tests</b><br>U - Undisturbed Sample<br>D - Disturbed Sample<br>SPT - Standard Penetration Test<br>ES - Environmental Sample<br>TW - Thin Walled<br>LB - Large Disturbed Sample | <b>Moisture Condition</b><br>D - Dry<br>M - Moist<br>W - Wet | <b>Consistency/Relative Density</b><br>VS - Very soft<br>S - Soft<br>F - Firm<br>St - Stiff<br>VSt - Very stiff<br>H - Hard<br>VL - Very loose<br>L - Loose<br>MD - Medium dense<br>D - Dense<br>VD - Very dense<br>Ce - Cemented<br>C - Compact |
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Borehole ID

2020/BH15

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## Engineering Log - Non Cored Borehole

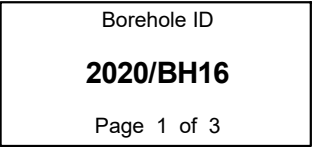
Project No.: PSM4010

|                                                         |  |                           |  |
|---------------------------------------------------------|--|---------------------------|--|
| Client: Altro Management Pty Ltd                        |  | Commenced: 11/11/2020     |  |
| Project Name:                                           |  | Completed: 11/11/2020     |  |
| Hole Location: 44 Clunies Ross Street                   |  | Logged By: JL             |  |
| Hole Position: 307909.0 m E 6257147.0 m N MGA94 Zone 56 |  | Checked By: AS            |  |
| Drill Model and Mounting: 6.5t Track Mounted            |  | Inclination: -90°         |  |
| Hole Diameter: 125 mm                                   |  | RL Surface: 51.70 m       |  |
|                                                         |  | Datum: AHD                |  |
|                                                         |  | Operator: Matrix Drilling |  |

| Drilling Information |             |         |       | Soil Description                               |          |        |           |             |                       | Observations                                                                                                                                                     |                    |                                |                             |                                                            |
|----------------------|-------------|---------|-------|------------------------------------------------|----------|--------|-----------|-------------|-----------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------|--------------------------------|-----------------------------|------------------------------------------------------------|
| Method               | Penetration | Support | Water | Samples Tests Remarks                          | Recovery | RL (m) | Depth (m) | Graphic Log | Classification Symbol | Material Description<br>SOIL NAME: Plasticity, behaviour or particle characteristics of primary component, colour, secondary components, additional observations | Moisture Condition | Consistency / Relative Density | Hand Penetrometer UCS (kPa) | Structure, Zoning, Origin, Additional Observations         |
| ADV                  |             | N       |       |                                                |          |        |           |             | CH                    | CLAY: high plasticity, red and dark brown; iron stained.                                                                                                         | W                  | VSt                            |                             |                                                            |
| AD/T                 |             | N       |       | SPT @ 5.5 m<br>10 21 30<br>N = 51<br>ES 5.50 m |          | 45.7   | 6         |             |                       | SHALE; fine grained, brown and pale grey, extremely to highly weathered, very low strength.                                                                      |                    | H                              |                             | 5.50: SPT recovery 320 mm<br>5.60: SPT encountered BEDROCK |
|                      |             |         |       | SPT @ 7.0 m<br>35 / 85 mm<br>Refusal           |          | 44.7   | 7         |             |                       | SHALE; grey and black, moderately weathered, low strength.<br>Hole Terminated at 7.09 m<br>Practical Refusal                                                     |                    |                                |                             | 7.00: SPT recovery 85 mm                                   |
|                      |             |         |       |                                                |          | 43.7   | 8         |             |                       |                                                                                                                                                                  |                    |                                |                             |                                                            |
|                      |             |         |       |                                                |          | 42.7   | 9         |             |                       |                                                                                                                                                                  |                    |                                |                             |                                                            |

|                                                                                                                                                                                                                                |                                                |                                                               |                                                                                                                                                                                               |                                                              |                                                                                                                                                                                                                                                  |
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| <b>Method</b><br>AD/T - Auger drilling TC bit<br>AD/V - Auger drilling V bit<br>WB - Washbore<br>SPT - Standard penetration test<br>PT - Push tube<br>AS - Auger screwing<br>CT - Continuous push tube 1.5m long 76mm diameter | <b>Penetration</b><br>No resistance<br>Refusal | <b>Water</b><br>▽ Inflow<br>▽ Partial Loss<br>◀ Complete Loss | <b>Samples and Tests</b><br>U - Undisturbed Sample<br>D - Disturbed Sample<br>SPT - Standard Penetration Test<br>ES - Environmental Sample<br>TW - Thin Walled<br>LB - Large Disturbed Sample | <b>Moisture Condition</b><br>D - Dry<br>M - Moist<br>W - Wet | <b>Consistency/Relative Density</b><br>VS - Very soft<br>S - Soft<br>F - Firm<br>St - Stiff<br>VSt - Very stiff<br>H - Hard<br>VL - Very loose<br>L - Loose<br>MD - Medium dense<br>D - Dense<br>VD - Very dense<br>Ce - Cemented<br>C - Compact |
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## Project No.: PSM4010

```
PSM 3.02.2 LIB GLB Log PSM AU NONCORE BHNZAU PSM4010.GPJ <<DrawingFile>> 23/11/2020 16:57 10.01.00.01 Dabbel Fence and Map Tool | Lib: PSM 3.02.1 2019-03-06 Proj: PSM 3.02.0 2019-02-24
```



Borehole ID  
**2020/BH16**

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## Engineering Log - Non Cored Borehole

Project No.: PSM4010

|                                                         |  |                           |  |
|---------------------------------------------------------|--|---------------------------|--|
| Client: Altro Management Pty Ltd                        |  | Commenced: 13/11/2020     |  |
| Project Name:                                           |  | Completed: 13/11/2020     |  |
| Hole Location: 44 Clunies Ross Street                   |  | Logged By: JL             |  |
| Hole Position: 307780.0 m E 6257066.0 m N MGA94 Zone 56 |  | Checked By: AS            |  |
| Drill Model and Mounting: 3.5t Track Mounted            |  | Inclination: -90°         |  |
| Hole Diameter: 125 mm                                   |  | RL Surface: 53.70 m       |  |
|                                                         |  | Datum: AHD                |  |
|                                                         |  | Operator: Matrix Drilling |  |

| Drilling Information |             |         |       |                       | Soil Description |        |           |             |                            | Observations                                                                                                                                                     |                    |                                |                             |                                                                    |
|----------------------|-------------|---------|-------|-----------------------|------------------|--------|-----------|-------------|----------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------|--------------------------------|-----------------------------|--------------------------------------------------------------------|
| Method               | Penetration | Support | Water | Samples Tests Remarks | Recovery         | RL (m) | Depth (m) | Graphic Log | Classification Symbol      | Material Description<br>SOIL NAME: Plasticity, behaviour or particle characteristics of primary component, colour, secondary components, additional observations | Moisture Condition | Consistency / Relative Density | Hand Penetrometer UCS (kPa) | Structure, Zoning, Origin, Additional Observations                 |
| AD/T                 |             | N       |       |                       |                  | 47.7   | 6         |             | CH                         | CLAY: high plasticity, pale red and brown; iron stained.                                                                                                         | W                  |                                | 100                         | 6.00: Drilling resistance decreased                                |
|                      |             |         |       |                       |                  | 46.7   | 7         |             | Becoming red and pale grey | 200                                                                                                                                                              |                    |                                |                             |                                                                    |
|                      |             |         |       |                       |                  | 45.7   | 8         |             |                            | 300                                                                                                                                                              |                    |                                |                             |                                                                    |
|                      |             |         |       |                       |                  | 44.7   | 9         |             |                            | 400                                                                                                                                                              |                    |                                |                             |                                                                    |
|                      |             |         |       |                       |                  |        |           |             |                            |                                                                                                                                                                  |                    |                                | 500                         | 8.00: Drilling resistance increased. Crushed ironstone encountered |

|                                                                                                                                                                                                                                |                                                |                                                         |                                                                                                                                                                                               |                                                              |                                                                                                                                                                                                                                                  |
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| <b>Method</b><br>AD/T - Auger drilling TC bit<br>AD/V - Auger drilling V bit<br>WB - Washbore<br>SPT - Standard penetration test<br>PT - Push tube<br>AS - Auger screwing<br>CT - Continuous push tube 1.5m long 76mm diameter | <b>Penetration</b><br>No resistance<br>Refusal | <b>Water</b><br>Inflow<br>Partial Loss<br>Complete Loss | <b>Samples and Tests</b><br>U - Undisturbed Sample<br>D - Disturbed Sample<br>SPT - Standard Penetration Test<br>ES - Environmental Sample<br>TW - Thin Walled<br>LB - Large Disturbed Sample | <b>Moisture Condition</b><br>D - Dry<br>M - Moist<br>W - Wet | <b>Consistency/Relative Density</b><br>VS - Very soft<br>S - Soft<br>F - Firm<br>St - Stiff<br>VSt - Very stiff<br>H - Hard<br>VL - Very loose<br>L - Loose<br>MD - Medium dense<br>D - Dense<br>VD - Very dense<br>Ce - Cemented<br>C - Compact |
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Borehole ID

2020/BH16

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## Engineering Log - Non Cored Borehole

Project No.: PSM4010

|                                                         |  |                           |  |
|---------------------------------------------------------|--|---------------------------|--|
| Client: Altro Management Pty Ltd                        |  | Commenced: 13/11/2020     |  |
| Project Name:                                           |  | Completed: 13/11/2020     |  |
| Hole Location: 44 Clunies Ross Street                   |  | Logged By: JL             |  |
| Hole Position: 307780.0 m E 6257066.0 m N MGA94 Zone 56 |  | Checked By: AS            |  |
| Drill Model and Mounting: 3.5t Track Mounted            |  | Inclination: -90°         |  |
| Hole Diameter: 125 mm                                   |  | RL Surface: 53.70 m       |  |
|                                                         |  | Datum: AHD                |  |
|                                                         |  | Operator: Matrix Drilling |  |

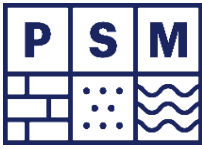
| Drilling Information |             |         |       | Soil Description      |          |        |           |             |                       | Observations                                                                                                                                                     |                    |                                |                             |                                                    |
|----------------------|-------------|---------|-------|-----------------------|----------|--------|-----------|-------------|-----------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------|--------------------------------|-----------------------------|----------------------------------------------------|
| Method               | Penetration | Support | Water | Samples Tests Remarks | Recovery | RL (m) | Depth (m) | Graphic Log | Classification Symbol | Material Description<br>SOIL NAME: Plasticity, behaviour or particle characteristics of primary component, colour, secondary components, additional observations | Moisture Condition | Consistency / Relative Density | Hand Penetrometer UCS (kPa) | Structure, Zoning, Origin, Additional Observations |
| AD/T                 |             | N       |       |                       |          |        |           |             |                       | SHALE; grey, extremely to highly weathered, very low strength                                                                                                    |                    |                                |                             | 10.00: Crushed ironstone encountered               |
|                      |             |         |       |                       |          | 42.7   | 11        |             |                       | Hole Terminated at 10.80 m Practical Refusal                                                                                                                     |                    |                                |                             | 10.80: TC-Bit refusal                              |
|                      |             |         |       |                       |          | 41.7   | 12        |             |                       |                                                                                                                                                                  |                    |                                |                             |                                                    |
|                      |             |         |       |                       |          | 40.7   | 13        |             |                       |                                                                                                                                                                  |                    |                                |                             |                                                    |
|                      |             |         |       |                       |          | 39.7   | 14        |             |                       |                                                                                                                                                                  |                    |                                |                             |                                                    |

|                                                                                                                                                                                                                                |                                                |                                                         |                                                                                                                                                                                               |                                                              |                                                                                                                                                                                                                                                  |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------|---------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Method</b><br>AD/T - Auger drilling TC bit<br>AD/V - Auger drilling V bit<br>WB - Washbore<br>SPT - Standard penetration test<br>PT - Push tube<br>AS - Auger screwing<br>CT - Continuous push tube 1.5m long 76mm diameter | <b>Penetration</b><br>No resistance<br>Refusal | <b>Water</b><br>Inflow<br>Partial Loss<br>Complete Loss | <b>Samples and Tests</b><br>U - Undisturbed Sample<br>D - Disturbed Sample<br>SPT - Standard Penetration Test<br>ES - Environmental Sample<br>TW - Thin Walled<br>LB - Large Disturbed Sample | <b>Moisture Condition</b><br>D - Dry<br>M - Moist<br>W - Wet | <b>Consistency/Relative Density</b><br>VS - Very soft<br>S - Soft<br>F - Firm<br>St - Stiff<br>VSt - Very stiff<br>H - Hard<br>VL - Very loose<br>L - Loose<br>MD - Medium dense<br>D - Dense<br>VD - Very dense<br>Ce - Cemented<br>C - Compact |
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## **Appendix B**

### **Piezometer construction records**

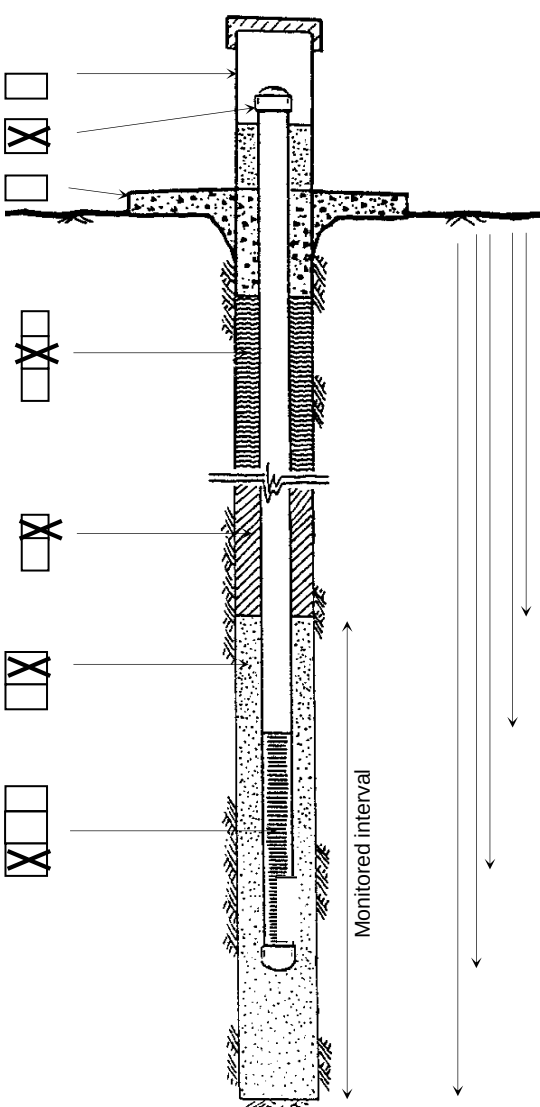


**PIEZOMETER CONSTRUCTION RECORD**

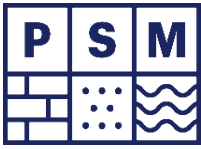
HOLE NUMBER: BH13  
PIEZOMETER: BH13  
COLLAR EASTING: 308005 mE  
COLLAR NORTHING: 6257200 mN  
COLLAR RL(m): 51.4  
DATUM: AHD

DRILLING CONTRACTOR: Matrix Drilling  
RIG: Comacchio 6.5t tracked mounted  
DEPTH OF HOLE (m): 7.35  
BOREHOLE INCLINATION: -90°  
PIEZO INSTALLATION DATE: 11/11/2020  
SUPERVISED BY: JL

*Tick boxes**Complete dimensions if appropriate*

|                                                                         |                                                                                                        |                                                                                    |                             |             |
|-------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------|-----------------------------|-------------|
| Steel protective well cover                                             | <input type="checkbox"/>                                                                               |  | Height of stickup (m)       | <u>0.6</u>  |
| PVC cap                                                                 | <input checked="" type="checkbox"/>                                                                    |                                                                                    | Diameter of PVC (mm)        | <u>50</u>   |
| Concrete collar                                                         | <input type="checkbox"/>                                                                               |                                                                                    |                             |             |
| Back fill type:<br>Cement bentonite<br>Soil<br>None                     | <input checked="" type="checkbox"/><br><input checked="" type="checkbox"/><br><input type="checkbox"/> |                                                                                    | Depth to top of seal        | <u>2.3</u>  |
| Seal:<br>Bentonite pellets<br>Other                                     | <input checked="" type="checkbox"/><br><input type="checkbox"/>                                        |                                                                                    | Depth to top of gravel pack | <u>3.3</u>  |
| Gravel type:<br>2-5mm gravel<br>Other                                   | <input checked="" type="checkbox"/><br><input type="checkbox"/>                                        |                                                                                    | Depth to top of screen      | <u>3.8</u>  |
| Perforation type:<br>Drill holes<br>Hack saw cuts<br>40um machine slots | <input type="checkbox"/><br><input type="checkbox"/><br><input checked="" type="checkbox"/>            |                                                                                    | Depth to base of screen     | <u>6.8</u>  |
|                                                                         |                                                                                                        |                                                                                    | Depth to base of piezo      | <u>7</u>    |
|                                                                         |                                                                                                        |                                                                                    | Depth to base of gravel     | <u>7.35</u> |
|                                                                         |                                                                                                        |                                                                                    |                             |             |

COMMENTS:



JOB no.:PSM4010

PROJECT: 44 Clunies Ross Street

## PIEZOMETER CONSTRUCTION RECORD

HOLE NUMBER: BH14  
PIEZOMETER: BH14  
COLLAR EASTING: 307959 mE  
COLLAR NORTHING: 6257170 mN  
COLLAR RL(m): 56.7  
DATUM: AHD

DRILLING CONTRACTOR: Matrix Drilling  
RIG: Comacchio 6.5t tracked mounted  
DEPTH OF HOLE (m): 10.42  
BOREHOLE INCLINATION: -90°  
PIEZO INSTALLATION DATE: 11/11/2020  
SUPERVISED BY: JL

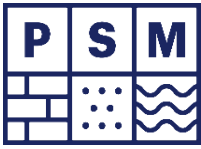
Tick boxes

Complete dimensions if appropriate

|                                                                         |                                     |  |                             |              |
|-------------------------------------------------------------------------|-------------------------------------|--|-----------------------------|--------------|
| Steel protective well cover                                             | <input type="checkbox"/>            |  | Height of stickup (m)       | <u>0.54</u>  |
| PVC cap                                                                 | <input checked="" type="checkbox"/> |  | Diameter of PVC (mm)        | <u>50</u>    |
| Concrete collar                                                         | <input type="checkbox"/>            |  |                             |              |
| Back fill type:<br>Cement bentonite<br>Soil<br>None                     | <input checked="" type="checkbox"/> |  | Depth to top of seal        | <u>5.5</u>   |
| Seal:<br>Bentonite pellets<br>Other                                     | <input checked="" type="checkbox"/> |  | Depth to top of gravel pack | <u>7</u>     |
| Gravel type:<br>2-5mm gravel<br>Other                                   | <input checked="" type="checkbox"/> |  | Depth to top of screen      | <u>7.5</u>   |
| Perforation type:<br>Drill holes<br>Hack saw cuts<br>40um machine slots | <input checked="" type="checkbox"/> |  | Depth to base of screen     | <u>9.5</u>   |
|                                                                         |                                     |  | Depth to base of piezo      | <u>10</u>    |
|                                                                         |                                     |  | Depth to base of gravel     | <u>10.42</u> |
|                                                                         |                                     |  |                             |              |

COMMENTS:

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JOB no.:PSM4010

PROJECT: 44 Clunies Ross Street

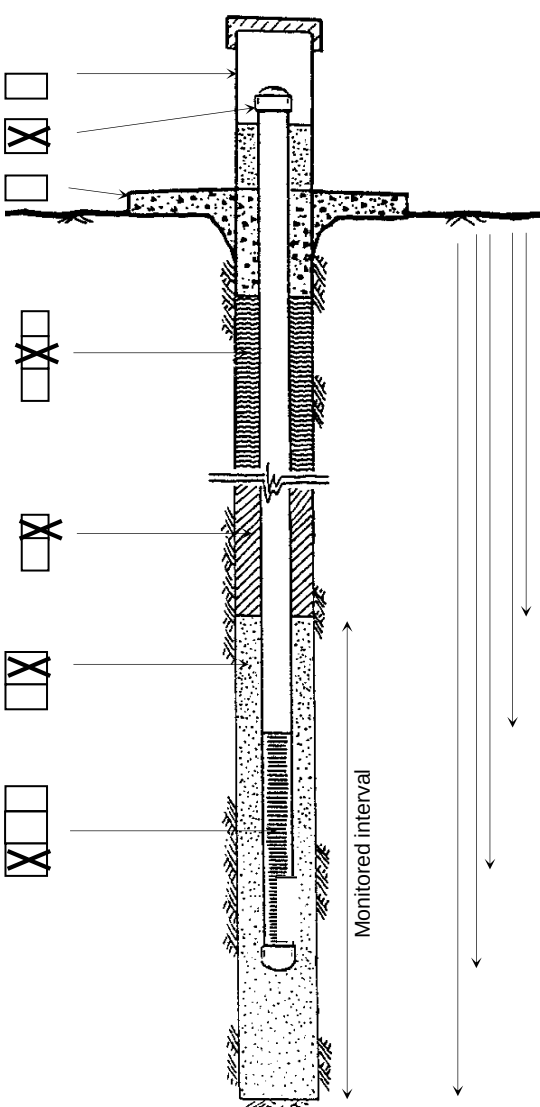
## PIEZOMETER CONSTRUCTION RECORD

HOLE NUMBER: BH15  
PIEZOMETER: BH15  
COLLAR EASTING: 307909 mE  
COLLAR NORTHING: 6257147 mN  
COLLAR RL(m): 51.7  
DATUM: AHD

DRILLING CONTRACTOR: Matrix Drilling  
RIG: Comacchio 6.5t tracked mounted  
DEPTH OF HOLE (m): 7.09  
BOREHOLE INCLINATION: -90°  
PIEZO INSTALLATION DATE: 11/11/2020  
SUPERVISED BY: JL

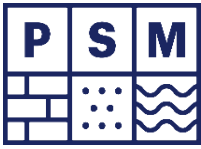
Tick boxes

Complete dimensions if appropriate

|                                                                         |                                     |                                                                                    |                             |             |
|-------------------------------------------------------------------------|-------------------------------------|------------------------------------------------------------------------------------|-----------------------------|-------------|
| Steel protective well cover                                             | <input type="checkbox"/>            |  | Height of stickup (m)       | <u>0.6</u>  |
| PVC cap                                                                 | <input checked="" type="checkbox"/> |                                                                                    | Diameter of PVC (mm)        | <u>50</u>   |
| Concrete collar                                                         | <input type="checkbox"/>            |                                                                                    |                             |             |
| Back fill type:<br>Cement bentonite<br>Soil<br>None                     | <input checked="" type="checkbox"/> |                                                                                    | Depth to top of seal        | <u>1.7</u>  |
| Seal:<br>Bentonite pellets<br>Other                                     | <input checked="" type="checkbox"/> |                                                                                    | Depth to top of gravel pack | <u>2.9</u>  |
| Gravel type:<br>2-5mm gravel<br>Other                                   | <input checked="" type="checkbox"/> |                                                                                    | Depth to top of screen      | <u>3.5</u>  |
| Perforation type:<br>Drill holes<br>Hack saw cuts<br>40um machine slots | <input checked="" type="checkbox"/> |                                                                                    | Depth to base of screen     | <u>6.5</u>  |
|                                                                         |                                     |                                                                                    | Depth to base of piezo      | <u>7</u>    |
|                                                                         |                                     |                                                                                    | Depth to base of gravel     | <u>7.09</u> |

COMMENTS:

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JOB no.:PSM4010

PROJECT: 44 Clunies Ross Street

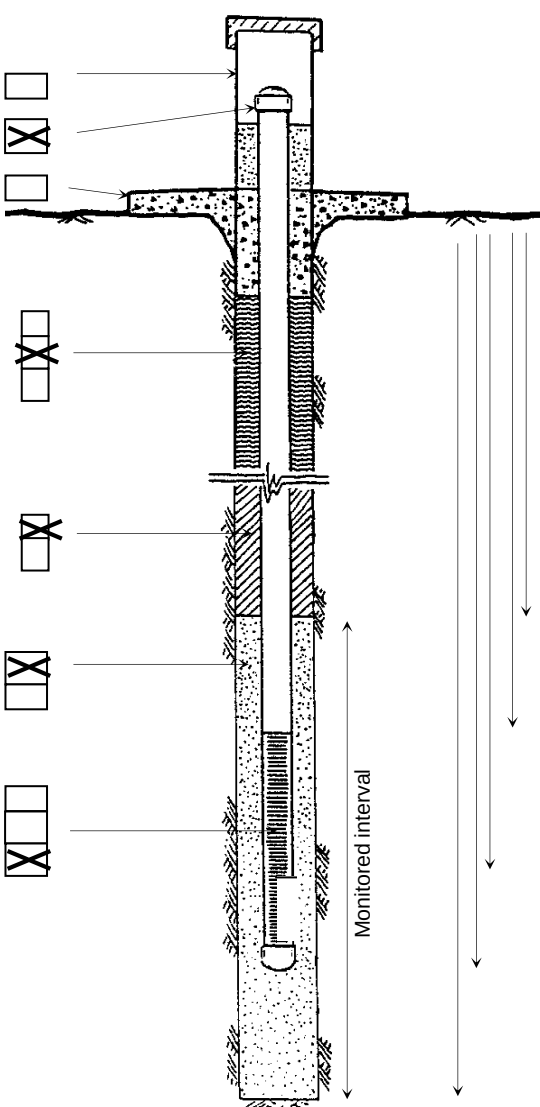
## PIEZOMETER CONSTRUCTION RECORD

HOLE NUMBER: BH16  
PIEZOMETER: BH16  
COLLAR EASTING: 307780 mE  
COLLAR NORTHING: 6257066 mN  
COLLAR RL(m): 53.7  
DATUM: AHD

DRILLING CONTRACTOR: Matrix Drilling  
RIG: Comacchio 3.5t tracked mounted  
DEPTH OF HOLE (m): 10.87  
BOREHOLE INCLINATION: -90°  
PIEZO INSTALLATION DATE: 13/11/2020  
SUPERVISED BY: JL

Tick boxes

Complete dimensions if appropriate

|                                                                         |                                     |                                                                                    |                             |              |
|-------------------------------------------------------------------------|-------------------------------------|------------------------------------------------------------------------------------|-----------------------------|--------------|
| Steel protective well cover                                             | <input type="checkbox"/>            |  | Height of stickup (m)       | <u>1.1</u>   |
| PVC cap                                                                 | <input checked="" type="checkbox"/> |                                                                                    | Diameter of PVC (mm)        | <u>50</u>    |
| Concrete collar                                                         | <input type="checkbox"/>            |                                                                                    |                             |              |
| Back fill type:<br>Cement bentonite<br>Soil<br>None                     | <input checked="" type="checkbox"/> |                                                                                    | Depth to top of seal        | <u>0.1</u>   |
| Seal:<br>Bentonite pellets<br>Other                                     | <input checked="" type="checkbox"/> |                                                                                    | Depth to top of gravel pack | <u>5</u>     |
| Gravel type:<br>2-5mm gravel<br>Other                                   | <input checked="" type="checkbox"/> |                                                                                    | Depth to top of screen      | <u>7.3</u>   |
| Perforation type:<br>Drill holes<br>Hack saw cuts<br>40um machine slots | <input checked="" type="checkbox"/> |                                                                                    | Depth to base of screen     | <u>10.3</u>  |
|                                                                         |                                     |                                                                                    | Depth to base of piezo      | <u>10.8</u>  |
|                                                                         |                                     |                                                                                    | Depth to base of gravel     | <u>10.87</u> |
|                                                                         |                                     |                                                                                    |                             |              |

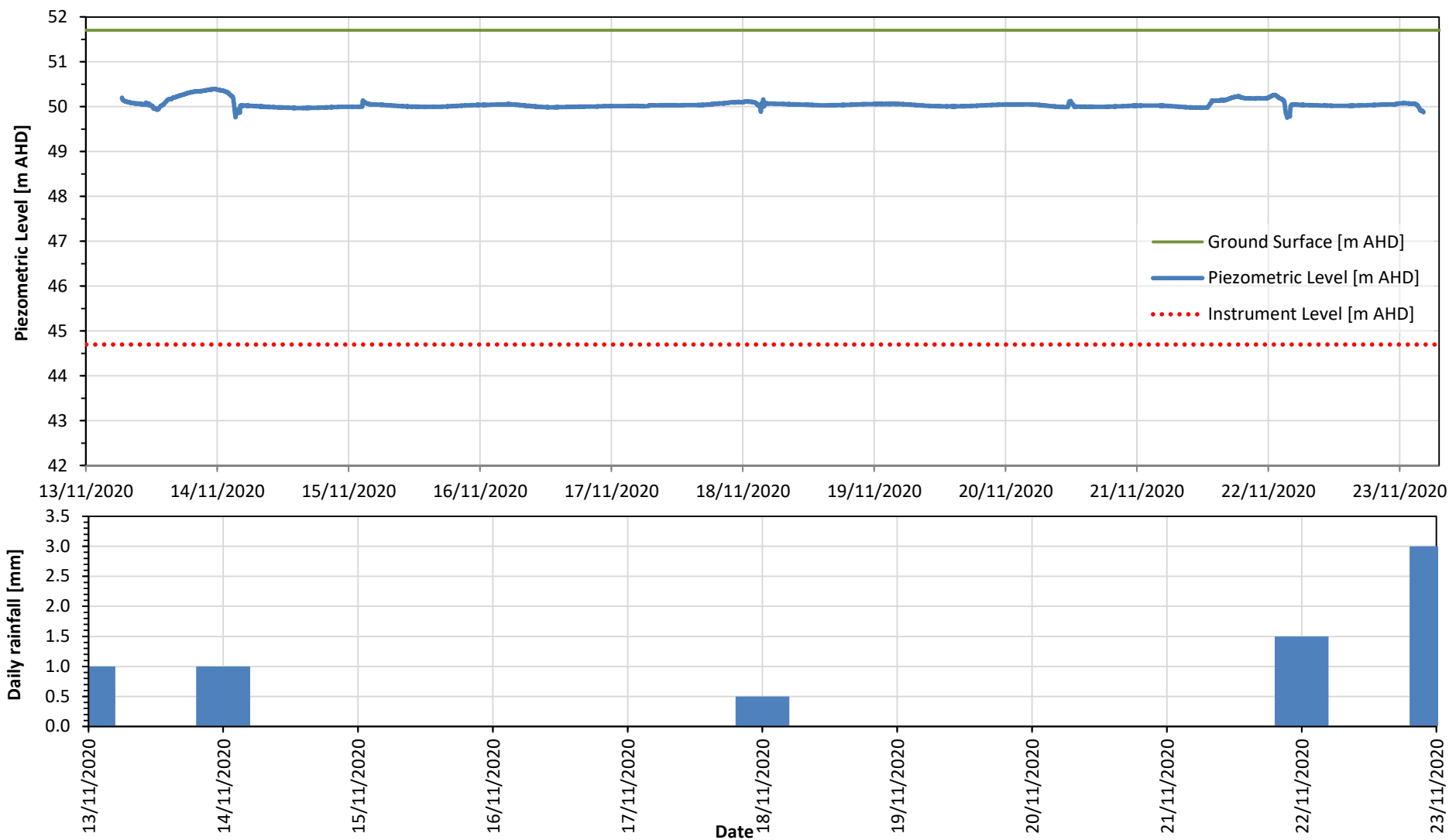
COMMENTS:

|  |
|--|
|  |
|  |
|  |
|  |
|  |

## **Appendix C**

### **Results of piezometric monitoring at 2020/BH15**





Notes:

1. Screened lithology: Bedrock
2. Instrument RL (m AHD): 44.7
3. Borehole ID: 2020/BH15
4. Rainfall data source: Seven Hills (Radio FM 103.2)  
(station number: 67110)



Pells Sullivan Meynink

**Aliro Group**  
**44 Cluines Ross Street**  
**Prospect NSW**  
**PIEZOMETRIC LEVEL MONITORING**  
**RESULTS IN 2020/BH15**

PSM4010-010L

APPENDIX C

## **Appendix D**

### **Result of Atterberg limit and linear shrinkage testing**



**SOIL TEST SERVICES**

ABN 43 002 145 173

## **ATTERBERG LIMIT AND LINEAR SHRINKAGE TEST REPORT**

**Client:** Pells Sullivan Meynink  
**PSM Job No.:** PSM4010

**Ref No:** L4389E  
**Report:** 3  
**Report Date:** 28/01/2020  
**Page 1 of 1**

| AS 1289         | TEST METHOD | 3.1.2                | 3.2.1                 | 3.3.1                    | 3.4.1                    |
|-----------------|-------------|----------------------|-----------------------|--------------------------|--------------------------|
| BOREHOLE NUMBER | DEPTH<br>m  | LIQUID<br>LIMIT<br>% | PLASTIC<br>LIMIT<br>% | PLASTICITY<br>INDEX<br>% | LINEAR<br>SHRINKAGE<br>% |
| 6               | 1.0 - 1.5   | 68                   | 26                    | 42                       | 18.5                     |
| 8               | 1.0 - 1.5   | 57                   | 17                    | 40                       | 16.5                     |
| 9               | 2.0 - 3.0   | 52                   | 15                    | 37                       | 17.0                     |
| 10              | 2.0 - 3.5   | 70                   | 16                    | 54                       | 21.0                     |
| 11              | 3.0 - 4.0   | 52                   | 13                    | 39                       | 15.5                     |

### **Notes:**

- The test sample for liquid and plastic limit was air-dried & dry-sieved
- The linear shrinkage mould was 125mm
- Refer to appropriate notes for soil descriptions
- Date of receipt of sample: 10/01/2020.
- Sampled and supplied by client. Samples tested as received.



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28/01/2020  
Authorised Signature / Date  
(D. Treweek)

## ATTERBERG LIMIT AND LINEAR SHRINKAGE TEST REPORT

**Client:** Pells Sullivan Meynink  
**PSM Job No.:** PSM4010

**Ref No:** L4518E  
**Report:** 1A  
**Report Date:** 23/11/2020  
**Page 1 of 1**

| AS 1289            | TEST<br>METHOD | 3.1.2                | 3.2.1                 | 3.3.1                    | 3.4.1                    |
|--------------------|----------------|----------------------|-----------------------|--------------------------|--------------------------|
| BOREHOLE<br>NUMBER | DEPTH<br>m     | LIQUID<br>LIMIT<br>% | PLASTIC<br>LIMIT<br>% | PLASTICITY<br>INDEX<br>% | LINEAR<br>SHRINKAGE<br>% |
| 13                 | 1.0 - 1.5      | 80                   | 21                    | 59                       | 22.5                     |
| 14                 | 2.0 - 2.5      | 51                   | 18                    | 33                       | 12.0                     |
| 15                 | 2.5 - 3.0      | 67                   | 19                    | 48                       | 20.0                     |

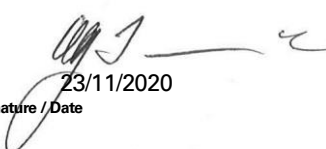
### Notes:

- The test sample for liquid and plastic limit was air-dried & dry-sieved
- The linear shrinkage mould was 125mm
- Refer to appropriate notes for soil descriptions
- Date of receipt of sample: 16/11/2020.
- Sampled and supplied by client. Samples tested as received.
- Report supersedes previously issued report L4518E - 1.



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23/11/2020  
Authorised Signature / Date  
(D. Trewick)

## **Appendix E**

### **Results of PSD testing**



## PARTICLE SIZE DISTRIBUTION TEST REPORT

Client: Pells Sullivan Meynink  
PSM Job No.: PSM4010

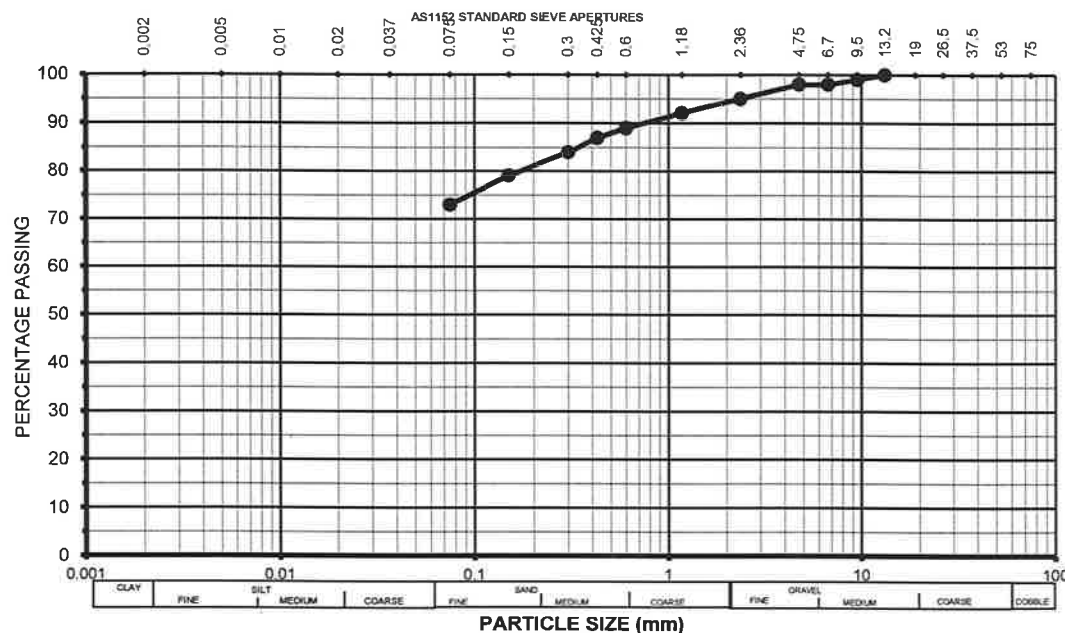
Ref No: L4389E  
Report No: 2  
Report Date: 21/01/2020  
Page 3 of 5

Borehole Number: 9  
Depth (m): 2.0 - 3.0

### SIEVE ANALYSIS RESULTS

SIEVE SIZE % PASSING

|         |     |
|---------|-----|
| 13.2 mm | 100 |
| 9.50 mm | 99  |
| 6.70 mm | 98  |
| 4.75 mm | 98  |
| 2.36 mm | 95  |
| 1.18 mm | 92  |
| 600 µm  | 89  |
| 425 µm  | 87  |
| 300 µm  | 84  |
| 150 µm  | 79  |
| 75 µm   | 73  |



Test Method: AS1289.3.6.1 & 3.6.3 Dry Sieve (washed)

- **Notes:** Sampled and supplied by client. Sample tested as received.
- Please refer to appropriate notes for soil descriptions
- Date of receipt of sample: 10/01/2020.

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(D. Treweek)

21/1/20

## PARTICLE SIZE DISTRIBUTION TEST REPORT

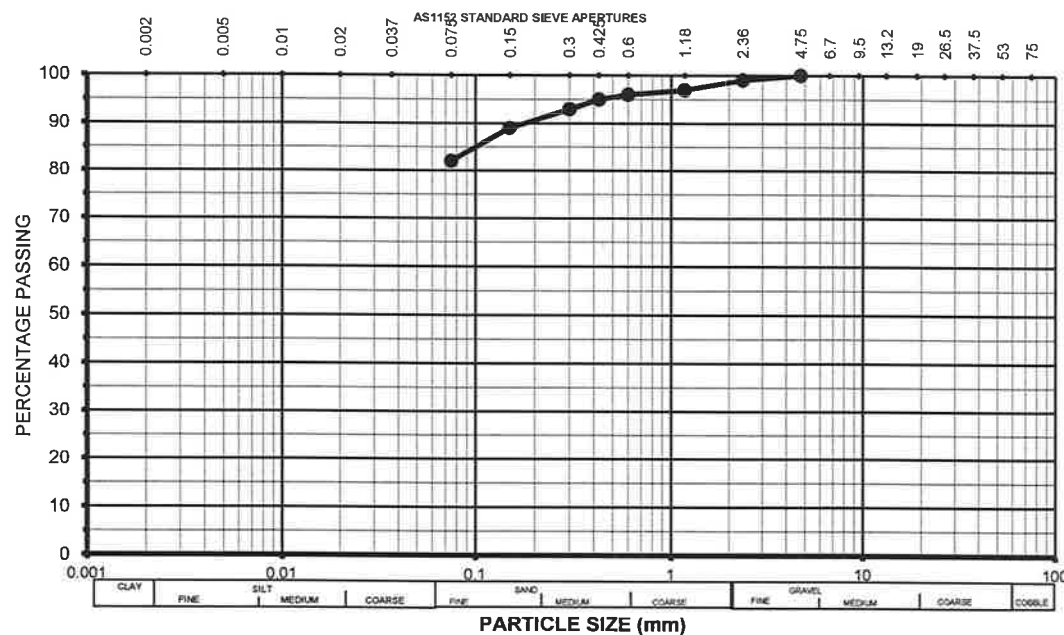
**Client:** Pells Sullivan Meynink  
**PSM Job No.:** PSM4010

**Ref No:** L4389E  
**Report No:** 2  
**Report Date:** 21/01/2020  
**Page** 4 of 5

**Borehole Number:** 10  
**Depth (m):** 2.0 - 3.5

### SIEVE ANALYSIS RESULTS

| SIEVE SIZE | % PASSING |
|------------|-----------|
| 4.75 mm    | 100       |
| 2.36 mm    | 99        |
| 1.18 mm    | 97        |
| 600 µm     | 96        |
| 425 µm     | 95        |
| 300 µm     | 93        |
| 150 µm     | 89        |
| 75 µm      | 82        |



Test Method: AS1289.3.6.1 & 3.6.3 Dry Sieve (washed)

- **Notes:** Sampled and supplied by client. Sample tested as received.
- Please refer to appropriate notes for soil descriptions
- Date of receipt of sample: 10/01/2020.

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(D. Treweek)

## PARTICLE SIZE DISTRIBUTION TEST REPORT

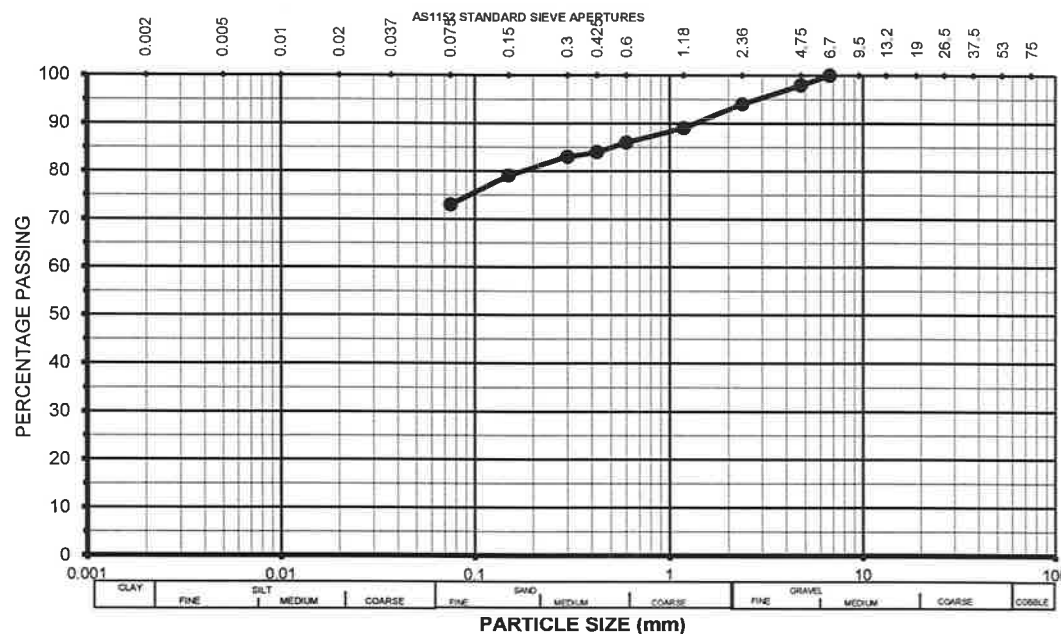
**Client:** Pells Sullivan Meynink  
**PSM Job No.:** PSM4010

**Ref No:** L4389E  
**Report No:** 2  
**Report Date:** 21/01/2020  
**Page** 5 of 5

**Borehole Number:** 11  
**Depth (m):** 3.0 - 4.0

### SIEVE ANALYSIS RESULTS

| SIEVE SIZE | % PASSING |
|------------|-----------|
| 6.70 mm    | 100       |
| 4.75 mm    | 98        |
| 2.36 mm    | 94        |
| 1.18 mm    | 89        |
| 600 µm     | 86        |
| 425 µm     | 84        |
| 300 µm     | 83        |
| 150 µm     | 79        |
| 75 µm      | 73        |



Test Method: AS1289.3.6.1 & 3.6.3 Dry Sieve (washed)

- Notes:** Sampled and supplied by client. Sample tested as received.
- Please refer to appropriate notes for soil descriptions
- Date of receipt of sample: 10/01/2020.



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Approved Signatory / Date  
(D. Treweek)

*[Signature]*  
21/1/20

## PARTICLE SIZE DISTRIBUTION TEST REPORT

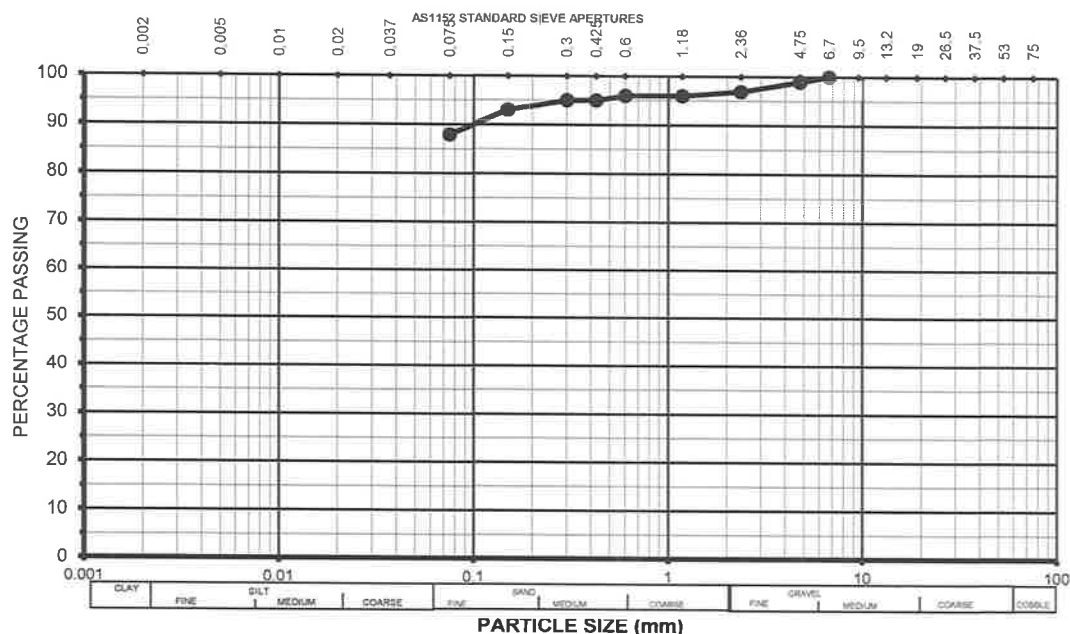
**Client:** Pells Sullivan Meynink  
**PSM Job No.:** PSM4010

**Ref No:** L4518E  
**Report No:** 2A  
**Report Date:** 23/11/2020  
**Page** 1 of 3

**Borehole Number:** 13  
**Depth (m) :** 1.0 - 1.5

### **SIEVE ANALYSIS RESULTS**

| SIEVE SIZE | % PASSING |
|------------|-----------|
| 6.70 mm    | 100       |
| 4.75 mm    | 99        |
| 2.36 mm    | 97        |
| 1.18 mm    | 96        |
| 600 µm     | 96        |
| 425 µm     | 95        |
| 300 µm     | 95        |
| 150 µm     | 93        |
| 75 µm      | 88        |



Test Method: AS1289.3.6.1 & 3.6.3 Dry Sieve (washed)

- Notes:** Sampled and supplied by client. Sample tested as received.
- Please refer to appropriate notes for soil descriptions
- Date of receipt of sample: 16/11/2020.
- Report supersedes previously issued report L4518E - 2.

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(D. Treweek)

*[Signature]*  
23/11/20

## PARTICLE SIZE DISTRIBUTION TEST REPORT

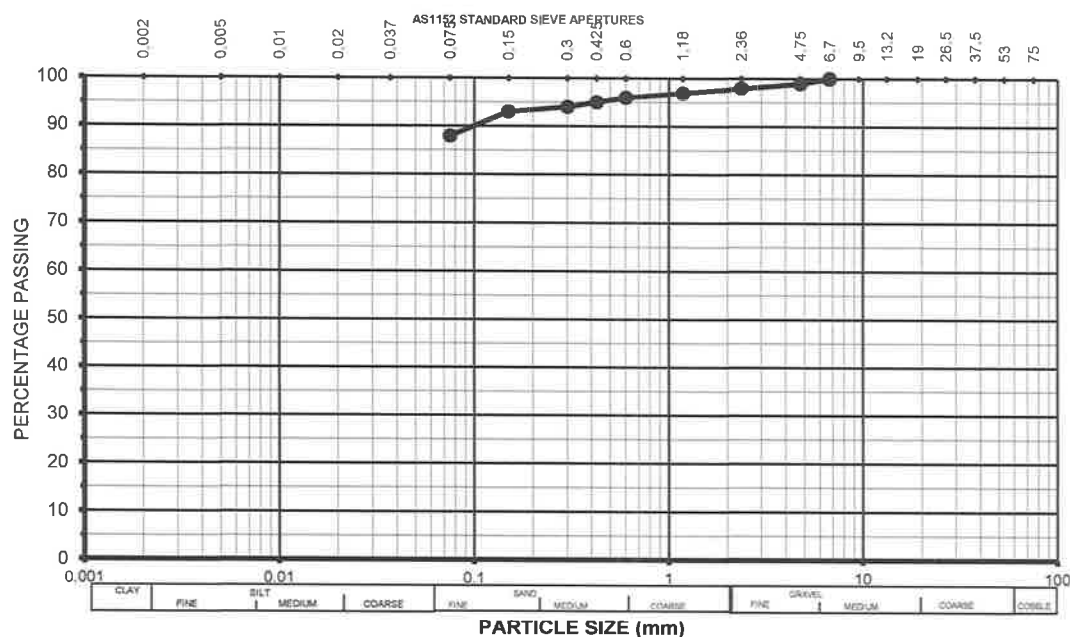
**Client:** Pells Sullivan Meynink  
**PSM Job No.:** PSM4010

**Ref No:** L4518E  
**Report No:** 2A  
**Report Date:** 23/11/2020  
**Page** 2 of 3

**Borehole Number:** 14  
**Depth (m):** 2.0 - 2.5

### **SIEVE ANALYSIS RESULTS**

| SIEVE SIZE | % PASSING |
|------------|-----------|
| 6.70 mm    | 100       |
| 4.75 mm    | 99        |
| 2.36 mm    | 98        |
| 1.18 mm    | 97        |
| 600 µm     | 96        |
| 425 µm     | 95        |
| 300 µm     | 94        |
| 150 µm     | 93        |
| 75 µm      | 88        |



Test Method: AS1289.3.6.1 & 3.6.3 Dry Sieve (washed)

- **Notes:** Sampled and supplied by client. Sample tested as received.
- Please refer to appropriate notes for soil descriptions
- Date of receipt of sample: 16/11/2020.
- Report supersedes previously issued report L4518E - 2.

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Approved Signatory / Date  
(D. Treweek)

*[Signature]*  
23/11/20



## PARTICLE SIZE DISTRIBUTION TEST REPORT

**Client:** Pells Sullivan Meynink  
**PSM Job No.:** PSM4010

**Ref No:** L4518E  
**Report No:** 2A  
**Report Date:** 23/11/2020  
**Page** 3 of 3

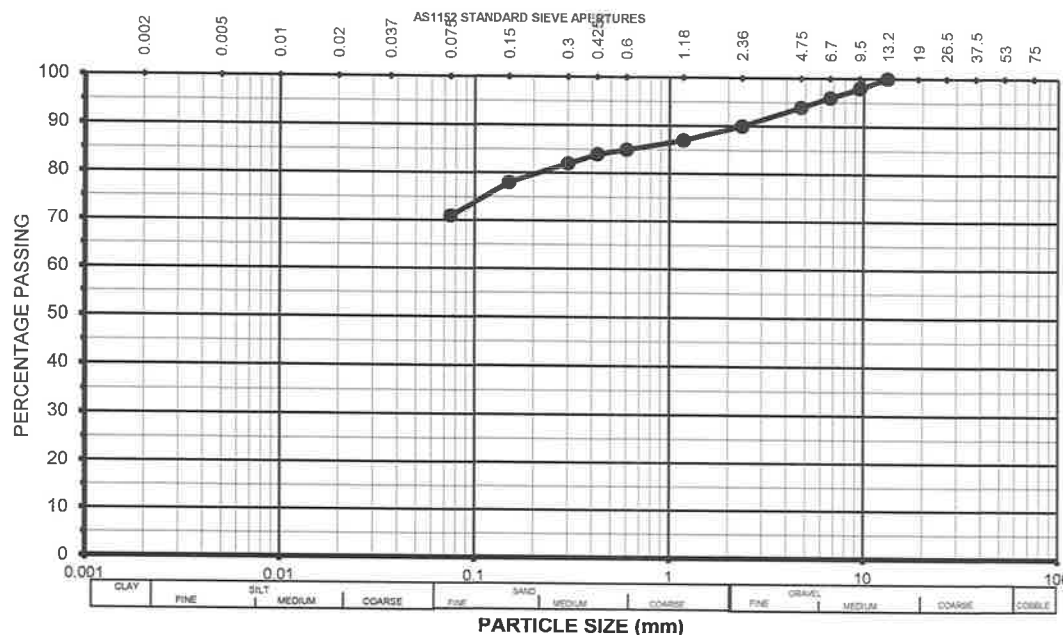
**Borehole Number:** 15

**Depth (m):** 2.5 - 3.0

### SIEVE ANALYSIS RESULTS

**SIEVE SIZE % PASSING**

|         |     |
|---------|-----|
| 13.2 mm | 100 |
| 9.50 mm | 98  |
| 6.70 mm | 96  |
| 4.75 mm | 94  |
| 2.36 mm | 90  |
| 1.18 mm | 87  |
| 600 µm  | 85  |
| 425 µm  | 84  |
| 300 µm  | 82  |
| 150 µm  | 78  |
| 75 µm   | 71  |



Test Method: AS1289.3.6.1 & 3.6.3 Dry Sieve (washed)

- Notes:** Sampled and supplied by client. Sample tested as received.
- Please refer to appropriate notes for soil descriptions
- Date of receipt of sample: 16/11/2020.
- Report supersedes previously issued report L4518E - 2.

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Approved Signatory / Date  
(D. Treweek)

*[Signature]*  
23/11/20

## **Appendix F**

### **Results of soil moisture content**

## CERTIFICATE OF ANALYSIS

|                                |                                                               |                                |                                                              |
|--------------------------------|---------------------------------------------------------------|--------------------------------|--------------------------------------------------------------|
| <b>Work Order</b>              | <b>: ES2040079</b>                                            | <b>Page</b>                    | <b>: 1 of 7</b>                                              |
| <b>Amendment</b>               | <b>: 1</b>                                                    |                                |                                                              |
| <b>Client</b>                  | <b>: PELLIS SULLIVAN MEYNINK T/A PSM Admin PTY LTD</b>        | <b>Laboratory</b>              | <b>: Environmental Division Sydney</b>                       |
| <b>Contact</b>                 | <b>: Juno Liang</b>                                           | <b>Contact</b>                 | <b>: Customer Services ES</b>                                |
| <b>Address</b>                 | <b>: G3, 56 DELHI ROAD<br/>NORTH RYDE NSW, AUSTRALIA 2113</b> | <b>Address</b>                 | <b>: 277-289 Woodpark Road Smithfield NSW Australia 2164</b> |
| <b>Telephone</b>               | <b>: ----</b>                                                 | <b>Telephone</b>               | <b>: +61-2-8784 8555</b>                                     |
| <b>Project</b>                 | <b>: PSM4010</b>                                              | <b>Date Samples Received</b>   | <b>: 12-Nov-2020 14:35</b>                                   |
| <b>Order number</b>            | <b>: ----</b>                                                 | <b>Date Analysis Commenced</b> | <b>: 18-Nov-2020</b>                                         |
| <b>C-O-C number</b>            | <b>: ----</b>                                                 | <b>Issue Date</b>              | <b>: 23-Nov-2020 13:58</b>                                   |
| <b>Sampler</b>                 | <b>: Juno Liang</b>                                           |                                |                                                              |
| <b>Site</b>                    | <b>: ----</b>                                                 |                                |                                                              |
| <b>Quote number</b>            | <b>: EN/333</b>                                               |                                |                                                              |
| <b>No. of samples received</b> | <b>: 22</b>                                                   |                                |                                                              |
| <b>No. of samples analysed</b> | <b>: 22</b>                                                   |                                |                                                              |



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

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

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results

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

### Signatories

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

| <i>Signatories</i> | <i>Position</i>     | <i>Accreditation Category</i>      |
|--------------------|---------------------|------------------------------------|
| Alex Rossi         | Organic Chemist     | Sydney Inorganics, Smithfield, NSW |
| Edwandy Fadjar     | Organic Coordinator | Sydney Inorganics, Smithfield, NSW |
| Ivan Taylor        | Analyst             | Sydney Inorganics, Smithfield, NSW |



## General Comments

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

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

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

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

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

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

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

- Amendment (23/11/2020): This report has been amended as a result of a request to change sample identification numbers (IDs) received by ALS from Juno Liang on 20/11/2020. All analysis results are as per the previous report.



Analytical Results

|                                             |            |     |      |                  |                   |                   |                   |                   |                   |
|---------------------------------------------|------------|-----|------|------------------|-------------------|-------------------|-------------------|-------------------|-------------------|
| Sub-Matrix: SOIL<br>(Matrix: SOIL)          |            |     |      | Client sample ID | BH13 0.5m         | BH13 15m          | BH13 2.5m         | BH13 3.5m         | BH13 4.5m         |
| Client sampling date / time                 |            |     |      |                  | 11-Nov-2020 00:00 | 11-Nov-2020 00:00 | 11-Nov-2020 00:00 | 11-Nov-2020 00:00 | 11-Nov-2020 00:00 |
| Compound                                    | CAS Number | LOR | Unit |                  | ES2040079-001     | ES2040079-002     | ES2040079-003     | ES2040079-004     | ES2040079-005     |
|                                             |            |     |      |                  | Result            | Result            | Result            | Result            | Result            |
| EA055: Moisture Content (Dried @ 105-110°C) |            |     |      |                  |                   |                   |                   |                   |                   |
| Moisture Content                            | ----       | 0.1 | %    |                  | 23.8              | 26.9              | 19.8              | 18.6              | 28.4              |



## Analytical Results

| Sub-Matrix: SOIL<br>(Matrix: SOIL)          |            |     |      | Client sample ID | BH13 5.5m         | BH14 0.5          | BH14 1.5          | BH14 2.5          | BH14 3.5          |
|---------------------------------------------|------------|-----|------|------------------|-------------------|-------------------|-------------------|-------------------|-------------------|
| Client sampling date / time                 |            |     |      |                  | 11-Nov-2020 00:00 | 11-Nov-2020 00:00 | 11-Nov-2020 00:00 | 11-Nov-2020 00:00 | 11-Nov-2020 00:00 |
| Compound                                    | CAS Number | LOR | Unit |                  | ES2040079-006     | ES2040079-007     | ES2040079-008     | ES2040079-009     | ES2040079-010     |
|                                             |            |     |      |                  | Result            | Result            | Result            | Result            | Result            |
| EA055: Moisture Content (Dried @ 105-110°C) |            |     |      |                  |                   |                   |                   |                   |                   |
| Moisture Content                            | ----       | 0.1 | %    |                  | 24.7              | 9.6               | 10.6              | 15.6              | 17.9              |





## Analytical Results

| Sub-Matrix: SOIL<br>(Matrix: SOIL)          |            |     |      | Client sample ID | BH14 4.5          | BH14 5.5          | BH14 6.5          | BH14 7.5          | BH14 8.5          |
|---------------------------------------------|------------|-----|------|------------------|-------------------|-------------------|-------------------|-------------------|-------------------|
| Client sampling date / time                 |            |     |      |                  | 11-Nov-2020 00:00 | 11-Nov-2020 00:00 | 11-Nov-2020 00:00 | 11-Nov-2020 00:00 | 11-Nov-2020 00:00 |
| Compound                                    | CAS Number | LOR | Unit |                  | ES2040079-011     | ES2040079-012     | ES2040079-013     | ES2040079-014     | ES2040079-015     |
|                                             |            |     |      |                  | Result            | Result            | Result            | Result            | Result            |
| EA055: Moisture Content (Dried @ 105-110°C) |            |     |      |                  |                   |                   |                   |                   |                   |
| Moisture Content                            | ----       | 0.1 | %    |                  | 13.5              | 14.8              | 17.0              | 23.3              | 23.3              |

Page : 6 of 7  
 Work Order : ES2040079 Amendment 1  
 Client : PELLIS SULLIVAN MEYNINK T/A PSM Admin PTY LTD  
 Project : PSM4010



## Analytical Results

Sub-Matrix: **SOIL**  
 (Matrix: **SOIL**)

Client sample ID

|                                                    |            |     |      | BH14 9.5          | BH15 0.5m         | BH15 1.5m         | BH15 2.5m         | BH15 3.5m         |
|----------------------------------------------------|------------|-----|------|-------------------|-------------------|-------------------|-------------------|-------------------|
| Client sampling date / time                        |            |     |      | 11-Nov-2020 00:00 | 11-Nov-2020 00:00 | 11-Nov-2020 00:00 | 11-Nov-2020 00:00 | 11-Nov-2020 00:00 |
| Compound                                           | CAS Number | LOR | Unit | ES2040079-016     | ES2040079-017     | ES2040079-018     | ES2040079-019     | ES2040079-020     |
|                                                    |            |     |      | Result            | Result            | Result            | Result            | Result            |
| <b>EA055: Moisture Content (Dried @ 105-110°C)</b> |            |     |      |                   |                   |                   |                   |                   |
| Moisture Content                                   | ----       | 0.1 | %    | 19.7              | 17.0              | 21.1              | 18.2              | 17.8              |

Page : 7 of 7  
 Work Order : ES2040079 Amendment 1  
 Client : PELLIS SULLIVAN MEYNINK T/A PSM Admin PTY LTD  
 Project : PSM4010

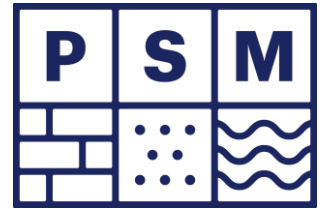


## Analytical Results

|                                                   |            |     |      |                             |                   |                   |       |       |       |
|---------------------------------------------------|------------|-----|------|-----------------------------|-------------------|-------------------|-------|-------|-------|
| Sub-Matrix: <b>SOIL</b><br>(Matrix: <b>SOIL</b> ) |            |     |      | Client sample ID            | BH15 4.5m         | BH15 5.5m         | ----  | ----  | ----  |
|                                                   |            |     |      | Client sampling date / time | 11-Nov-2020 00:00 | 11-Nov-2020 00:00 | ----  | ----  | ----  |
| Compound                                          | CAS Number | LOR | Unit |                             | ES2040079-021     | ES2040079-022     | ----- | ----- | ----- |
|                                                   |            |     |      |                             | Result            | Result            | ----  | ----  | ----  |
| EA055: Moisture Content (Dried @ 105-110°C)       |            |     |      |                             |                   |                   |       |       |       |
| Moisture Content                                  | ----       | 0.1 | %    |                             | 15.7              | 21.2              | ----  | ----  | ----  |

## **Appendix G**

# **Interim Geotechnical Design Advice – PSM4010-004L REV1**



Our Ref: PSM4010-004L REV1

26 November 2020

Aliro Group  
Level 53, Governor Macquarie Tower  
1 Farrer Place  
Sydney NSW 2000  
dlousick@aliro.com.au

G3 56 Delhi Road  
North Ryde NSW 2113  
**P** +61-2 9812 5000  
**F** +61-2 9812 5001  
**E** mailbox@psm.com.au  
[www.psm.com.au](http://www.psm.com.au)

Attention: David Lousick

Dear David

**RE: 44 CLUNIES ROSS STREET, PROSPECT.  
INTERIM GEOTECHNICAL DESIGN ADVICE**

## **1. Introduction**

This letter provides interim geotechnical design advice for the proposed warehouse development located at 44 Clunies Ross Street, Prospect NSW. PSM understand the proposed new facility will comprise typically light warehouse facilities.

This interim advice should be reviewed when the details of the warehouse design are known (design loads, floor levels, footing dimensions, etc) and will be confirmed or issued as final once the bulk earthworks are completed and audited.

Figure 1 presents the proposed development layout.

The interim geotechnical design advice in this letter has been provided on the following basis:

- The subsurface conditions encountered are as logged and inferred from the site investigations
- The proposed earthworks are completed in accordance with the Bulk Earthworks Specification (Ref: PSM4010-005S (DRAFT)).

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

## **2. Bulk Excavation**

PSM understands that cut and fill works will be required for this site.

The design intent is for the bulk earthworks on site to be completed in accordance with a PSM Specification – PSM4010-005S (DRAFT). The Specification sets out clearly the roles and responsibilities of the earthworks contractor and its Geotechnical Inspection and Testing Authority (GITA). The Specification will only be varied with the consent of PSM to ensure that this interim design advice is able to be confirmed at the completion of the earthworks.

The Specification allows for a broad range of fill to be incorporated into the earthworks. The Specification requires close inspection, and frequent testing to provide a high level of confidence that the completed work complies with the Specification.

We have based our assessment of moduli on numerous plate load tests (PLTs) completed on VENM/ENM fills by PSM. Fill placed in accordance with such a Specification is referred to herein as ENGINEERED FILL. It is our opinion that the majority of the cut material would be suitable for reuse on the site as ENGINEERED FILL without the requirement for crushing. The criteria for and selection of acceptable material is set out in Clause 2.3 of the Specification.

If the structural or civil engineer requires engineering properties different to those provided in Section 3, then the Specification can be modified such that these properties will be obtained in the final earthworks. This allows the additional cost of the earthworks to be balanced against any economies achieved in other parts of the works.

### **3. Design Advice**

#### **3.1 Characteristic Surface Movement**

While the proposed development is out of scope of AS2870-2011 “Residential slabs and footings”, we assess that, for fill placed in accordance with the Specification, the characteristic surface movement,  $y_s$ , would be in the range 40 mm to 60 mm and thus would classify the site as Class H1. The civil and structural engineers should consider likely heave / settlement due to the effect of climatic factors in their designs.

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

Mounds at perimeters or penetrations of slabs open to the environment can be taken to be as per AS2870-2011 for  $y_s = 50$  mm.

For effectively sealed areas away from the perimeter, the design should allow for the following:

- Differential mound movement,  $y_m = 15$  mm. We note that this is not the total heave or settlement but the estimated local heave or settlement due to fill variability
- Tilts of up to approximately 1 in 300.

We note that desiccation and/or wetting up of the pad surface is possible should it be exposed to the elements for an extended period of time, particularly at completion of the bulk earthworks prior to the builder taking responsibility for the pad. To reduce the likelihood of this and preserve the pad condition we recommend the following should be considered following completion of the bulk earthworks:

- Placement of a sacrificial layer comprising road base or other equivalent material
- Grade the pad surface to reduce the extent and severity of standing water during and after weather events
- Minimise the time between the completion of earthworks and the builder commencing construction of the warehouse roof
- Limit vehicular and plant access until a roof has been installed.

Alternately, the builder may have to undertake some surficial remediation if the pad is to comply with the requirements of this IGDA (i.e. comply with the PSM Specification) at the time of construction. There should be a strict transfer of the risk. We recommend that building tenderers be required to indicate how they intend to manage this risk.



## 3.2 Foundations

### 3.2.1 Pad Footings

Pad footings can be proportioned based on an allowable bearing pressure (ABP) for centric vertical loads provided in Table 1. Higher ABPs in soil units may be available, but these depend on the size, depth, loads, etc., and would be subject to specific advice. The ABP needs to be confirmed by a geotechnical engineer during an inspection.

Settlements in soil units can be estimated using the elastic parameters provided in Table 1. We note that allowable bearing pressures presented in Table 1 assume a settlement of approximately 1% (or less) of the least footing dimension for footings in the rock.

### 3.2.2 Slab on ground

In general, we advise the slab on ground design can be based on a subgrade with a long-term Young's modulus of 10 MPa. The short-term Young's modulus can be taken to be 15 MPa. We note that the environmental effects (e.g. drying or wetting up of the finished surface) affecting the land prior to the development should be considered by the various designers of any development.

We note that the final bulk earthworks subgrade will require proof rolling and plate load testing to confirm the properties provided and may require some boxing out and refilling, etc.

We understand that the structural engineer should be able to design efficient slabs. If assessed deformation and settlement is an issue, our advice can be further refined if required.

The structural designer or builder may wish to employ a surface layer of road base / crushed sandstone / concrete for trafficability or structural purposes. This is not required to achieve the properties in this design advice.

**Table 1 – Engineering parameters of inferred geotechnical units**

| Inferred unit                                | Bulk unit weight (kN/m <sup>3</sup> ) | Soil effective strength parameters |          | Allowable bearing pressure under vertical centric loading (kPa) | Ultimate bearing pressure under vertical centric loading (kPa) | Ultimate Shaft Adhesion (kPa) | Elastic parameters    |                 |
|----------------------------------------------|---------------------------------------|------------------------------------|----------|-----------------------------------------------------------------|----------------------------------------------------------------|-------------------------------|-----------------------|-----------------|
|                                              |                                       | c' (kPa)                           | φ' (deg) |                                                                 |                                                                |                               | Young's Modulus (MPa) | Poisson's Ratio |
| SOIL (e.g. engineered fill and natural soil) | 18                                    | 0                                  | 30       | 150 <sup>1</sup>                                                | 400 <sup>1</sup>                                               | N/A                           | 10                    | 0.3             |
| BEDROCK A                                    | 22                                    | N/A                                | N/A      | 700                                                             | 3,000                                                          | 50                            | 50                    | 0.3             |
| BEDROCK B/C                                  | 22                                    | N/A                                | N/A      | 1,200                                                           | 3,600                                                          | 150                           | 100                   | 0.35            |

Note: 1. Pad footings in soil unit should have a minimum horizontal dimension of 1.0 m and a minimum embedment depth of 0.5 m

### 3.2.3 Piled Foundations

Piles should be designed in accordance with the requirements in AS 2159 (2009), *Piling – Design and Installation*.

The parameters provided in Table 1 may be adopted in the design of piles founded in the bedrock unit.

The foundation designer should note the following with regards to the pile design:

- The ABP needs to be confirmed by a geotechnical engineer during a pile inspection
- Under permanent load, the contribution of side adhesion for soils including soil units should be ignored.

Pile settlement needs to be checked using the recommended elastic parameters in Table 1.

The bearing capacities provided are contingent on piles or footings being vertically and centrally loaded. Further advice should be sought if the footings are not vertically centrally loaded. Should higher bearing capacities be required in Table 1, further advice should be sought from PSM.

With regards to the pile design we recommend that:

- A geotechnical strength reduction factor,  $\Phi_g = 0.60$  (AS2159 CL. 4.3.2) be adopted for a high redundancy system for an assessed average risk rating (ARR) between 2.5 and 3.0. This should be reviewed to suit the specific design and appropriate pile testing proposed by the structural designers in accord with the requirements of AS2159
- It may be possible to increase the pile reduction factors, if the details of the proposed pile installation procedures indicate a high level of quality control with regards to concrete placement, base cleanliness, etc
- If a geotechnical strength reduction factor,  $\Phi_g = 0.40$  is adopted then no pile testing will be required (AS2159 Clause 8.2.4 (b)).

### 3.3 Permanent and Temporary Batters

The batter slope angles shown in Table 2 are recommended for the design of batters up to 8 m height and above the groundwater table; subject to the following recommendations:

1. The batters shall be protected from erosion.
2. Permanent batters shall be drained.
3. Temporary batters shall not be left unsupported for more than 1 month without further advice, and inspection by a geotechnical engineer should be undertaken following significant rain events.
4. Where loads are imposed or structures / services are located within one batter height of the crest of the batter, further advice should be sought.
5. Where steep or vertically cut rock faces are exposed, it should be inspected by a suitably experienced geotechnical engineer or engineering geologist during excavation at 1.5 m lifts to assess the need for localised rock bolting and / or shotcreting to control adverse jointing in the Bedrock unit and for overall face support.

**Table 2 – Batter slope angles**

| Unit             | Temporary | Permanent  |
|------------------|-----------|------------|
| SOIL             | 2H : 1V   | 3H : 1V    |
| BEDROCK A, B & C | 1H : 1V*  | 1.5H : 1V* |

Note: \*: See above requirements regarding inspections and local support

Steeper batters or vertical cuts ( in bedrock) may be possible subject to further advice. This could include the requirement for soil nails or rock bolts. The length and spacing of soil nail and rock bolts is a matter of design.

### 3.4 Excavation Support

Permanent cuts in the SOIL and BEDROCK unit's steeper than the recommended permanent batter slopes in Table 2 will need to be supported by some form of retaining structure.

The design of retaining structures should be based on the following:

- Effective soil strength parameters in Table 1, and
- Water pressure (depending on the type of the structure).

With regards to the BEDROCK units, the designer shall allow a minimum lateral pressure of 10 kPa for the BEDROCK units when cut vertical. This is to allow for blocks and rock wedges formed due to adverse defects that may exist within the unit. These loads may be able to be reduced by specifying inspections during the works and provision of additional support (rock bolts, shotcrete etc.) should the inspection indicate that support is required. In any case excavation in BEDROCK units will need to be inspected during the works to confirm/dismiss the presence of defects/structure in the unit that may result in higher loads than anticipated in this design. The designer of the wall should consider including inspection requirements in their design at no more than 2 m intervals in the excavation.

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

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

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

### 3.5 Pavements

A total of eight (8) CBR tests (including 2 from the previous DP's investigation) were undertaken in the geotechnical investigation (Ref. PSM4010-003L Rev1). The test results indicate a soaked CBR value of between 1.0% and 11%. We note that the low CBR values were associated to samples' high swell.

We advise that a CBR of 2% can be adopted for subgrade and fill formed in bulk earthworks constructed in accordance with the Specification. Higher values, particularly in areas of significant cut, may be provided on completion of testing on the finished bulk earthworks or if, on request, the Specification is varied to obtain such higher values on fill.

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

For and on behalf of

**PELLS SULLIVAN MEYNINK**



**DANE POPE**  
**ASSOCIATE GEOTECHNICAL ENGINEER**



**AGUSTRIA SALIM**  
**PRINCIPAL**

Encl.

Figure 1      Site Locality Plan





#### Legend:

- ⊗ 2020/BH - Boreholes undertaken in 2020
- ⊗ 2019/BH - Boreholes undertaken in 2019
- ⊗ 2018/BH - Boreholes undertaken in 2018
- ⊗ 2017/BH - Boreholes undertaken in 2017
- Approximate boundary of proposed development
- Approximate pad boundaries

#### Notes:

1. Base map aerial photo retrieved from nearmap.com dated, 7/01/2020
2. Full reference provided from the letter PSM4010-003L dated XXX



Aliro Group  
44 Clunies Ross Street  
Prospect NSW

## PROPOSED BOREHOLE LOCATIONS LOCALITY PLAN

PSM4010

Figure 1