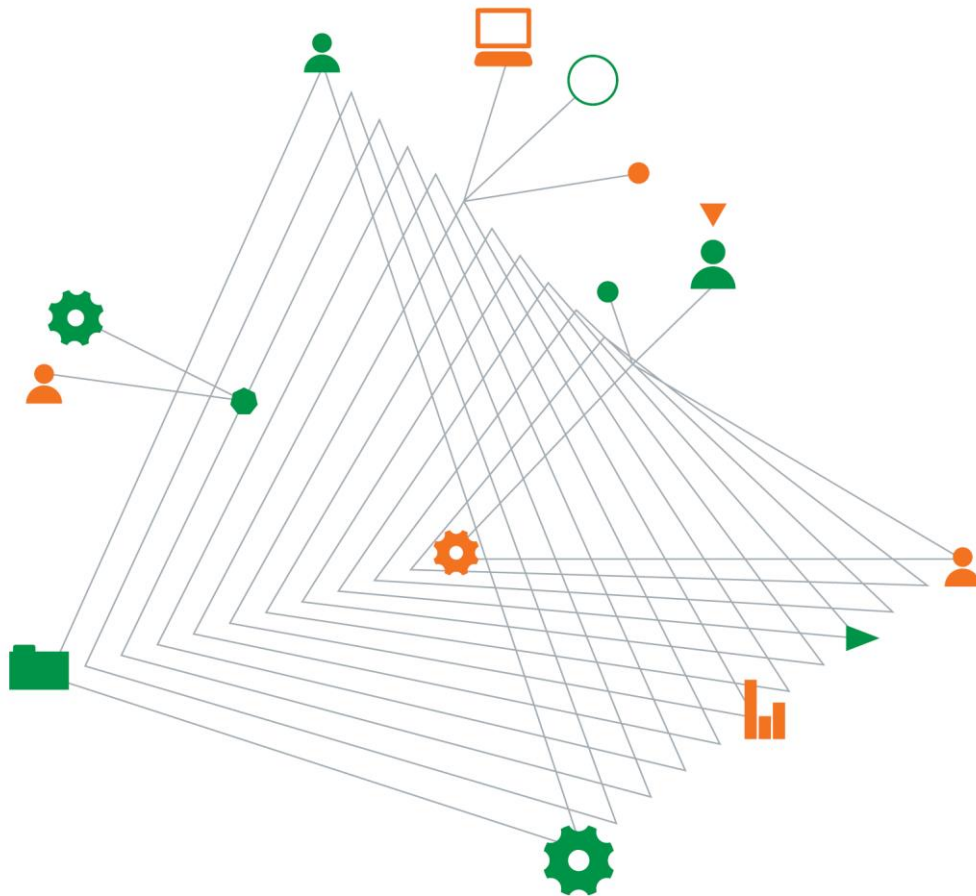


**The Lakes (2012) Ltd**

**The Lakes - Stages 3G, 3H & Lots 236-239 (Stage D)**

**Geotechnical Completion Report**

17 February 2017



Experience  
comes to life  
when it is  
powered by  
expertise

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# The Lakes - Stages 3G, 3H & Lots 236-239 (Stage D)

Prepared for  
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C/- Harrison Grierson Consultants Ltd  
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17 February 2017

## Document authorisation

Our ref: GENZTAUC13086AP-AK

For and on behalf of Coffey



**David Cullen**  
Engineering Geologist

## Quality information

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# 1. INTRODUCTION AND SCOPE

This Geotechnical Completion Report (GCR) has been prepared by Coffey Services (NZ) Ltd (Coffey) for the Lakes (2012) Limited following completion of earthworks for Stage 3G, Stage 3H (collectively known as 3GH) and Lots 236 to 239 within Stage D of the Lakes Subdivision and in general accordance with the conditions of Council resource consent number RC21332.

This GCR contains the results of site investigations together with as-built plans derived from Harrison Grierson Consultants Ltd (HGCL) topographical data. It describes bulk earthworks completed during the 2007-2008, 2013-2014 and 2014-2015 earthworks seasons.

The extent of earthworks observed by Coffey is shown on the appended plans (Figures 1 to 6, Appendix A). A Statement of Professional Opinion (Form G2) and Summary of Technical Data (Form G3) for the works described herein are also appended.

# 2. DESCRIPTION OF SUBDIVISION

Stages 3GH and Lots 236 to 239 within Stage D of the Lakes subdivision are located near the intersection of Pyes Pa Road and Takitimu Drive (State Highway SH26) in Pyes Pa, Tauranga. The site location and original ground contours are shown on Figures 1 (Stage 3GH) and 4 (Lots 236 to 239) in Appendix A. Stage 3G, Stage 3H and Lots 236 to 239 consists a total of 80, 11 and 4 lots respectively.

Before earthworks began, the majority of Stage 3G consisted of a flat or gently rolling north-south oriented plateau at approximately RL 55-65m (Moturiki Datum, 1953). During the 2013-2014 earthworks season, filling was placed over the northern portion of Stage 3G. The following 2014-2015 earthworks season, excavation of the elevated plateau was undertaken in the southeast of Stage 3G and additional filling was placed in the north and eastern extent. Combined cut/fill contours of the works completed are shown on Figure 2.

Stage H comprised a sloping terrace on the edge of the plateau before earthworks proceeded, dipping from approximately RL 59m in the western extents to approximately RL 49m in the east. During the 2014 to 2015 earthworks season, filling commenced over much of Stage 3H, with the exception of minor cut in the north-western and south-western extents.

Lots 236 to 239 within Stage 3D originally comprised of steeply sloping ground over much of the lots, dipping in a southeast and western direction where a deeply incised gully extended into the lots. Earthworks commenced in this area with the placement of fill over Lots 237 to 239 during the 2007 to 2008 earthworks season, followed by unsupervised filling thereafter, likely between 2010 and 2012 and discussed later in this report. Cut/fill contours are shown on Figure 4. The 2012 ground surface is shown on Figure 5. Further earthworks were completed during the 2014-2015 work season, with cut/fill contours for the 2014-2015 earthworks also shown on Figure 5.

Construction of a cantilever timber pole retaining wall was completed in 2017 adjacent to the northern perimeter of Stage 3G (lots numbers for which this wall spans are currently being confirmed). Additionally in 2016, a stormwater pipe was thrust beneath the slope to the east of Stage 3H to an outlet structure above the stream in the valley below. The location of the stormwater pipe and indicative location of the retaining wall is shown on Figure 3.

Civil infrastructure for these stages and lots of the subdivision was installed in 2015 and 2016. The finished ground surface is shown on Figures 3 and 6.

### 3. RELATED REPORTS

The following documents were prepared prior to or during the design and development of Stages 3G, 3H & Lots 236-239 (Stage D):

1. *'Pyes Pa West Urbanisation Development, Tauranga – Geotechnical Assessment Report'*, report prepared by S&L Consultants Ltd (Ref: 16944, dated October 2003).
2. *'Geotechnical Investigation Report for the Lakes Subdivision – Stage 3 (Phase 1) at Pyes Pa, Tauranga'*, report prepared by Coffey (Ref: GENZTAUC13086AF-AA, dated 29 April 2013).
3. *'Geotechnical Investigation Report for the Lakes Subdivision – Stage 3 Zone 2 at Pyes Pa, Tauranga'*, report prepared by Coffey (Ref: GENZTAUC13086AK-AC, dated 7 April 2014).
4. *'The Lakes Subdivision Stage 3 Zone 1 Earthworks Completion Report'*, report prepared by Coffey (Ref: GENZTAUC13086AF-AE, dated 15 August 2014).
5. *'The Lakes Stage 3 - Zone 3, Geotechnical Investigation Report (Addendum 1)'*, report prepared by Coffey (Ref: GENZTAUC13086AQ-AB, dated 10 July 2015).
6. *'Building Restriction Lines above Western Slope and Collector Road, The Lakes Subdivision Stage 3 – Zone 2'*, memo prepared by Coffey (Ref: GENZTAUC13086AQ-AC, dated 25 August 2015).
7. *'Retaining Wall Design Report for Stage 3G The Lakes, The Lakes Subdivision, Tauriko'*, report prepared by Coffey (Ref: GENZTAUC13086AB-AB, dated 16 June 2016).

Key conclusions of the main documents are summarised below.

#### 3.1. Geotechnical Assessments

The original geotechnical assessment for the Lakes subdivision was completed by S&L Consultants Ltd and contained an overview of geotechnical conditions for the entire Lakes project. The report concluded that the site was generally adequate for subdivision and residential development, subject to appropriate design and construction.

Subsequent geotechnical investigation reports by Coffey in April 2013 and April 2014 summarised additional investigations that were completed to specifically assess the Stage 3 area. These investigations generally confirmed the S&L conclusion that the site was adequate for subdivision.

#### 3.2. Earthworks Completion Report

The August 2014 Earthworks Completion Report (ECR) concluded that the bulk earthworks undertaken in 2007-2008 and 2013-2014 were generally completed in accordance with the relevant standards and guidelines including NZS 4431 (Code of Practice for Earth Fill for Residential Development) and the Tauranga City Council Infrastructure Development Code (TCC IDC). The report did however identify several areas that needed to be re-visited in this GCR. These were:

1. Some of the fill materials placed towards the end of the 2013-2014 season did not pass the required Nuclear Density Meter (NDM) tests. The failed tests were attributed to the highly variable source materials being used (silts, sands and clays) which resulted in fills that could not be easily assessed with a NDM. It was therefore decided that the affected fill would be re-tested using hand-auger boreholes with undrained shear strength measurements and/or Dynamic Cone Penetrometer (DCP) testing as appropriate for the individual soils.
2. The ECR also commented on the presence of undocumented filling that was encountered during excavations in 2013 within lots 238 & 239 and elsewhere within the Lakes development. This filling is understood to have been placed between 2010 and 2012, when

works on site were not closely managed by either Grasshopper Farms Ltd or The Lakes (2012) Ltd.

3. Finally, the ECR recommended that the stability of the eastern slope should be reassessed in the GCR and an appropriate Building Restriction Line (BRL) be defined for lots along the crest of this slope.

These issues are addressed in the following sections of this report.

The ECR also referred to the presence of subsurface erosion features ('tomos') found in other stages of the Lakes Subdivision, indicating soils below the plateau may be subject to erosion and scouring. While 'tomos' have not been observed within these subject Stages and Lots, it is possible erosional features may be encountered during construction on these lots.

## 4. INVESTIGATIONS COMPLETED

Geotechnical investigations have been undertaken on this and adjacent sites during each stage of the Lakes subdivision's design and construction. The investigations used for this report are listed below. Logs of each investigation are included in Appendix C.

- Three test pits excavated in 2012 within or near Stage 3G to maximum depths of up to 5m to assess shallow ground conditions before the 2013-2014 work season (Coffey, TP07–TP09 on Figure 1);
- One Cone Penetrometer Test (CPT) to a depth of approximately 13 meters below the existing ground level using a truck mounted rig supplied by Geotech Drilling Limited (Coffey, CPT314 on Figure 1);
- One machine borehole drilled to a depth of approximately 20.0m. Standard Penetration Tests (SPT) were carried out at 1.5m intervals (Coffey, MH301 on Figure 1);
- Two flight-auger machine boreholes drilled to a maximum depth of 20.0m within Stage 3H. SPT tests were conducted at specific depths within these boreholes to provide strength estimates and relatively undisturbed samples of key lithologies encountered (Coffey, CFA04 & CFA05 on Figure 1).

On completion of the bulk earthworks in 2016, Coffey drilled a total of 50 hand-auger boreholes to target depths of 2m or 2.5m (and in some cases, up to 5m depth) on approximately every second lot to confirm finished subgrade conditions. The location of each borehole is shown on Figures 3 & 6. Although labels are not shown on the plan, the boreholes are numbered according to the relevant lot number. For example, the hand auger borehole on Lot 413 in Stage 3G is referred to as HAL413. Logs of these boreholes are included in Appendix D.

## 5. OVERVIEW OF GEOLOGICAL CONDITIONS

The subject areas of Stage 3G and Lots 236 to 239 within Stage 3D are located on an elevated, gently sloping plateau. Below the topsoil layer, the pre-development soil profile across this plateau comprised of volcanic ashes including the Hamilton Ash and Rotoehu Ash. This ash sequence is common throughout the Tauranga area. At this location the volcanic ashes overlie ancient alluvial deposits of the Matua Sub-Group and weakly cemented pumice sands of the Te Ranga Ignimbrite.

Stage 3H is located on a gently to moderately sloping terrace formed from ancient alluvial deposits of the Matua Subgroup.

Excavations during the 2013-2015 period reduced the thickness of the volcanic ashes across the southeast of the Stage 3G plateau by up to 7m. The subsoils below many of the finished lots therefore



comprise volcanic ash silts but in some areas excavations have penetrated through the ash layers and the finished lots are underlain by variable Matua Sub-Group soils. These include silts, sands and clays which can be highly sensitive to reworking. Areas underlain by fill are discussed in Section 6.2.

## **6. EARTHWORKS OPERATIONS**

### **6.1. Plant**

Earthworks during the 2007-2008 season were completed by Bob Hicks Earthmovers Ltd. The contractor for the 2013-2014 and 2014-2015 seasons was JMC Civil Construction Ltd.

The main items of plant used during each of the bulk earthworks phase comprised Terex motor-scrappers and bulldozer or tractor towed 'scoops', hydraulic excavators, bulldozers, articulated all-terrain dump trucks (ADT's) and sheep's-foot rollers.

### **6.2. Construction Programme**

#### **6.2.1. 2007 – 2012**

Under ownership of Grasshopper Farms Ltd, earthworks during this period included excavations of up to 1m depth over Lot 237 (Stage D) as shown on Figure 4. Filling took place over Lots 237 to 239 (Stage D), however as cut & fill contours for this period are not available, fill contours were calculated by HGCL (Harrison Grierson Consultants Ltd) by subtracting the original ground surface (surveyed in 2007) from a survey completed by HGCL in 2012. This resulted in indicated fill depths of up to 11m across the lots.

Excavations in the filling in Lots 237 to 239 encountered soils that consisted of highly sensitive silts and clays with a relatively high moisture content and low undrained shear strength. Based on a series of unlogged test pits within the fill, it was considered that the non-engineered filling could remain in place provided that later fill in these areas was placed appropriately and that static settlements were monitored and reviewed prior to issue of the GCR. This later filling is discussed in more detail below.

No cut or fill took place over Stages 3GH during 2007 to 2012.

#### **6.2.2. 2013 – 2014 & 2014 – 2015 Earthworks Seasons**

In 2012 ownership of the Lakes subdivision passed from Grasshopper Farms Ltd to The Lakes (2012) Ltd. During this period the remaining earthworks were completed to form the current ground surface. Earthworks during the 2013-14 and 2014-15 summers included excavations of up to 7m depth on the main plateau of Stage 3G and 1m cuts in the north and south of Stage 3H, as shown on Figure 2.

Excavated material was used for filling up to approximately 2m deep in the northern portion of Stage 3G during both summer periods, and up to 4m deep along the eastern boundary of Stage 3G and over much of Stage 3H during the 2014-15 season.

Further cut and fill was undertaken over Lots 236 to 239 of Stage D. Lot 236 and 237 underwent cut of up to 1m and all of the lots had fill placed to varying depths, with filling of up to 8m deep in places as shown on Figure 5.

## **7. QUALITY CONTROL**

### **7.1. Site Preparation Observations**

During 2013-2014 and 2014-2015, Coffey undertook regular observations of fill areas to ensure topsoil, vegetation or unsuitable materials had been removed before filling.

### **7.2. Fill Control**

As mentioned previously, filling placed over Lots 237 to 239 of Stage 3D during 2007-2012 was not tested or certified by Coffey and no other records or test results have been located.

For Stages 3GH and Lots 236 to 239 of Stage 3D in the 2013-2014 and 2014-2015 seasons, Nuclear Density Meter (NDM), laboratory moisture content and undrained shear strength tests were carried out by Geotechnics & Fulton Hogan on behalf of JMC Limited. The locations of the tests completed are shown on Figure 2 and 5.

In cases where of the above tests recorded low undrained shear strengths, retests were undertaken to assess the ground conditions and fill strength, either as additional NDM tests or subsequent hand-auger boreholes in close proximity to the original test.

#### **7.2.1. Compaction Control Criteria**

The compaction control criteria for this project were specified using the 'minimum allowable shear strength and maximum allowable air voids' method as defined below:

- Air voids percentage (defined in NZS 4402:1986 and as measured by NDM) targeting an average value less than 10% over any 10 consecutive tests and maximum single value no greater than 12%.
- Undrained shear strength measured by hand held shear vane calibrated using the NZGS 2001 method. A single undrained shear strength 'test' was defined as the average of four individual shear vane readings at each NDM location. The target test values were an average value greater than 150kPa and minimum single value no less than 140kPa.

The hand-auger boreholes drilled to re-test filling used field shear vane measurements with the same target result as above.

#### **7.2.2. Test Results**

Summary tables showing the results of the laboratory fill tests for bulk earthworks at Stages 3G, 3H & Lots 236-239 (Stage D) are included in Appendix E and the locations of the tests are shown on Figures 2 and 5. The majority of tests met or exceeded the compaction control criteria given above. Failed tests are shown in red on the relevant figures.

Three tests during the 2013-2014 season did not meet the required values, with test numbers A-05, A-12, and A-41 being deemed to have failed due to low undrained shear strength readings. The fill surrounding these tests were either reworked or retested with hand-auger boreholes at a later date (passing thereafter), indicating the failed result was either due to an incorrect test value or an isolated pocket of filling.

During the 2014-2005 season, three tests being B-01, B-05 and B-13 initially failed due to low undrained shear strength readings but were retested and subsequently passed. As these tests were superseded by later testing, the tests are not showing as failed results on the site plan.

Two further tests, B-08 and B-09, failed due to low undrained shear strength readings and were retested with hand-auger boreholes at a later date, again with passing results indicating the failed tests were either due to an incorrect test value or an isolated pocket of filling.

## **8. ENGINEERING EVALUATION AND RECOMMENDATIONS**

### **8.1. Fill Quality**

Based on the appended earth fill quality control test data and reliance on the diligence of the bulk earthworks contractor at times when engineering staff were not present on site, results indicate that the compaction control criteria were generally met during the bulk earthworks periods in 2013-2014 and 2014-2015.

### **8.2. Static Settlement**

The majority of the area, specifically Stage 3G, was either located in zones of cut or received evenly distributed filling over volcanic ashes with soils not expected to be subject to significant settlement. Static settlements were therefore not monitored in Stage 3G.

However, Stage 3H and Lots 236-239 (Stage D) received up to 4m and 8m of fill material respectively during the 2013-14 season. Settlement monitoring points were therefore installed in these areas. The monitoring pins consisted of steel rods attached to plates installed at the base of the filling. The data from these pins are presented graphically in Appendix F and settlement marker locations shown on Figures 2 and 6 for Stage 3H and Lots 236-239 (Stage D) respectively.

#### **8.2.1. Stage 3H**

Static settlements below the 2014 filling were monitored at two locations shown as SM26 and SM27 on Figure 2. Measured settlements were 205mm and 390mm for SM26 and SM27.

The data show the majority of consolidation settlement below the filling occurred within 2 to 3 months of earthworks being completed. Thereafter, settlement entered a long term 'creep' phase. Extrapolating the data out for a period of 50 years indicated that lots in this area may be affected by up to 100mm of future creep settlement over the assumed life of the proposed dwellings. However, differential settlements within the affected lots would be expected to be within the allowable range recommended by MBIE (i.e. 25mm/6m length), provided additional fill does not exceed 0.6m.

#### **8.2.2. Lots 236-239 (Stage D)**

Static settlements were monitored over Lots 236-239 during and after the 2013-2014 and 2014-2015 work seasons.

Three settlement markers were installed, SM15, SM28, and SM28A as shown on Figure 6, however only SM28 remained functional during the whole monitoring period as the other two markers were either damaged or moved during fill placement.

In regards to SM28, monitoring from April 2015 to August 2016 indicated the filling had induced static settlements of 68mm and that settlement was ongoing. Extrapolating the data out for 50 years indicated long-term settlement may exceed 60mm, with a high likelihood of excessive differential settlement beneath the building platforms.

The area was therefore pre-loaded with 2m of topsoil in April 2016 as shown in Figure 6. Continuing monitoring indicated this pre-load induced an additional settlement of up to 47mm. Following the completion of monitoring in August 2016, the pre-load was removed.

Following preloading we consider that the potential for future static settlements beneath these lots has been reduced, and long term differential settlements would be expected to be within accepted limits, provided additional fill does not exceed 1.0m.

### **8.2.3. Fill Development Restrictions**

To reduce possible future settlements, any additional filling the lots listed below should not exceed the following depths without the approval of the TCC Category 1 or 2 Geo-Professional:

- 1.0m for lots 236-239
- 0.6m for lots 495-502

## **8.3. Slope Stability**

While the majority of proposed lots within Stage 3G are located on gently sloping ground, the lots within this stage adjacent to the eastern perimeter and all lots within Stage 3H are located above a steeper slope. Lots 236-239 are also positioned above steeper slopes to the east and south of the lot boundaries.

### **8.3.1. Lots 413, 458, 460 and 493-503**

The adjacent slope below the plateau exhibited a few areas of instability. Colluvial soils were encountered in hand auger boreholes and test pits in this area and topographic evidence also suggested that this slope has been affected by larger scale ancient instability.

Stability analyses of this slope noted that values were generally less than required by the IDC for residential development and indicated that further instability may occur on this slope in the future during extreme rainfall events or under seismic loads.

As the slope is insufficiently stable for residential development, the lots are subject to a building restriction line (BRL) as shown on Figure 3. The BRL has been defined by either projecting a 1V:2.5H line from the toe of the steepest adjacent slope, or by measuring 15m back from the slope crest, whichever is smaller. The proposed setback distance is considered adequate for the residential development in this area.

### **8.3.2. Lots 236-239 (Stage 3D)**

Slopes adjacent to Lots 236-237 have been engineered with a gradient of 1V:2.5H for which this gradient is considered to be an adequately stable slope angle for Tauranga soils. However, this does not allow for surcharge from residential buildings or fill and therefore a BRL has been placed on these lots, setback 3-5m from the slope crest as shown on Figure 6.

The slope south of lots 237-239 have been engineered with a gradient of 1V:3H and therefore are adequate for residential development without a BRL.

### **8.3.3. Slope Development Restrictions**

For lots 236-237, 413, 458, 460 and 493-503, it should be understood that the inclusion of a BRL on a lot does not specifically preclude development beyond the restriction line. However, any development between the BRL and slope will require specific geotechnical input and may need additional slope protection works such as retaining walls, deepened foundations, etc. The following restrictions are recommended for these lots:

- Any part of a dwelling or structure which extends beyond the BRL must be reviewed and approved by a TCC Category 1 Geo-Professional prior to the building consent application. A geotechnical report must be provided including the specific design of any mitigation works proposed.

- Any filling between the BRL and slope must be reviewed and approved by a TCC Category 1 Geo-Professional with a report to be provided to Council before work begins.
- Stormwater from any paved or impermeable surfaces including roofs and driveways on these lots must be collected and piped to the site's stormwater system. Stormwater must not be disposed via ground soakage on these lots and any concentration of runoff over the slope must be avoided.

## **8.4. Stage 3G Retaining Wall**

The construction of the timber pole retaining wall along the northern boundary of Stage 3G was observed by Coffey. This included regular site visits to confirm borehole and post dimensions and ground conditions along the wall alignment as specified in the retaining wall design report.

Based on our observations we consider the wall has been built in accordance with the design. A separate certification letter has been provided for the wall, a copy of which is included in Appendix G.

### **8.4.1. Retaining Wall BRL**

As the wall has not been designed for additional surcharge loads, a BRL has been defined with a setback distance equal to the height of the wall. The BRL has been assigned to lots 441, 442, 444 to 455, 457 and 458 within Stage 3G as shown on Figure 3.

### **8.4.2. Retaining Wall Development Restrictions**

Specifically for lots 441, 442, 444 to 455, 457 and 458, in regards to the BRL adjacent to the Stage 3G retaining wall, the following restrictions are recommended:

- Any part of a dwelling or structure which extends beyond the BRL must be reviewed and approved by a TCC Category 1 or 2 Geo-Professional prior to the building consent application. A geotechnical report must be provided including the specific design of any mitigation works proposed. Specific design may include, deepened foundations past the 45° zone of influence from the toe of the retaining wall.
- No filling is to take place between the BRL and crest of wall without review and approval by a TCC Category 1 or 2 Geo-Professional. Due to the height of the existing retaining wall, any additional filling or retaining structures above the wall and within the BRL may require a Resource Consent.
- Stormwater from any paved or impermeable surfaces including roofs and driveways on these lots must be collected and piped to the site's stormwater system and not allowed to flow over the the retaining wall.

## **8.5. Stage 3H Stormwater Pipe Line**

As mentioned in Section 2, a stormwater pipeline was horizontally drilled or 'thrust' beneath the slope to the east of Stage 3H as part of the civil infrastructure installation in 2016. The pipeline was designed by Harrison Grierson Consultants Ltd. Coffey provided advice regarding the pipeline alignment and recommended the pipe was installed at least 3.0m below existing ground level to reduce the risk of damage in the event of slope failure

A copy of Harrison Grierson's design drawings for the pipeline is included in Appendix G. Based on our observations during drilling and as-built survey information from Harrison Grierson, we consider the pipeline has been installed along an appropriate alignment. The survey data indicate the pipe is at least 3.0m deep below the existing ground surface as recommended.

## 8.6. Foundation Design & Bearing Capacity

The lots within Stage 3G and Lots 236-239 (Stage D) are underlain by either engineered fill or natural soils that meet or exceed the conditions for 'good ground' as defined by NZS 3604. Dwellings on these sites may therefore be supported on standard shallow foundations designed for a geotechnical ultimate bearing capacity of 300kPa.

Lots 493 to 503 within Stage 3H also meet or exceed the conditions for 'good ground' as defined by NZS 3604. However, as the lots are moderately steeply sloping, development on these lots may require deep excavation to form a level building platform. We recommend that whenever the proposed depth of excavation exceeds 1.5m, additional investigation should be undertaken by a TCC Category 1 or 2 Geo-Professional at the design/building consent stage to confirm soil conditions below the proposed foundations. A consent notice to this effect should be added to the affected lots (see Form G3, Appendix B).

It should be understood that due to the volcanic nature of the natural soils on this site, it is possible that local soil conditions may vary from those discussed above. Some soils observed onsite are also potentially prone to sub-surface erosion (e.g. 'tomos'). It is therefore important that any potentially soft or unsuitable soils encountered in the foundation excavations are brought to the attention of a geotechnical professional.

## 8.7. Stormwater Management

To further reduce the potential for surface and sub-surface erosion, all stormwater from impervious areas within the development will need to be carefully collected and piped to a safe disposal point or to the reticulated network. Particular care should be taken to avoid areas of ponded stormwater or concentrated flows around and under buildings or structures.

## 9. CONCLUSION

Based on the observations and investigations presented in this report and with reliance on the diligence of the earthworks contractors, it is concluded that the earthworks and subdivision of Stages 3GH and Lots 236-239 of Stage 3D have been completed in general accordance with previous recommendations and current Tauranga City Council Infrastructure Development Code.

This report presents site-specific recommendations including Building Restriction Lines (BRLs) on some lots located above steeper slopes or adjacent to retaining walls. Provided these recommendations are followed and prudent development practices are adopted, it is considered that the finished lots are at low risk of erosion, falling debris, subsidence, inundation or liquefaction and these sites are therefore adequate for residential development without the need for Section 72 restrictions under the New Zealand Building Act.

Development outside the BRL (i.e. between the restriction line and the slope/retaining wall) is subject to further geotechnical input per Sections 8.3.3 and 8.4.2 of this report. The placement of additional filling is also restricted on some lots as per Section 8.2.3. The need for a Section 72 restriction on affected lots may therefore need to be re-assessed at the building consent stage.

## 10. LIMITATIONS

This report has been prepared solely for the use of the client, The Lakes (2012) Limited, their professional advisers and the relevant Territorial Authorities in relation to the specific project described herein. No liability is accepted in respect of its use for any other purpose or by any other person or entity. All future owners of this property should seek professional geotechnical advice to satisfy themselves as to its ongoing suitability for their intended use.

The opinions, recommendations and comments given in this report result from the application of normal methods of site investigation. As the post construction factual evidence has been obtained solely from boreholes and test pits, which by their nature only provide information about a relatively small volume of subsoils, there may be special conditions pertaining to this site which have not been disclosed by the investigation and which have not been taken into account in the report.

For and on behalf of Coffey

Report Prepared By:



**D B CULLEN**  
Engineering Geologist

Report Reviewed By:



**D SULLIVAN**  
Principal Geotechnical Engineer  
BSc, MBA, CE (Calif.), MIPENZ, CPEng, TCC Category 1 Geotechnical Engineer  
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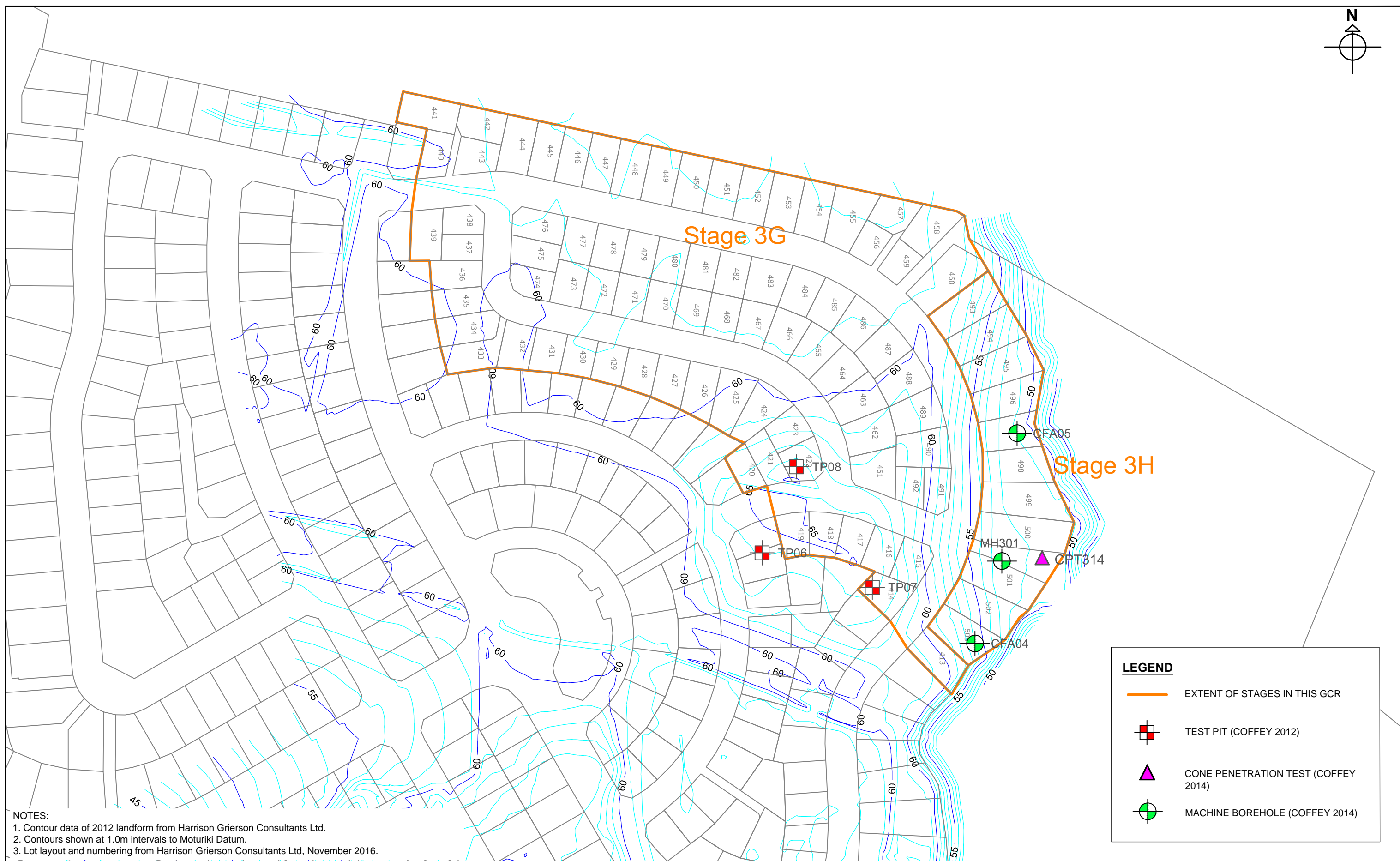
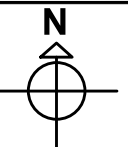
Geotechnical Suitability Statement Signed By:



**R TELFORD**  
TCC Category 2 Geotechnical Engineer

## **Appendix A - Figures**



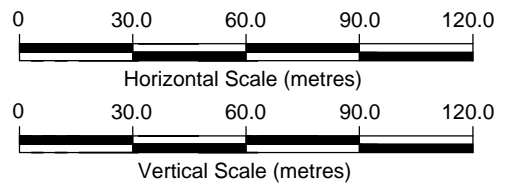


NOTES:  
 1. Contour data of 2012 landform from Harrison Grierson Consultants Ltd.  
 2. Contours shown at 1.0m intervals to Moturiki Datum.  
 3. Lot layout and numbering from Harrison Grierson Consultants Ltd, November 2016.

**LEGEND**

- EXTENT OF STAGES IN THIS GCR
- TEST PIT (COFFEY 2012)
- CONE PENETRATION TEST (COFFEY 2014)
- MACHINE BOREHOLE (COFFEY 2014)

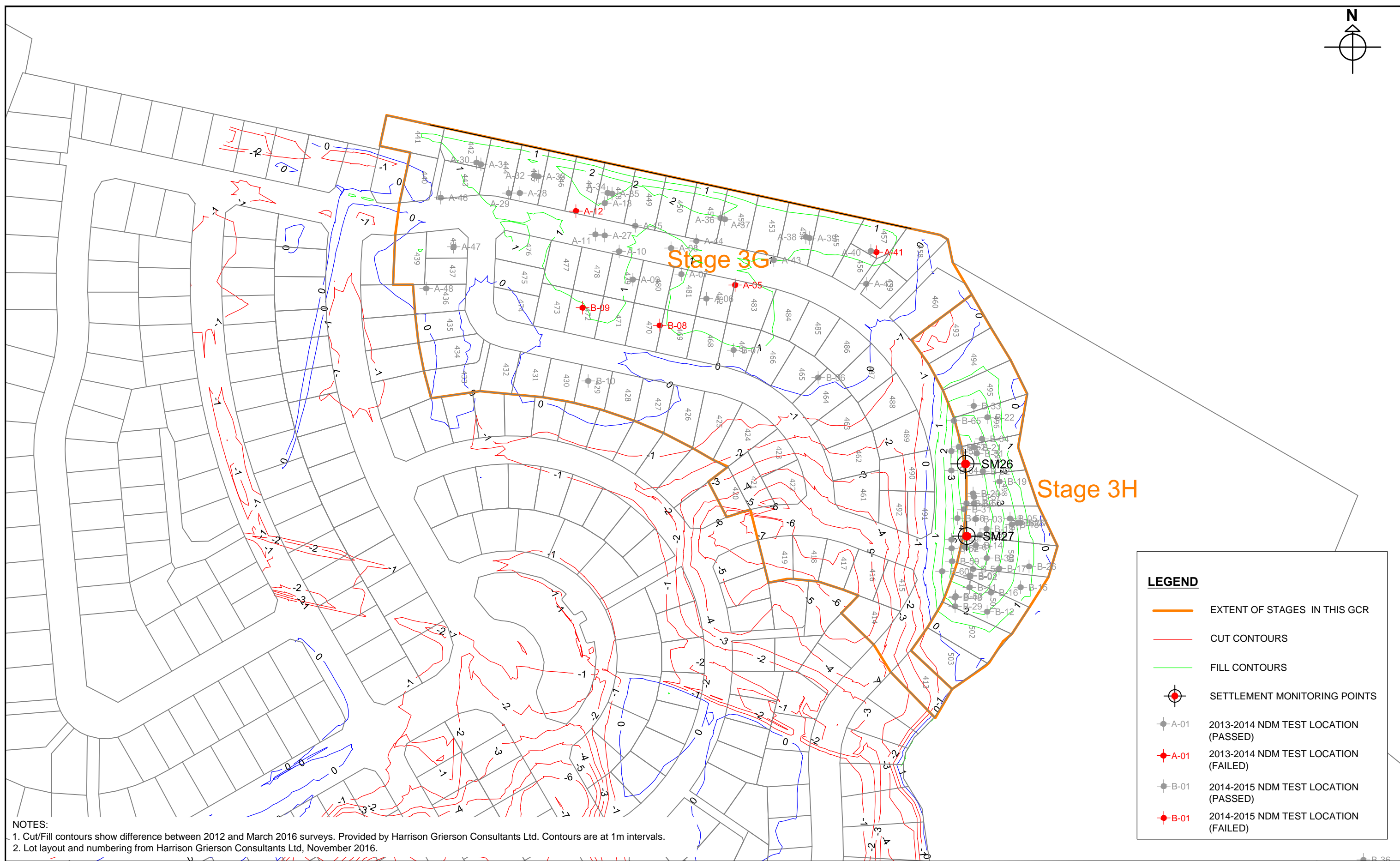
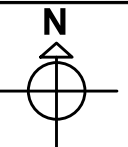
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approved	<b>RBT</b>
date	<b>17-2-2017</b>
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original size	<b>A3</b>



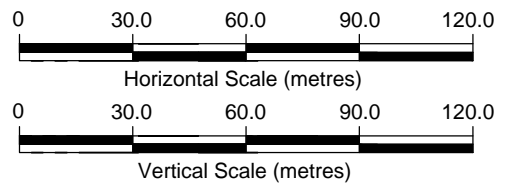
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project:	<b>The Lakes Stage 3G &amp; 3H Geotechnical Completion Report</b>		
title:	<b>Original Contour Plan</b>		
project no:	<b>13086AP-AK</b>	figure no:	<b>1</b>
rev:	<b>-</b>		



NOTES:  
 1. Cut/Fill contours show difference between 2012 and March 2016 surveys. Provided by Harrison Grierson Consultants Ltd. Contours are at 1m intervals.  
 2. Lot layout and numbering from Harrison Grierson Consultants Ltd, November 2016.

LEGEND	
	EXTENT OF STAGES IN THIS GCR
	CUT CONTOURS
	FILL CONTOURS
	SETTLEMENT MONITORING POINTS
	2013-2014 NDM TEST LOCATION (PASSED)
	2013-2014 NDM TEST LOCATION (FAILED)
	2014-2015 NDM TEST LOCATION (PASSED)
	2014-2015 NDM TEST LOCATION (FAILED)

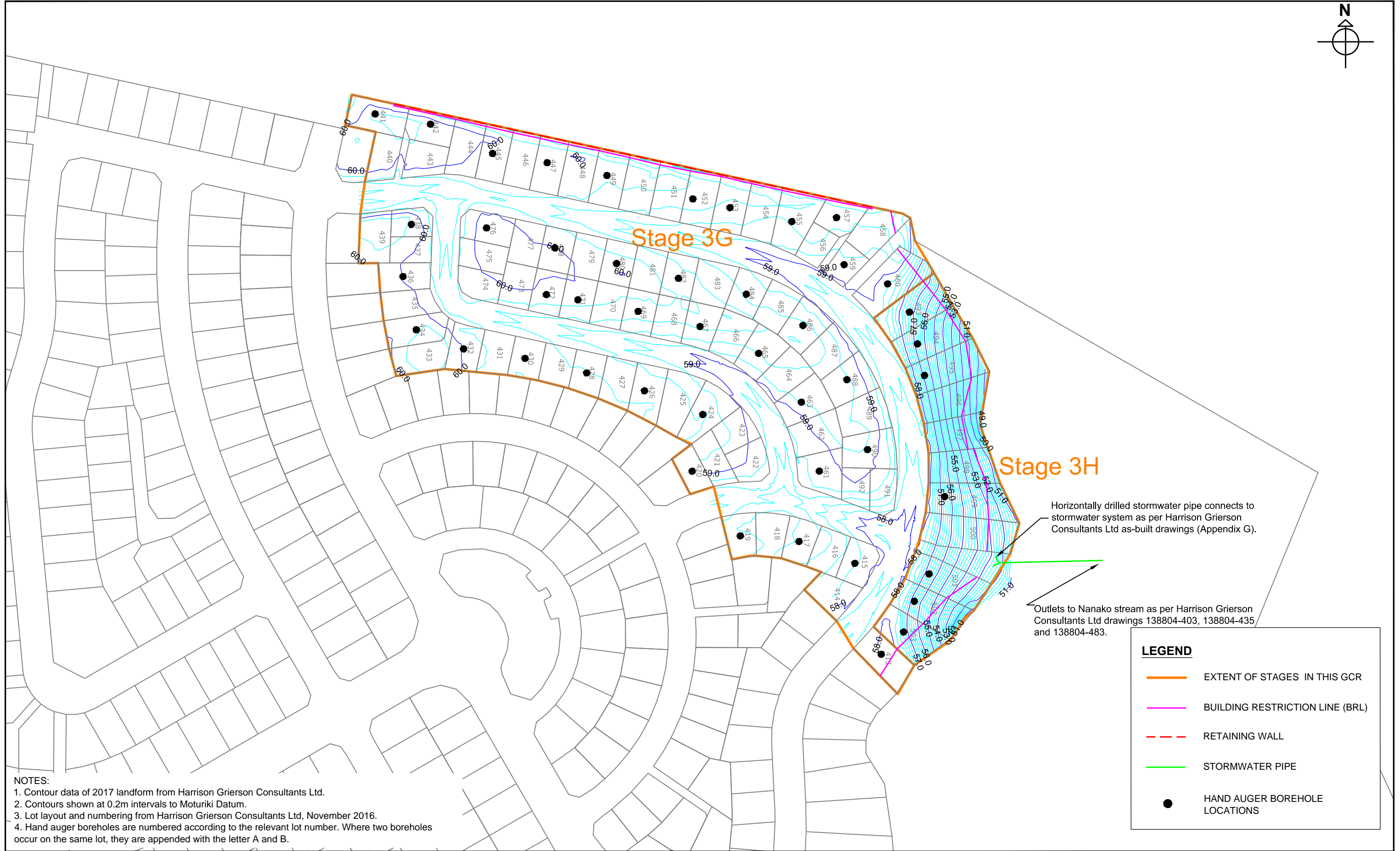
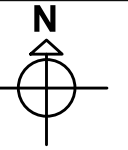
revision	rev	description	drawn	approved	date



drawn	ODS / DBC
approved	RBT
date	17-2-2017
scale	1:2000
original size	A3

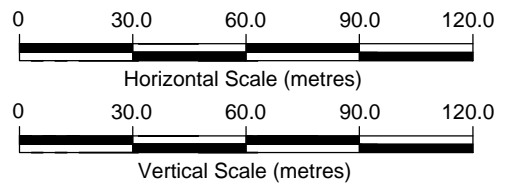


client:	The Lakes (2012) Ltd		
project:	The Lakes Stage 3G & 3H Geotechnical Completion Report		
title:	2013-2015 Earthworks Contour & Settlement Monitoring Plan		
project no:	13086AP-AK	figure no:	2
rev:			-



NOTES:  
 1. Contour data of 2017 landform from Harrison Grierson Consultants Ltd.  
 2. Contours shown at 0.2m intervals to Moturiki Datum.  
 3. Lot layout and numbering from Harrison Grierson Consultants Ltd, November 2016.  
 4. Hand auger boreholes are numbered according to the relevant lot number. Where two boreholes occur on the same lot, they are appended with the letter A and B.

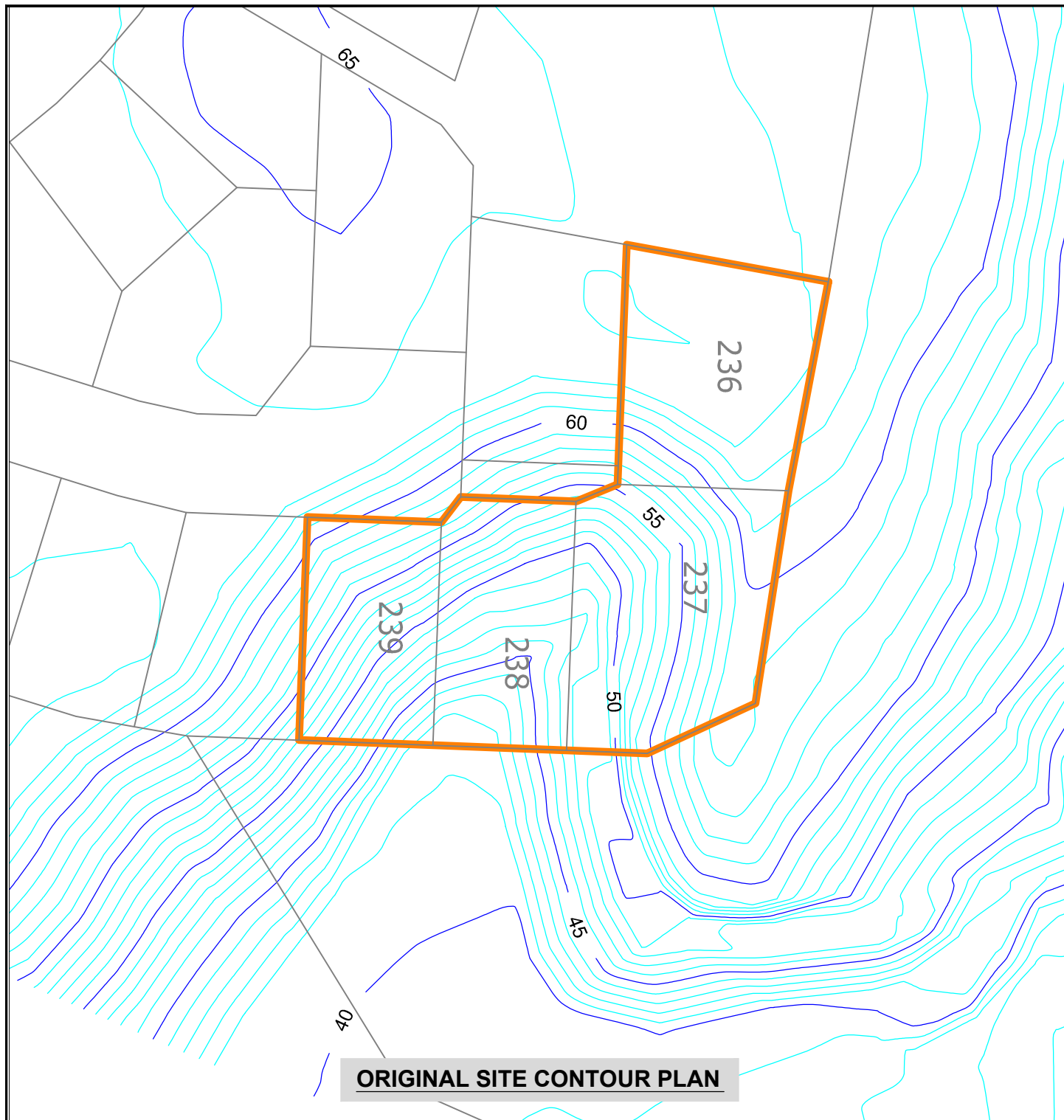
revision	rev	description	drawn	approved	date



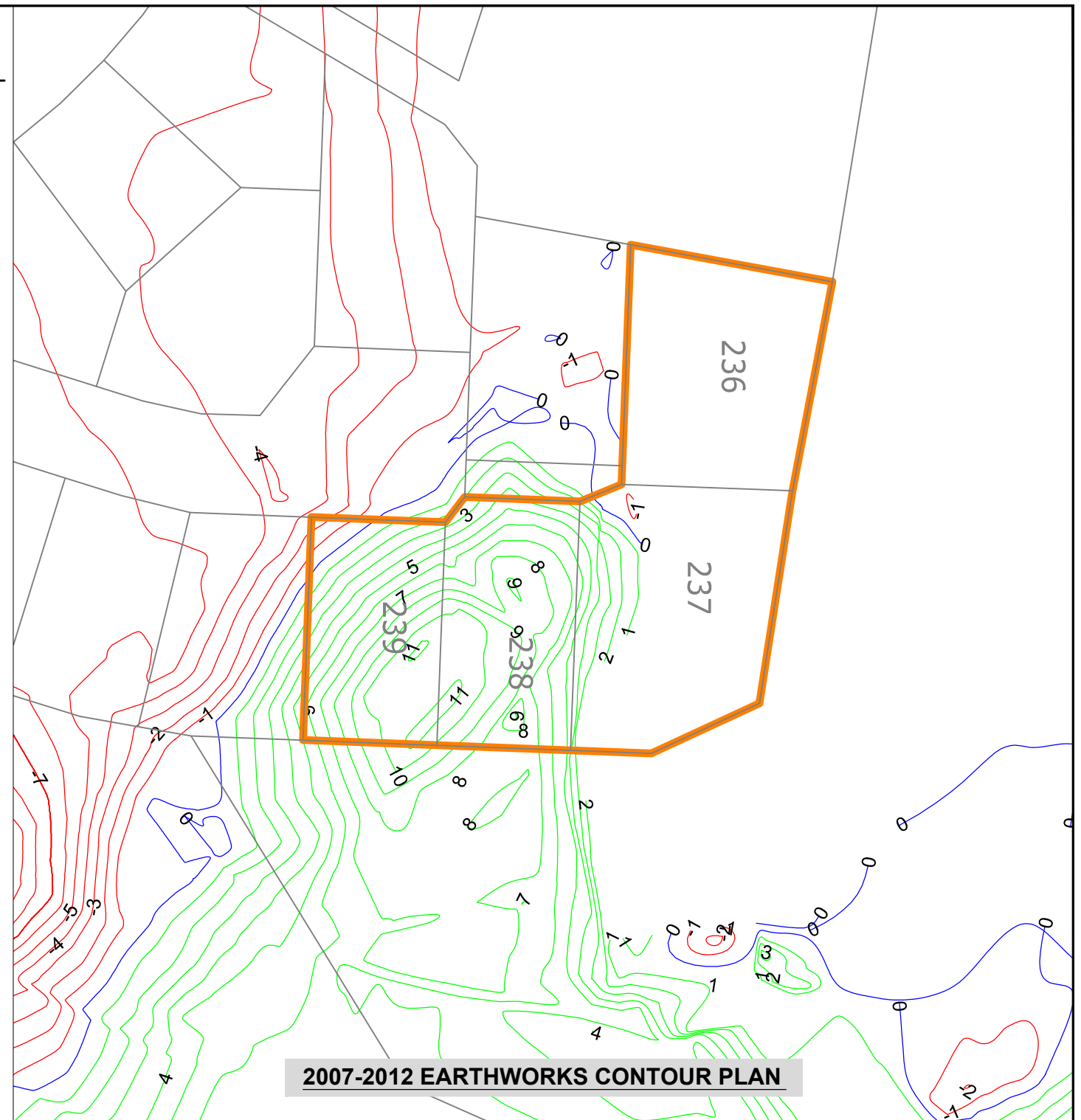
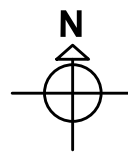
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approved	<b>RBT</b>
date	<b>17-2-2017</b>
scale	<b>1:2000</b>
original size	<b>A3</b>



client:	<b>The Lakes (2012) Ltd</b>		
project:	<b>The Lakes Stage 3G &amp; 3H Geotechnical Completion Report</b>		
title:	<b>2017 Contour Plan</b>		
project no:	<b>13086AP-AK</b>	figure no:	<b>3</b>
		rev:	<b>-</b>



**ORIGINAL SITE CONTOUR PLAN**



**2007-2012 EARTHWORKS CONTOUR PLAN**

**NOTES:**

1. Contour data of original pre-earthworks landform from Harrison Grierson Consultants Ltd, May 2007.
2. Contours shown at 1.0m intervals to Moturiki Datum.
3. Lot layout and numbering from Harrison Grierson Consultants Ltd, November 2016.

**NOTES:**

1. Cut/Fill contours show difference between 2007 and March 2012 surveys. Provided by Harrison Grierson Consultants Ltd. Contours are at 1m intervals.
2. Lot layout and numbering from Harrison Grierson Consultants Ltd, November 2016.

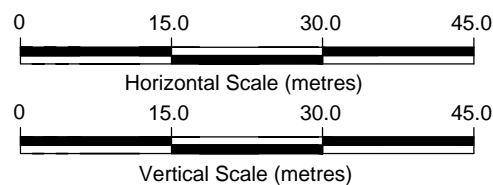
**LEGEND**

EXTENT OF STAGES IN THIS GCR

CUT CONTOURS

FILL CONTOURS

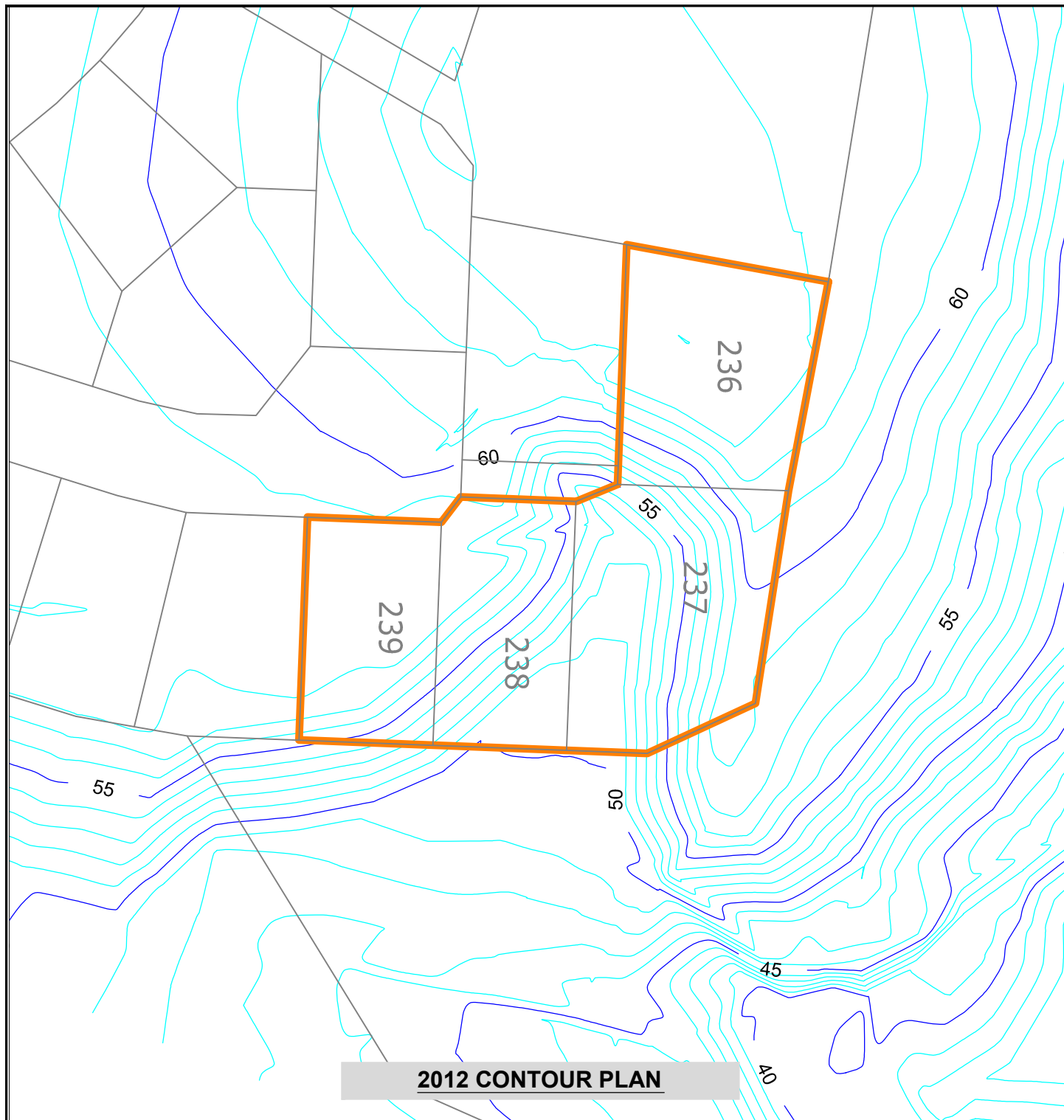
revision	rev	description	drawn	approved	date



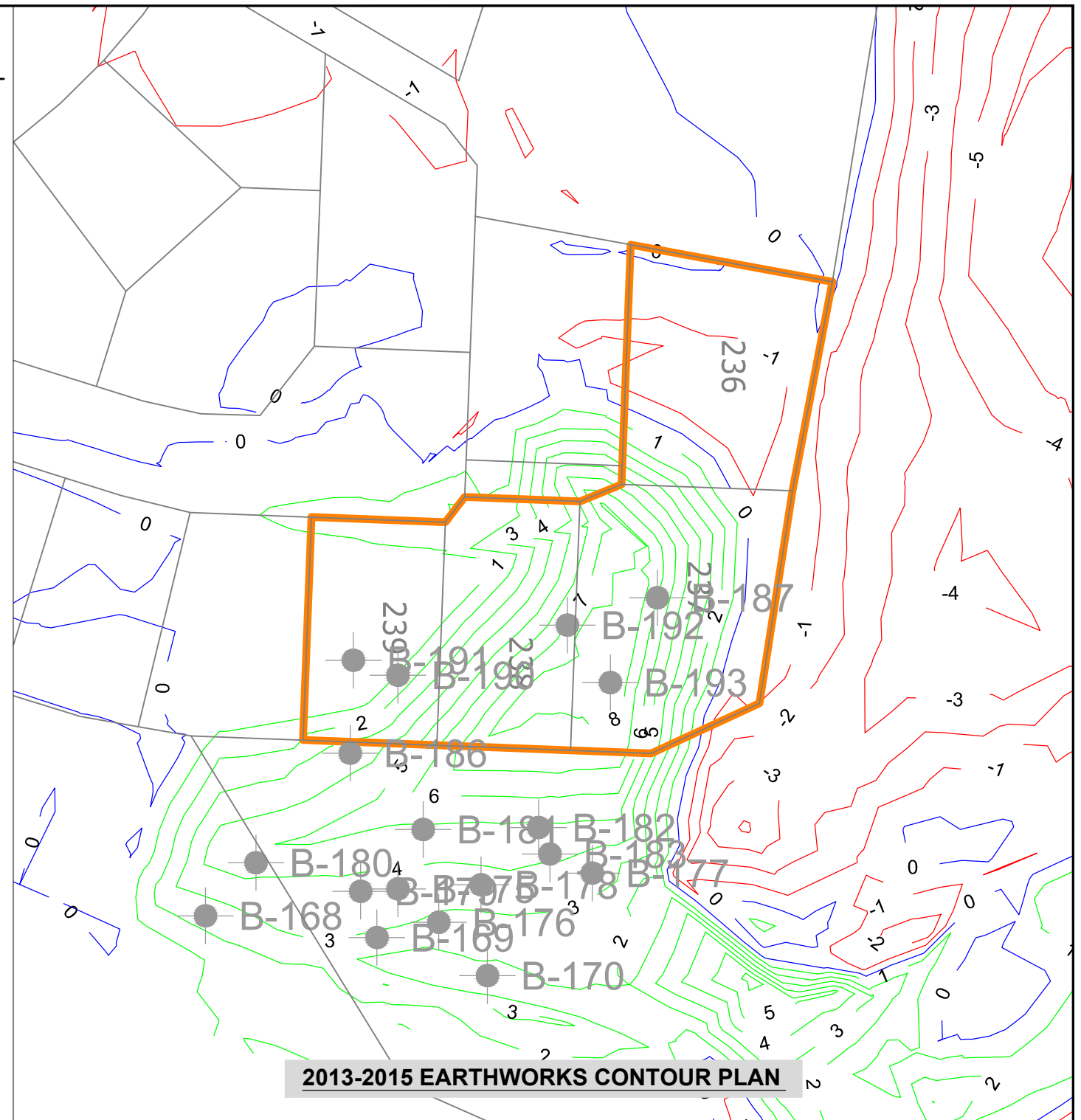
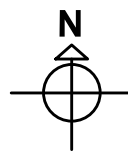
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original size	<b>A3</b>



client:	<b>The Lakes (2012) Ltd</b>		
project:	<b>The Lakes - Lots 236 to 239 of Stage 3D Geotechnical Completion Report</b>		
title:	<b>Original Contour &amp; 2007-2012 Earthworks Plan</b>		
project no:	<b>13086AP-AK</b>	figure no:	<b>4</b>
		rev:	<b>-</b>



**2012 CONTOUR PLAN**



**2013-2015 EARTHWORKS CONTOUR PLAN**

**NOTES:**

1. Contour data of 2012 landform from Harrison Grierson Consultants Ltd.
2. Contours shown at 1.0m intervals to Moturiki Datum.
3. Lot layout and numbering from Harrison Grierson Consultants Ltd, November 2016.

**NOTES:**

1. Cut/Fill contours show difference between 2012 and March 2016 surveys. Provided by Harrison Grierson Consultants Ltd. Contours are at 1m intervals.
2. Lot layout and numbering from Harrison Grierson Consultants Ltd, November 2016.

**LEGEND**

— EXTENT OF STAGES IN THIS GCR

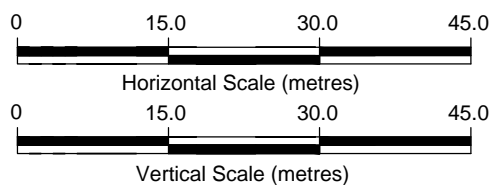
— CUT CONTOURS

● B-01 2014-2015 NDM TEST LOCATION (PASSED)

— FILL CONTOURS

● B-01 2014-2015 NDM TEST LOCATION (FAILED)

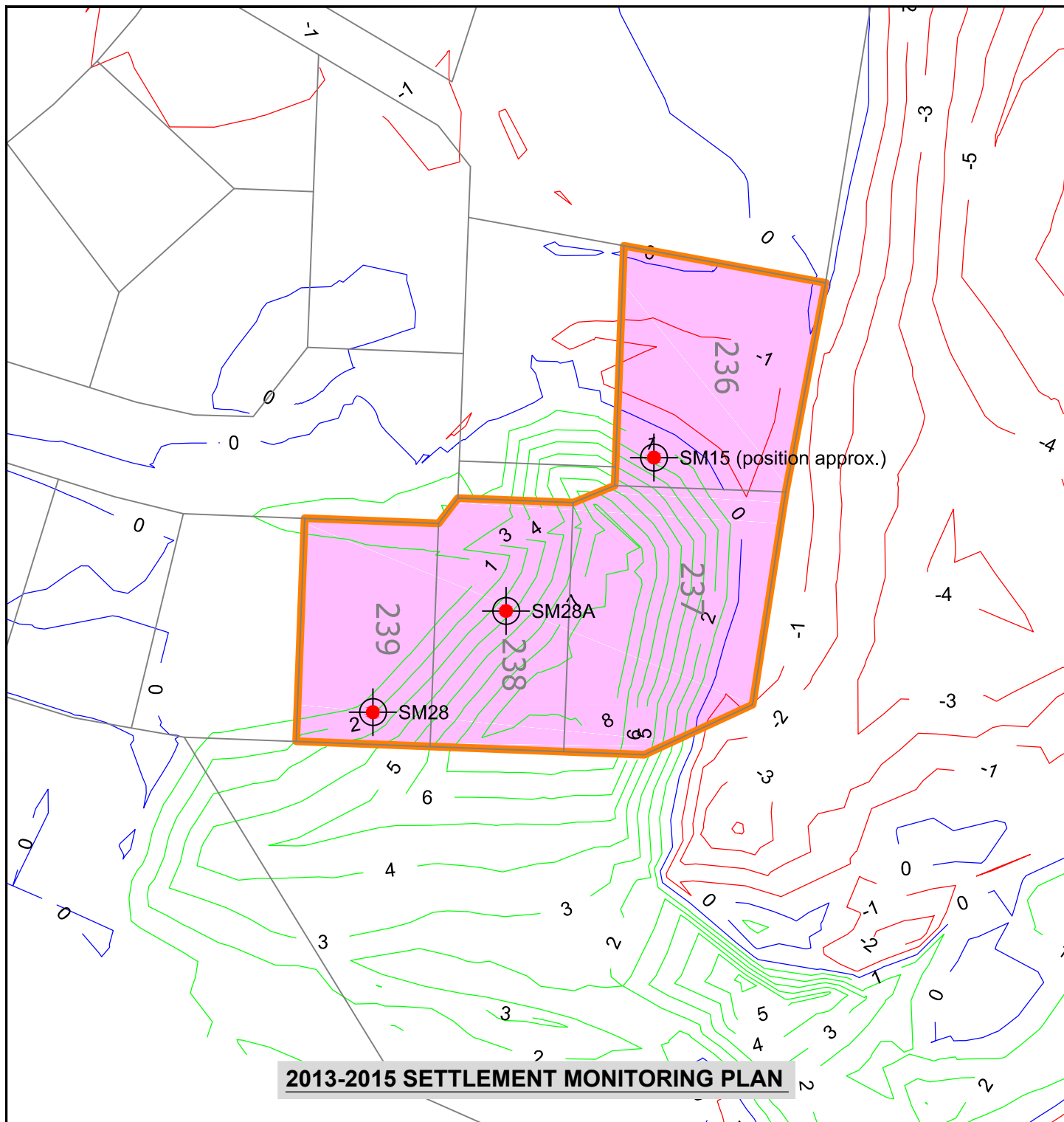
revision	rev	description	drawn	approved	date



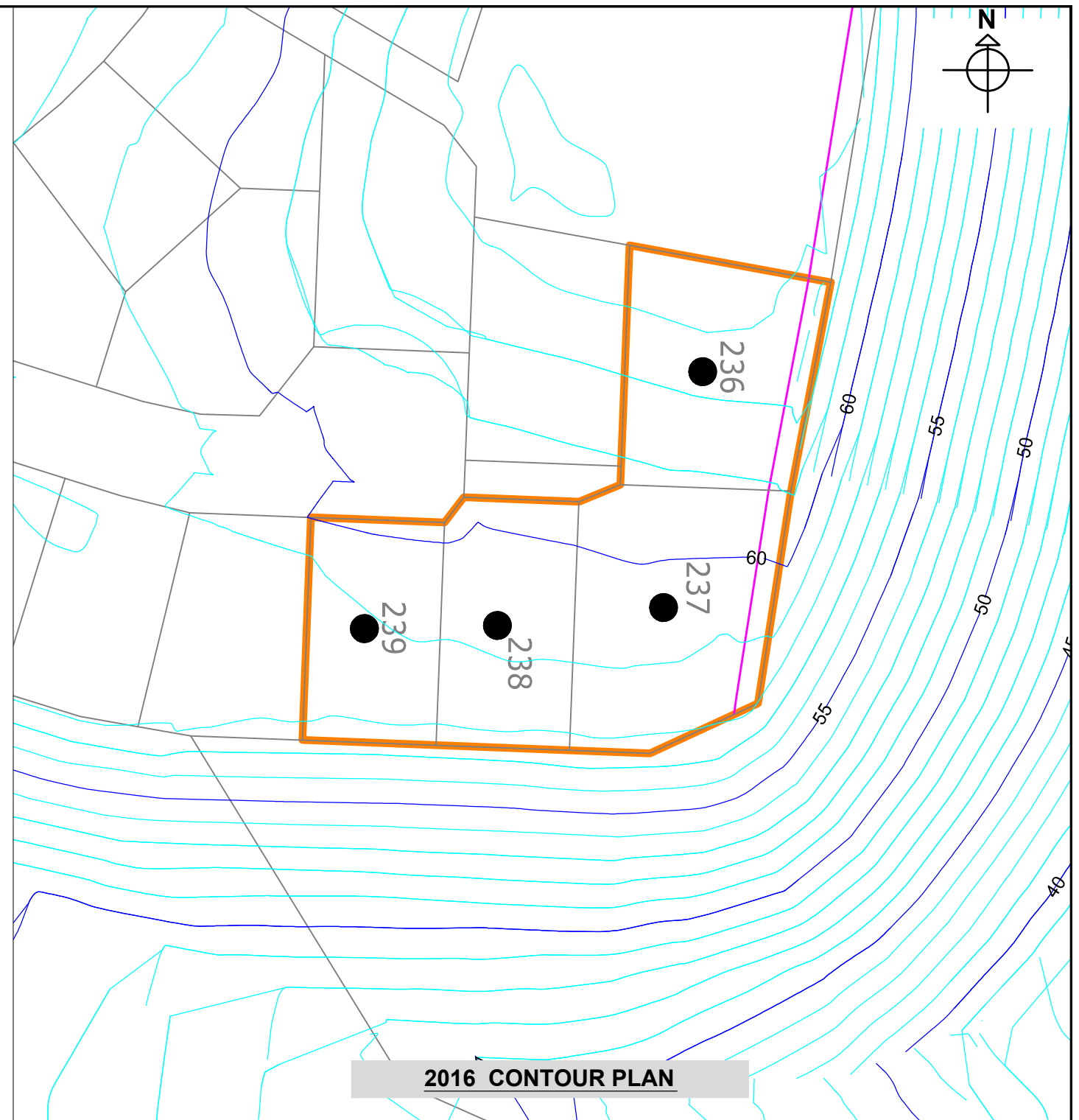
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approved	<b>RBT</b>
date	<b>17-2-2017</b>
scale	<b>1:750</b>
original size	<b>A3</b>



client:	<b>The Lakes (2012) Ltd</b>		
project:	<b>The Lakes - Lots 236 to 239 of Stage 3D Geotechnical Completion Report</b>		
title:	<b>2012 Contour &amp; 2013-2015 Earthworks Plan</b>		
project no:	<b>13086AP-AK</b>	figure no:	<b>5</b>
rev:	<b>-</b>		



**2013-2015 SETTLEMENT MONITORING PLAN**



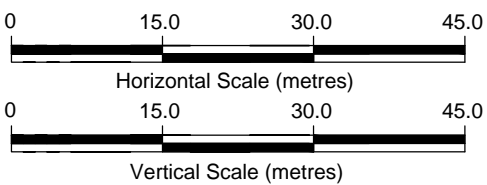
**2016 CONTOUR PLAN**

- NOTES:
1. Cut/Fill contours show difference between 2012 and March 2016 surveys. Provided by Harrison Grierson Consultants Ltd. Contours are at 1m intervals.
  2. Lot layout and numbering from Harrison Grierson Consultants Ltd, November 2016.
  3. Settlement Monitoring Point locations provided by Harrison Grierson Consultants Ltd.

- NOTES:
1. Contour data of March 2016 landform from Harrison Grierson Consultants Ltd.
  2. Contours shown at 1.0m intervals to Moturiki Datum.
  3. Lot layout and numbering from Harrison Grierson Consultants Ltd, November 2016.
  4. Hand auger boreholes are numbered according to the relevant lot number.

LEGEND	
	EXTENT OF STAGES IN THIS GCR
	SETTLEMENT MONITORING POINTS
	CUT CONTOURS
	FILL CONTOURS
	EXTENT OF 2m TOPSOIL PRELOAD
	BUILDING RESTRICTION LINE (BRL)
	HAND AUGER BOREHOLE LOCATIONS

revision	rev	description	drawn	approved	date



drawn	<b>DBC</b>
approved	<b>RBT</b>
date	<b>17-2-2017</b>
scale	<b>1:750</b>
original size	<b>A3</b>



client:	<b>The Lakes (2012) Ltd</b>		
project:	<b>The Lakes - Lots 236 to 239 of Stage 3D Geotechnical Completion Report</b>		
title:	<b>Settlement Monitoring &amp; 2016 Contour Plan</b>		
project no:	<b>13086AP-AK</b>	figure no:	<b>6</b>
rev:	<b>-</b>		

**Appendix B - Geotechnical Suitability Statement &  
Geotechnical Data Summary Table**

**STATEMENT OF PROFESSIONAL OPINION AS TO THE  
GEOTECHNICAL SUITABILITY OF LAND FOR BUILDING**

NAME OF SUBDIVISION	The Lakes Subdivision – Stages 3G, 3H & Lots 236-239 (Stage D)
COUNCIL FILE NUMBER RC No:	RC21332
ENGINEER RESPONSIBLE FOR DEVELOPMENT	Robert Telford
QUALIFICATIONS:	TCC Category 2 Geotechnical Engineer

I, Robert Telford of Coffey Services (NZ) Ltd, 96 Cameron Road, Tauranga, hereby confirm that:

- 1) I am a professional person, appropriately qualified with experience in geomechanics to ascertain the suitability of the land for building development and was retained as the Soils Engineer to the above development.
- 2) An appropriate level of site investigation and construction supervision has been carried out under my direction and is described in our development evaluation reports dated 29 April 2013, 7 April 2014 and 10 July 2015.
- 3) In my professional opinion, not to be construed as a guarantee, I consider that;
  - a) The areas shown in my report dated 17 February 2017 of each new allotment are suitable for the erection thereon of the building types appropriate to the zoning of the land, provided that reference is made to my Geotechnical Completion Report Ref. GENZTAUC13086AP-AK, dated 17 February 2017.
  - b) The earth fills shown on the attached Plans ref Figure 2, Figure 5 and Figure 6 have been placed in general accordance with the requirements of the Infrastructure Development Code.
  - c) The completed works give due regard to all land slope and foundation stability considerations.
  - d) The filled ground is suitable for the erection thereon of residential buildings not requiring specific design subject to the recommendations presented in my Geotechnical Completion Report Ref. GENZTAUC13086AP-AK, dated 17 February 2017.
  - e) The original ground not affected by filling is suitable for the erection thereon of residential buildings not requiring specific design subject to the recommendations presented in my Geotechnical Completion Report Ref. GENZTAUC13086AP-AK, dated 17 February 2017.
- 4) This professional opinion is furnished to the Council and the owner for their purposes alone, on the express condition that it will not be relied upon by any other person and does not remove the necessity for the normal inspection of foundation conditions at the time of erection for any dwelling.

Signed

Date: 17 February 2017



**PRODUCER STATEMENT  
SUITABILITY OF LAND FOR BUILDING DEVELOPMENT**

**INFRASTRUCTURE DEVELOPMENT CODE**

**G2**

VERSION 1  
July 2011

**1**



DP No:	Lot 1001 DP486181	Property Address	310 Lakes Boulevard, Pyes Pa	RC No:	21332													
Lot No:	Subsurface data		Foundations	Consent Notice	Comments													
	Area (m <sup>2</sup> )	Shear Strength (kPa) at 0.5m depth		Subdivision Filling		Natural Topography Unworked	Natural Topography Earthworked	Conventional Shallow Foundation to NZS 3604:2011	Specific Design	Building Restriction Line	S/W Specific Design	S/W Soakage	S/W Reticulate	Designated Building Platform	Minimum Building Platform	Compressible Soils	On-Site Effluent Disposal	
	Y/N	Depth (m)	Y/N	Y/N		Y/N/NA	Y/N/NA	Y/N/NA	Y/N/NA	Y/N/NA	Y/N/NA	Y/N/NA	Y/N/NA	Y/N/NA	Y/N/NA	Y/N/NA	Y/N/NA	
236	765	147	Y	5		N	Y	1	Y	N	Y	N	N	N	N	N	Y	Suitable for standard foundations designed in accordance with NZS 3604, as per Section 8.6 of Coffey GCR ref: GENZTAUC13086AP-AK.
237	894	DCP	Y	14		N	Y	1	Y	N	Y	N	N	N	N	N	Y	Development subject to fill depth restrictions per Section 8.2.3 of Coffey GCR ref:GENZTAUC13086AP-AK.
238	599	>240	Y	19		N	N	-	N	N	N	N	N	N	N	N	Y	Development subject to Slope BRL restrictions per Section 8.3.3 of Coffey GCR ref:GENZTAUC13086AP-AK.
239	540	>183	Y	16		N	Y	2	Y	N	Y	N	N	N	N	N	Y	Suitable for standard foundations designed in accordance with NZS 3604, as per Section 8.6 of Coffey GCR ref: GENZTAUC13086AP-AK.
413	605	190	N	-		N	Y	3	Y	N	Y	N	N	N	N	N	Y	Development subject to fill depth restrictions per Section 8.2.3 of Coffey GCR ref:GENZTAUC13086AP-AK.
414	487	N/T	N	-		N	Y	5	Y	N	Y	N	N	N	N	N	N	Suitable for standard foundations designed in accordance with NZS 3604, as per Section 8.6 of Coffey GCR ref: GENZTAUC13086AP-AK.
415	455	>202	N	-		N	Y	5	Y	N	Y	N	N	N	N	N	N	Development subject to Slope BRL restrictions per Section 8.3.3 of Coffey GCR ref:GENZTAUC13086AP-AK.



**SUMMARY OF GOTECHNICAL DATA FOR INDIVIDUAL LOTS**

**INFRASTRUCTURE DEVELOPMENT CODE**

<b>G3</b>	
VERSION 1	1
July 2011	











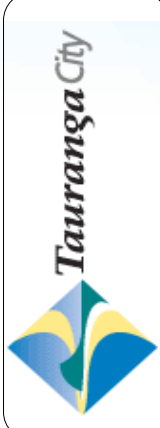








DP No:	Lot 1001 DP486181	Property Address	310 Lakes Boulevard, Pyes Pa	RC No:	21332									
Lot No:	Subsurface data		Foundations	Building Restriction Line	S/W Specific Design	S/W Soakage	S/W Reticulate	Designated Building Platform	Minimum Building Platform	Compressible Soils	On-Site Effluent Disposal	Consent Notice	Comments	
	Area (m <sup>2</sup> )	Shear Strength (kPa) at 0.5m depth			Subdivision Filling	Natural Topography Unworked	Natural Topography Earthworked	Conventional Shallow Foundation to NZS 3604:2011	Specific Design	Y/N/NA	Y/N/NA	Y/N/NA		Y/N/NA
	Y/N	Y/N	Y/N	Y/N	Y/N	Y/N	Y/N	Y/N	Y/N	Y/N	Y/N	Y/N	Y/N	
493	824	130	Y	<1	N	Y	1	Y	N	N	N	N	N	Suitable for standard foundations designed in accordance with NZS 3604, as per Section 8.6 of Coffey GCR ref: GENZTAUC13086AP-AK.
494	813	>202	Y	1	N	Y	<1	Y	N	N	N	N	N	Development subject to Slope BRL restrictions per Section 8.3.3 of Coffey GCR ref:GENZTAUC13086AP-AK.
495	840	>202	Y	2	N	N	-	N	N	N	N	N	N	Additional geotechnical investigation required if excavation depth >1.5m, as per Section 8.6 of Coffey GCR ref: GENZTAUC13086AP-AK.
496	753	N/T	Y	4	N	N	-	N	N	N	N	N	N	Suitable for standard foundations designed in accordance with NZS 3604, as per Section 8.6 of Coffey GCR ref: GENZTAUC13086AP-AK.
497	625	N/T	Y	4	N	N	-	N	N	N	N	N	N	Development subject to fill depth restrictions per Section 8.2.3 of Coffey GCR ref:GENZTAUC13086AP-AK.
498	718	N/T	Y	4	N	N	-	N	N	N	N	N	N	Development subject to Slope BRL restrictions per Section 8.3.3 of Coffey GCR ref:GENZTAUC13086AP-AK.
499	931	>202	Y	4	N	N	-	N	N	N	N	N	N	Additional geotechnical investigation required if excavation depth >1.5m, as per Section 8.6 of Coffey GCR ref: GENZTAUC13086AP-AK.
500	975	N/T	Y	4	N	N	-	N	N	N	N	N	N	
501	827	>202	Y	2	N	N	-	N	N	N	N	N	N	



**SUMMARY OF GOTECHNICAL DATA FOR INDIVIDUAL LOTS**

**INFRASTRUCTURE DEVELOPMENT CODE**

**G3**

VERSION 1

1

July 2011



## **Appendix C - Pre Development Investigation Data**

Trial Pit No. **TP06**  
 Sheet 1 of 1  
 Project No: **GENZTAUC13086AF**  
 Date started: **14.3.2013**  
 Date completed: **14.3.2013**  
 Logged by: **KB**  
 Checked by: **RBT**

# Engineering Log - Trial Pit

Client: **THE LAKES 2012 LTD**  
 Principal:  
 Project: **THE LAKES STAGE 3 CONSTRUCTION**  
 Trial pit location: **Refer to site plan**

Equipment type: Pit Orientation: Easting: 368704.4 m R.L. Surface:  
 Excavation dimensions: m long m wide Vane No: DR2244 Northing: 799943.7 m Datum:

excavation information				material substance							
stratigraphy	water	notes samples, tests, etc	RL	depth metres	graphic log	classification symbol	material	moisture condition	consistency/density index	vane shear (remoulded) (kPa)	structure and additional observations
Younger Ash	Groundwater not encountered	Sample 17		1		OL	TOPSOIL	D			
		Sample 18		1		ML	SILT; light brown. Friable and dry.				
		Sample 19		2		ML	- becoming orange brown and moist below 1.0m.	M			
		Sample 19		2		ML	SILT with trace fine sand and clay; orange brown. Greasy when reworked.				
		Sample 20		3		SP	SILT with minor sand and trace clay; bright orange. Low plasticity.				
Hamilton Ash	Groundwater not encountered	Sample 20		3		SP	Fine to coarse SAND with trace silt; orange brown. Occasional silty lenses. Sand is well graded.				
		Sample 21		4		ML	- becoming white/light brown below 3.2m.				UTP
		Sample 21		4		ML	Clayey SILT; brown. Medium plasticity, very stiff, greasy when reworked.				
				5			- becoming orange brown and less stiff.				
				6			(Target depth) RA = Rotoehu Ash Test pit TP06 terminated at 5 metres.				

Sketch

<b>classification symbols and soil description</b> based on New Zealand Geotechnical Society Inc 2005	<b>vane shear (kPa)</b> ● remoulded × peak >>× peak greater than 200kPa UTP unable to penetrate  <b>water</b> 10/1/98 water level on date shown water inflow water outflow	<b>moisture</b> D dry M moist W wet S saturated	<b>consistency/ density index</b> VS very soft VL very loose S soft L loose F firm MD medium dense St stiff D dense VSt very stiff VD very dense H hard
<b>notes, samples, tests</b> U <sub>50</sub> undisturbed sample 50mm diameter U <sub>63</sub> undisturbed sample 63mm diameter D disturbed sample Bs bulk sample E environmental sample R refusal			

TRIAL PIT TEST PITS 150313.GPJ COFFEY.GDT 29.4.13

Trial Pit No. **TP07**  
 Sheet 1 of 1  
 Project No: **GENZTAUC13086AF**  
 Date started: **14.3.2013**  
 Date completed: **14.3.2013**  
 Logged by: **KB**  
 Checked by: **RBT**

# Engineering Log - Trial Pit

Client: **THE LAKES 2012 LTD**  
 Principal:  
 Project: **THE LAKES STAGE 3 CONSTRUCTION**  
 Trial pit location: **Refer to site plan**

Equipment type: Pit Orientation: Easting: 368767.5 m R.L. Surface:  
 Excavation dimensions: m long m wide Vane No: DR2244 Northing: 799923.9 m Datum:

excavation information				material substance							
stratigraphy	water	notes samples, tests, etc	RL	depth metres	graphic log	classification symbol	material	moisture condition	consistency/density index	vane shear (remoulded) (peak) kPa	structure and additional observations
Younger Ash	Groundwater not encountered	Sample 22		0		OL	TOPSOIL	D			
		Sample 23		1		ML	SILT; light brown. Friable and dry.	M			
		Sample 24		2		ML	SILT with trace sand and clay; orange brown. Greasy when reworked.				
				2		ML	SILT with minor sand; bright orange.				
				3		SP	Fine to coarse SAND with trace silt; orange brown. Pumiceous, well graded.				
				3			- becoming light brown/white below 3.1m.				
RA	Groundwater not encountered	Sample 25		4		ML	Clayey SILT; brown. Medium plasticity and greasy when reworked.				
HA		Sample 26		5			- becoming orange brown below 4.0m.				
				6			(Target depth) RA = Rotoehu Ash HA = Hamilton Ash Test pit TP07 terminated at 5 metres.				

Sketch

<b>classification symbols and soil description</b> based on New Zealand Geotechnical Society Inc 2005	<b>vane shear (kPa)</b> ● remoulded × peak >>× peak greater than 200kPa UTP unable to penetrate  <b>water</b> 10/1/98 water level on date shown water inflow water outflow	<b>moisture</b> D dry M moist W wet S saturated	<b>consistency/ density index</b> VS very soft VL very loose S soft L loose F firm MD medium dense St stiff D dense VSt very stiff VD very dense H hard
<b>notes, samples, tests</b> U <sub>50</sub> undisturbed sample 50mm diameter U <sub>63</sub> undisturbed sample 63mm diameter D disturbed sample Bs bulk sample E environmental sample R refusal			

TRIAL PIT TEST PITS 150813.GPJ COFFEY.GDT 29.4.13

Trial Pit No. **TP08**  
 Sheet 1 of 1  
 Project No: **GENZTAUC13086AF**  
 Date started: **15.3.2013**  
 Date completed: **15.3.2013**  
 Logged by: **RBT**  
 Checked by: **RBT**

# Engineering Log - Trial Pit

Client: **THE LAKES 2012 LTD**  
 Principal:  
 Project: **THE LAKES STAGE 3 CONSTRUCTION**  
 Trial pit location: **Refer to site plan**

Equipment type: Pit Orientation: Easting: 368724 m R.L. Surface:  
 Excavation dimensions: m long m wide Vane No: DR2244 Northing: 799993 m Datum:

excavation information				material substance							
stratigraphy	water	notes samples, tests, etc	RL	depth metres	graphic log	classification symbol	material	moisture condition	consistency/ density index	vane shear (remoulded) (peak) kPa	structure and additional observations
Younger Ash	Groundwater not encountered	Sample 27		1		OL	Organic SILT with numerous fine rootlets; greyish brown.	D			
		Sample 28		1.5		ML	SILT with trace to minor clay, some fine rootlets; yellowish brown. Stiff, dry, friable.  - becoming moist, minor clay, occasional rootlets below 1.0m. - becoming mottled yellow/orange brown below 1.3m.	M			
		Sample 29		2		SP	Fine to coarse SAND with trace silt; yellow/brown with black flecks.  - trace very fine sand, moist below 1.7m.				
		Sample 30		3		SP	Fine to medium SAND with minor silt; pale yellow/white. Pockets rework to soft sandy silt with some clay, slightly plastic.	M-W			
		Sample 31		4		CL	Silty CLAY; chocolate brown with white flecks. Stiff to very stiff in-situ, soft and with medium to high plasticity when reworked.				
		Sample 31		4.5		ML	SILT with trace clay and trace fine sand; yellowish brown. Very stiff to hard, non plastic and moist.				
		Sample 32		5.2		ML	SILT with minor clay; orangish brown. Reworks to silty clay, moderately plastic, soft to firm.				
(Target depth) RA = Rotoehu Ash HA = Hamilton Ash Test pit TP08 terminated at 5.2 metres.											

Sketch

<b>classification symbols and soil description</b> based on New Zealand Geotechnical Society Inc 2005	<b>vane shear (kPa)</b> ● remoulded × peak >>> peak greater than 200kPa UTP unable to penetrate  <b>water</b> 10/1/98 water level on date shown water inflow water outflow	<b>moisture</b> D dry M moist W wet S saturated	<b>consistency/ density index</b> VS very soft VL very loose S soft L loose F firm MD medium dense St stiff D dense VSt very stiff VD very dense H hard
<b>notes, samples, tests</b> U <sub>50</sub> undisturbed sample 50mm diameter U <sub>63</sub> undisturbed sample 63mm diameter D disturbed sample Bs bulk sample E environmental sample R refusal			

# Engineering Log - Machine Borehole

Client: **THE LAKES LTD (2012)**

Date started: **7.3.2014**

Principal:

Date completed: **7.3.2014**

Project: **STAGE 3 - ZONE 2**

Logged by: **SLC**





Machine Borehole

Location: **Crest of western slope**

Checked by: **RBT**

Drill model & mounting: Flight auger JD2 Easting: 368826.5 m Slope: -90° R.L. Surface: 56 m Vane No:  
Hole diameter: 100 mm Drilling fluid: Northing: 799891.63 m Bearing: Datum: x/y = BOPC2000, z = Moturiki

drilling information				material substance										rock mass defects																												
stratigraphy	method	support	water	notes samples, tests, etc	RL	depth metres	graphic log	core recovery	classification symbol	Material Description	moisture condition	consistency/density index	weathering alteration	estimated strength					vane shear (remoulded /peak) kPa	recovery %	RQD %	defect spacing mm	defect description																			
										Soil name; plasticity or grading, colour, secondary components. Moisture, sensitivity, strength. Structure, bedding, cementation, defects. Origin, additional observations. Rock name; grain size & type, colour, fabric, inclusions & minor components. Weathering, moisture, strength, defects.				EW	VW	W	MS	S	VS	ES	25	50	75	100	125	150	175	30	100	300	1000	5000	number, type, orientation, shape, roughness, aperture, infill description (refer to defect description explanation sheet)									
	AD	N				55	1	XXXXXX		SILT, low plasticity, brown; trace fine sand.	D																															
VOLCANIC ASHES						54	2	XXXXXX		-2.0m, becoming pale brown.																																
										Sandy SILT, low plasticity, pale brown, sand is fine to medium.																																
HAMILTON ASH						53	3	XXXXXX		Clayey SILT, low plasticity, dark brown with some manganese inclusions.	D-M																															
										-4.5m, becoming brown.	M																															
						52	4	XXXXXX																																		
						51	5	XXXXXX																																		
						50	6	XXXXXX																																		

<b>method</b> AD auger drilling OB open barrel TT triple tube W washbore <b>support</b> N nil C casing <b>vane shear (kPa)</b> ● remoulded × peak >>× peak greater than 200kPa UTP unable to penetrate	<b>classification symbols and soil description</b> based on Field Description of Soil and Rock, New Zealand Geotechnical Society Inc 2005 <b>notes, samples, tests</b> U <sub>50</sub> undisturbed sample 50mm diameter U <sub>63</sub> undisturbed sample 63mm diameter D disturbed sample N* SPT - sample recovered Nc SPT with solid cone Bs bulk sample E environmental sample	<b>water</b>  10/1/98 water level on date shown  water inflow  partial drill fluid loss  complete drill fluid loss <b>moisture</b> D dry M moist W wet S saturated	<b>consistency/ density index</b> VS very soft S soft F firm St stiff VSt very stiff H hard VL very loose L loose MD medium dense D dense VD very dense	<b>weathering</b> UW unweathered SW slightly weathered MW moderately weathered HW highly weathered CW completely weathered RS residual soil <b>rock mass strength</b> EW extremely weak VW very weak W weak MS moderately strong S strong VS very strong ES extremely strong
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MACHINE BOREHOLE 13086AK\_INVESTIGATION DATA.GPJ COFFEY.GDT 28.3.14



# Engineering Log - Machine Borehole

 Client: **THE LAKES LTD (2012)**

 Date started: **7.3.2014**

Principal:

 Date completed: **7.3.2014**

 Project: **STAGE 3 - ZONE 2**

 Logged by: **SLC**

Machine Borehole

 Checked by: **RBT**

 Location: **Crest of western slope**

Drill model & mounting: Flight auger JD2	Easting: 368826.5 m	Slope: -90°	R.L. Surface: 56 m	Vane No:
Hole diameter: 100 mm	Drilling fluid:	Northing: 799891.63 m	Bearing:	Datum: x/y = BOPC2000, z = Moturiki

drilling information				material substance										rock mass defects																							
stratigraphy	method	support	water	notes samples, tests, etc	RL	depth metres	graphic log	core recovery	classification symbol	Material Description	moisture condition	consistency/density index	weathering alteration	estimated strength					vane shear (remoulded /peak) kPa	recovery %	RQD %	defect spacing mm	defect description														
										Soil name; plasticity or grading, colour, secondary components. Moisture, sensitivity, strength. Structure, bedding, cementation, defects. Origin, additional observations. Rock name; grain size & type, colour, fabric, inclusions & minor components. Weathering, moisture, strength, defects.				EW	VW	W	MS	S	VS	ES	25	50	75	100	125	150	175	30	100	300	1000	5000	number, type, orientation, shape, roughness, aperture, infill description (refer to defect description explanation sheet)				
	AD	N		SPT 1,2,2 N*=4	49	7	X			Clayey SILT, low plasticity, dark brown with some manganese inclusions. (continued) Clayey SILT, medium plasticity, pale brown with black flecks. Clayey SILT, medium plasticity, pale brown with black flecks. (continued) -6.5m, becoming sticky.	M																										
				SPT 1,2,2 N*=4	48	8	X			Sandy SILT, low plasticity, orange brown with black and pale grey flecks; some clay.	M-W																										
				SPT 0,0,0 N*=0	47	9	X			-8.5m, becoming cream brown, sticky, moist to wet, sand is fine to coarse.																											
				SPT 0,0,1 N*=1	46	10	X			Sandy SILT, low plasticity, pale brown grey with dark brown manganese inclusions, some clay.																											
					45	11	X																														
					44	12	X																														

<b>method</b> AD auger drilling OB open barrel TT triple tube W washbore <b>support</b> N nil C casing <b>vane shear (kPa)</b> ● remoulded × peak >>> peak greater than 200kPa UTP unable to penetrate	<b>classification symbols and soil description</b> based on Field Description of Soil and Rock, New Zealand Geotechnical Society Inc 2005 <b>notes, samples, tests</b> U <sub>50</sub> undisturbed sample 50mm diameter U <sub>63</sub> undisturbed sample 63mm diameter D disturbed sample N* SPT - sample recovered Nc SPT with solid cone Bs bulk sample E environmental sample	<b>water</b> ▼ 10/1/98 water level on date shown ▲ water inflow ▽ partial drill fluid loss ▲ complete drill fluid loss <b>moisture</b> D dry M moist W wet S saturated	<b>consistency/ density index</b> VS very soft S soft F firm St stiff VSt very stiff H hard VL very loose L loose MD medium dense D dense VD very dense	<b>weathering</b> UW unweathered SW slightly weathered MW moderately weathered HW highly weathered CW completely weathered RS residual soil <b>rock mass strength</b> EW extremely weak VW very weak W weak MS moderately strong S strong VS very strong ES extremely strong
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MACHINE BOREHOLE 13086AK\_INVESTIGATION DATA.GPJ COFFEY.GDT 28.3.14

# Engineering Log - Machine Borehole

 Client: **THE LAKES LTD (2012)**

 Date started: **7.3.2014**

Principal:

 Date completed: **7.3.2014**

 Project: **STAGE 3 - ZONE 2**

 Logged by: **SLC**

Machine Borehole

 Location: **Crest of western slope**

 Checked by: **RBT**

 Drill model & mounting: Flight auger JD2      Easting: 368826.5 m      Slope: -90°      R.L. Surface: 56 m      Vane No:  
 Hole diameter: 100 mm      Drilling fluid:      Northing: 799891.63 m      Bearing:      Datum: x/y = BOPC2000, z = Moturiki

drilling information				material substance										rock mass defects																						
stratigraphy	method	support	water	notes samples, tests, etc	RL	depth metres	graphic log	core recovery	classification symbol	Material Description	moisture condition	consistency/density index	weathering alteration	estimated strength					vane shear (remoulded /peak) kPa	recovery %	RQD %	defect spacing mm	defect description													
										Soil name; plasticity or grading, colour, secondary components. Moisture, sensitivity, strength. Structure, bedding, cementation, defects. Origin, additional observations. Rock name; grain size & type, colour, fabric, inclusions & minor components. Weathering, moisture, strength, defects.				EW	VW	W	MS	S	VS	ES	25	50	75	100	125	150	175	30	100	300	1000	3000	number, type, orientation, shape, roughness, aperture, infill description (refer to defect description explanation sheet)			
	AD	N		SPT 0,0,1 N*=1		43	13	X		Sandy SILT, low plasticity, pale brown grey with dark brown manganese inclusions, some clay. (continued)	M-W																									
				SPT 0,0,0 N*=0		42	14	X																												
			groundwater not encountered	SPT 0,0,0 N*=0		41	15	X		Clay SILT, medium plasticity, pale grey.	W																									
				SPT 0,0,0 N*=0		40	16	X																												
				SPT 0,0,0 N*=0		39	17	X																												
						38	18	X																												

<b>method</b> AD auger drilling OB open barrel TT triple tube W washbore <b>support</b> N nil C casing <b>vane shear (kPa)</b> ● remoulded × peak >>× peak greater than 200kPa UTP unable to penetrate	<b>classification symbols and soil description</b> based on Field Description of Soil and Rock, New Zealand Geotechnical Society Inc 2005 <b>notes, samples, tests</b> U <sub>50</sub> undisturbed sample 50mm diameter U <sub>63</sub> undisturbed sample 63mm diameter D disturbed sample N* SPT - sample recovered Nc SPT with solid cone Bs bulk sample E environmental sample	<b>water</b> ▼ 10/1/98 water level on date shown ▲ water inflow ▽ partial drill fluid loss ▲ complete drill fluid loss <b>moisture</b> D dry M moist W wet S saturated	<b>consistency/ density index</b> VS very soft S soft F firm St stiff VSt very stiff H hard VL very loose L loose MD medium dense D dense VD very dense	<b>weathering</b> UW unweathered SW slightly weathered MW moderately weathered HW highly weathered CW completely weathered RS residual soil <b>rock mass strength</b> EW extremely weak VW very weak W weak MS moderately strong S strong VS very strong ES extremely strong
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# Engineering Log - Machine Borehole

 Client: **THE LAKES LTD (2012)**

 Date started: **7.3.2014**

Principal:

 Date completed: **7.3.2014**

 Project: **STAGE 3 - ZONE 2**

 Logged by: **SLC**

Machine Borehole

 Location: **Crest of western slope**

 Checked by: **RBT**

Drill model & mounting: Flight auger JD2	Easting: 368826.5 m	Slope: -90°	R.L. Surface: 56 m	Vane No:
Hole diameter: 100 mm	Drilling fluid:	Northing: 799891.63 m	Bearing:	Datum: x/y = BOPC2000, z = Moturiki

drilling information				material substance										rock mass defects						
stratigraphy	method	support	water	notes samples, tests, etc	RL	depth metres	graphic log	core recovery	classification symbol	Material Description	moisture condition	consistency/density index	weathering alteration	estimated strength	vane shear (remoulded / peak) kPa	recovery %	RQD %	defect spacing mm	defect description	
MATUA SUB-GROUP	AD	N	groundwater not encountered	SPT 0,0,0 N*=0	37	19	[X pattern]			Clay SILT, medium plasticity, pale grey. (continued)	W					50				
				SPT 0,0,1 N*=1	20	20										60				
					36	20				EOBH, target depth. CFA04 terminated at 19.95 metres.										
					35	21														
					34	22														
					33	23														
					32	24														

<b>method</b> AD auger drilling OB open barrel TT triple tube W washbore <b>support</b> N nil C casing <b>vane shear (kPa)</b> ● remoulded × peak >>> peak greater than 200kPa UTP unable to penetrate	<b>classification symbols and soil description</b> based on Field Description of Soil and Rock, New Zealand Geotechnical Society Inc 2005 <b>notes, samples, tests</b> U <sub>50</sub> undisturbed sample 50mm diameter U <sub>63</sub> undisturbed sample 63mm diameter D disturbed sample N* SPT - sample recovered Nc SPT with solid cone Bs bulk sample E environmental sample	<b>water</b> ▽ 10/1/98 water level on date shown ▲ water inflow ▽ partial drill fluid loss ▲ complete drill fluid loss <b>moisture</b> D dry M moist W wet S saturated	<b>consistency/ density index</b> VS very soft S soft F firm St stiff VSt very stiff H hard VL very loose L loose MD medium dense D dense VD very dense	<b>weathering</b> UW unweathered SW slightly weathered MW moderately weathered HW highly weathered CW completely weathered RS residual soil <b>rock mass strength</b> EW extremely weak VW very weak W weak MS moderately strong S strong VS very strong ES extremely strong
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Machine Borehole No. **CFA05**

# Engineering Log - Machine Borehole

Sheet 1 of 4  
Project No: **GENZTAUC13086AK**

Client: **THE LAKES LTD (2012)**

Date started: **7.3.2014**

Principal:

Date completed: **7.3.2014**

Project: **STAGE 3 - ZONE 2**

Logged by: **SLC**

Machine Borehole Location: **Crest of western slope**

Checked by: **RBT**

Drill model & mounting: Flight auger JD2 Easting: 368826.5 m Slope: -90° R.L. Surface: 51 m Vane No:  
Hole diameter: 100 mm Drilling fluid: Northing: 800012.1 m Bearing: Datum: x/y = BOPC2000, z = Moturiki

drilling information				material substance										rock mass defects																											
stratigraphy	method	support	water	notes samples, tests, etc	RL	depth metres	graphic log	core recovery	classification symbol	Material Description	moisture condition	consistency/density index	weathering alteration	estimated strength					vane shear (remoulded /peak) kPa	recovery %	RQD %	defect spacing mm	defect description																		
										Soil name; plasticity or grading, colour, secondary components. Moisture, sensitivity, strength. Structure, bedding, cementation, defects. Origin, additional observations. Rock name; grain size & type, colour, fabric, inclusions & minor components. Weathering, moisture, strength, defects.				EW	VW	W	MS	S	VS	ES	25	50	75	100	125	150	175	30	100	300	1000	5000	number, type, orientation, shape, roughness, aperture, infill description (refer to defect description explanation sheet)								
	AD	N								SILT, low plasticity, brown; trace fine sand.	D																														
VOLCANIC ASHES				groundwater not encountered		50	1																																		
						49	2																																		
						48	3							Silty SAND, fine to coarse, pale brown.	M																										
						47	4							Sandy SILT, non plastic, pale brown with orange brown mottles, sand is fine to medium. Reworks to low plasticity.																											
						46	5							Silty SAND, fine to medium, dark brown.																											
						45	6							Sandy SILT, low plasticity, dark brown (non organic), some clay, sand is fine to coarse (possible remnants of lower Hamilton Ash). -4.5m, becoming pale brown.																											
MATUA SUB-GROUP										Silty SAND, fine to medium, pale brown, pumiceous.	W																														
										Sandy SILT, low plasticity, pale grey brown, wet, sand is fine to coarse. -5.3m, dark brown and orange brown mottles and streaks.																															
										Clayey SILT, low to medium plasticity, pale grey.	M																														

<b>method</b> AD auger drilling OB open barrel TT triple tube W washbore <b>support</b> N nil C casing <b>vane shear (kPa)</b> ● remoulded × peak >>× peak greater than 200kPa UTP unable to penetrate	<b>classification symbols and soil description</b> based on Field Description of Soil and Rock, New Zealand Geotechnical Society Inc 2005 <b>notes, samples, tests</b> U <sub>50</sub> undisturbed sample 50mm diameter U <sub>63</sub> undisturbed sample 63mm diameter D disturbed sample N* SPT - sample recovered Nc SPT with solid cone Bs bulk sample E environmental sample	<b>water</b> ▼ 10/1/98 water level on date shown ▲ water inflow ▽ partial drill fluid loss ▲ complete drill fluid loss <b>moisture</b> D dry M moist W wet S saturated	<b>consistency/ density index</b> VS very soft S soft F firm St stiff VSt very stiff H hard VL very loose L loose MD medium dense D dense VD very dense	<b>weathering</b> UW unweathered SW slightly weathered MW moderately weathered HW highly weathered CW completely weathered RS residual soil <b>rock mass strength</b> EW extremely weak VW very weak W weak MS moderately strong S strong VS very strong ES extremely strong
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MACHINE BOREHOLE 13086AK\_INVESTIGATION DATA.GPJ COFFEY.GDT 28.3.14

# Engineering Log - Machine Borehole

Client: **THE LAKES LTD (2012)**

Date started: **7.3.2014**

Principal:

Date completed: **7.3.2014**

Project: **STAGE 3 - ZONE 2**

Logged by: **SLC**





Machine Borehole

Location: **Crest of western slope**

Checked by: **RBT**

Drill model & mounting: Flight auger JD2	Easting: 368826.5 m	Slope: -90°	R.L. Surface: 51 m	Vane No:
Hole diameter: 100 mm	Drilling fluid:	Northing: 800012.1 m	Bearing:	Datum: x/y = BOPC2000, z = Moturiki

drilling information				material substance										rock mass defects																				
stratigraphy	method	support	water	notes samples, tests, etc	RL	depth metres	graphic log	core recovery	classification symbol	Material Description	moisture condition	consistency/density index	weathering alteration	estimated strength					vane shear (remoulded /peak) kPa	recovery %	RQD %	defect spacing mm	defect description											
										Soil name; plasticity or grading, colour, secondary components. Moisture, sensitivity, strength. Structure, bedding, cementation, defects. Origin, additional observations. Rock name; grain size & type, colour, fabric, inclusions & minor components. Weathering, moisture, strength, defects.				EW	VW	W	MS	S	VS	ES	25	50	75	100	125	150	175	30	100	300	1000	5000	number, type, orientation, shape, roughness, aperture, infill description (refer to defect description explanation sheet)	
	AD	N				44	7			Clayey SILT, low to medium plasticity, pale grey. <i>(continued)</i> -6.0m, becoming medium plasticity.	M																							
										-7.5m, some manganese inclusions.																								
						43	8			-7.8m, becoming brown orange with pale grey and dark brown manganese inclusions.																								
						42	9																											
						41	10			-9.4m, becoming very dark brown with brown, pale brown, orange brown and pale grey mottles. Manganese rich lense @ <80%.																								
						40	11			SILT, medium plasticity, orange, some clay and medium to coarse sand.																								
						39	12			-11.6m, becoming brown with dark brown manganese deposits.																								

<b>method</b> AD auger drilling OB open barrel TT triple tube W washbore <b>support</b> N nil C casing <b>vane shear (kPa)</b> ● remoulded × peak >>> peak greater than 200kPa UTP unable to penetrate	<b>classification symbols and soil description</b> based on Field Description of Soil and Rock, New Zealand Geotechnical Society Inc 2005 <b>notes, samples, tests</b> U <sub>50</sub> undisturbed sample 50mm diameter U <sub>63</sub> undisturbed sample 63mm diameter D disturbed sample N* SPT - sample recovered Nc SPT with solid cone Bs bulk sample E environmental sample	<b>water</b>  10/1/98 water level on date shown  water inflow  partial drill fluid loss  complete drill fluid loss <b>moisture</b> D dry M moist W wet S saturated	<b>consistency/ density index</b> VS very soft S soft F firm St stiff VSt very stiff H hard VL very loose L loose MD medium dense D dense VD very dense	<b>weathering</b> UW unweathered SW slightly weathered MW moderately weathered HW highly weathered CW completely weathered RS residual soil <b>rock mass strength</b> EW extremely weak VW very weak W weak MS moderately strong S strong VS very strong ES extremely strong
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MACHINE BOREHOLE 13086AK\_INVESTIGATION DATA.GPJ COFFEY.GDT 28.3.14

# Engineering Log - Machine Borehole

 Client: **THE LAKES LTD (2012)**

 Date started: **7.3.2014**

Principal:

 Date completed: **7.3.2014**

 Project: **STAGE 3 - ZONE 2**

 Logged by: **SLC**

Machine Borehole

 Location: **Crest of western slope**

 Checked by: **RBT**

 Drill model & mounting: Flight auger JD2      Easting: 368826.5 m      Slope: -90°      R.L. Surface: 51 m      Vane No:  
 Hole diameter: 100 mm      Drilling fluid:      Northing: 800012.1 m      Bearing:      Datum: x/y = BOPC2000, z = Moturiki

drilling information				material substance										rock mass defects																							
stratigraphy	method	support	water	notes samples, tests, etc	RL	depth metres	graphic log	core recovery	classification symbol	Material Description	moisture condition	consistency/density index	weathering alteration	estimated strength					vane shear (remoulded /peak) kPa	recovery %	RQD %	defect spacing mm	defect description														
										Soil name; plasticity or grading, colour, secondary components. Moisture, sensitivity, strength. Structure, bedding, cementation, defects. Origin, additional observations. Rock name; grain size & type, colour, fabric, inclusions & minor components. Weathering, moisture, strength, defects.				EW	VW	W	MS	S	VS	ES	25	50	75	100	125	150	175		30	100	300	1000	3000	number, type, orientation, shape, roughness, aperture, infill description (refer to defect description explanation sheet)			
	AD	N				38	13	X		Sandy SILT, non plastic, brown, wet, sand is fine to coarse.	W																										
										-13.0m, sand fraction increasing.																											
										-13.5m, low plasticity.																											
						37	14	X																													
						36	15	X																													
				SPT 0,1,2 N*=3						-15.0m, becoming brown with dark brown manganese mottles.																											
						35	16	X																													
				SPT 0,2,5 N*=7						-16.5m, poor recovery.																											
						34	17	X																													
						33	18	X																													

<b>method</b> AD auger drilling OB open barrel TT triple tube W washbore <b>support</b> N nil C casing <b>vane shear (kPa)</b> ● remoulded × peak >>> peak greater than 200kPa UTP unable to penetrate	<b>classification symbols and soil description</b> based on Field Description of Soil and Rock, New Zealand Geotechnical Society Inc 2005 <b>notes, samples, tests</b> U <sub>50</sub> undisturbed sample 50mm diameter U <sub>63</sub> undisturbed sample 63mm diameter D disturbed sample N* SPT - sample recovered Nc SPT with solid cone Bs bulk sample E environmental sample	<b>water</b> ▼ 10/1/98 water level on date shown ▲ water inflow ▽ partial drill fluid loss ▲ complete drill fluid loss <b>moisture</b> D dry M moist W wet S saturated	<b>consistency/ density index</b> VS very soft S soft F firm St stiff VSt very stiff H hard VL very loose L loose MD medium dense D dense VD very dense	<b>weathering</b> UW unweathered SW slightly weathered MW moderately weathered HW highly weathered CW completely weathered RS residual soil <b>rock mass strength</b> EW extremely weak VW very weak W weak MS moderately strong S strong VS very strong ES extremely strong
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Machine Borehole No. **CFA05**

# Engineering Log - Machine Borehole

Sheet 4 of 4  
Project No: **GENZTAUC13086AK**

Client: **THE LAKES LTD (2012)**

Date started: **7.3.2014**

Principal:

Date completed: **7.3.2014**

Project: **STAGE 3 - ZONE 2**

Logged by: **SLC**

Machine Borehole Location: **Crest of western slope**

Checked by: **RBT**

Drill model & mounting: Flight auger JD2 Easting: 368826.5 m Slope: -90° R.L. Surface: 51 m Vane No:  
Hole diameter: 100 mm Drilling fluid: Northing: 800012.1 m Bearing: Datum: x/y = BOPC2000, z = Moturiki

drilling information				material substance										rock mass defects						
stratigraphy	method	support	water	notes samples, tests, etc	RL	depth metres	graphic log	core recovery	classification symbol	Material Description	moisture condition	consistency/density index	weathering alteration	estimated strength	vane shear (remoulded /peak) kPa	recovery %	RQD %	defect spacing mm	defect description	
MATUA SUB-GROUP	AD	N	groundwater not encountered	SPT 0,2,3 N*=5	32	19	[X pattern]			Sandy Clayey SILT, medium plasticity, brown and grey with dark brown manganese deposits, sand is medium to coarse. (continued)	W					95				
				SPT 1,1,2 N*=3	20	20				Silty CLAY, medium to high plasticity, pale grey. - no recovery below 19.4m. Silty CLAY continuation inferred below 19.										
					31	20				EOBH, target depth. CFA05 terminated at 19.95 metres.										
					30	21														
					29	22														
					28	23														
					27	24														

<b>method</b> AD auger drilling OB open barrel TT triple tube W washbore <b>support</b> N nil C casing <b>vane shear (kPa)</b> ● remoulded × peak >>× peak greater than 200kPa UTP unable to penetrate	<b>classification symbols and soil description</b> based on Field Description of Soil and Rock, New Zealand Geotechnical Society Inc 2005 <b>notes, samples, tests</b> U <sub>50</sub> undisturbed sample 50mm diameter U <sub>63</sub> undisturbed sample 63mm diameter D disturbed sample N* SPT - sample recovered Nc SPT with solid cone Bs bulk sample E environmental sample	<b>water</b> ▽ 10/1/98 water level on date shown ▽ water inflow ▽ partial drill fluid loss ▽ complete drill fluid loss <b>moisture</b> D dry M moist W wet S saturated	<b>consistency/ density index</b> VS very soft S soft F firm St stiff VSt very stiff H hard VL very loose L loose MD medium dense D dense VD very dense	<b>weathering</b> UW unweathered SW slightly weathered MW moderately weathered HW highly weathered CW completely weathered RS residual soil <b>rock mass strength</b> EW extremely weak VW very weak W weak MS moderately strong S strong VS very strong ES extremely strong
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MACHINE BOREHOLE 13086AK\_INVESTIGATION DATA.GPJ COFFEY.GDT 28.3.14

Form GEO 5.3 Rev.6

# Engineering Log - Machine Borehole

 Client: **THE LAKES LTD (2012)**

 Date started: **15.1.2014**

Principal:

 Date completed: **15.1.2014**

 Project: **STAGE 3 - ZONE 2**

 Logged by: **KMJ**

Machine Borehole

 Checked by: **RBT**

 Location: **Crest of Section A-A**

Drill model & mounting: T2 Tractor Mount	Easting: 368841.822 m	Slope: -90°	R.L. Surface: 53 m	Vane No:
Hole diameter: mm	Drilling fluid:	Northing: 799939.797 m	Bearing:	Datum: x/y = BOPC2000, z = Moturiki

drilling information				material substance										rock mass defects					
stratigraphy	method	support	water	notes samples, tests, etc	RL	depth metres	graphic log	core recovery	classification symbol	Material Description	moisture condition	consistency/density index	weathering alteration	estimated strength	vane shear (remoulded / peak) kPa	recovery %	RQD %	defect spacing mm	defect description
TP	TT	C				52.5	0.5	XXXXXX	OL	Organic SILT, no plasticity, organic odor, rootlets (TOPSOIL).	M	F							
						52.0	1.0	XXXXXX	ML	SILT, no plasticity, yellow-brown, trace fine sand, minor rootlets.  - becoming orange-brown, low plasticity						67			
				SPT 1.0,1 N*=1		51.5	1.5	XXXXXX		- becoming pale brown & wet, trace rootlets - increasing plasticity from 1.5 to 2.6m	M-W								
						51.0	2.0	XXXXXX								100			
						50.5	2.5	XXXXXX		- becoming brown to orange-brown, black specks									
				SPT 1.1,0 N*=1		50.0	3.0	XXXXXX											
						49.5	3.5	XXXXXX								100			
						49.0	4.0	XXXXXX		- increasing sand content									
						48.5	4.5	XXXXXX	SP	SAND, fine to medium grained, pale grey, black & white specks, some silt.									
				SPT 9,11,8 N*=19		48.0	5.0	XXXXXX	ML	Sandy SILT, no plasticity, yellow-brown, white & black specks, sand is fine grained.	W	F-St							
						47.5	5.5	XXXXXX	ML	SILT, pink-grey, low plasticity, minor orange streaks.						93			
								XXXXXX	SP										

<b>method</b> AD auger drilling OB open barrel TT triple tube W washbore <b>support</b> N nil C casing <b>vane shear (kPa)</b> ● remoulded × peak >>> peak greater than 200kPa UTP unable to penetrate	<b>classification symbols and soil description</b> based on Field Description of Soil and Rock, New Zealand Geotechnical Society Inc 2005  <b>notes, samples, tests</b> U <sub>50</sub> undisturbed sample 50mm diameter U <sub>63</sub> undisturbed sample 63mm diameter D disturbed sample N* SPT - sample recovered Nc SPT with solid cone Bs bulk sample E environmental sample	<b>water</b> ▼ 10/1/98 water level on date shown ▲ water inflow ▽ partial drill fluid loss ▲ complete drill fluid loss  <b>moisture</b> D dry M moist W wet S saturated	<b>consistency/ density index</b> VS very soft S soft F firm St stiff VSt very stiff H hard VL very loose L loose MD medium dense D dense VD very dense	<b>weathering</b> UW unweathered SW slightly weathered MW moderately weathered HW highly weathered CW completely weathered RS residual soil <b>rock mass strength</b> EW extremely weak VW very weak W weak MS moderately strong S strong VS very strong ES extremely strong
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MACHINE BOREHOLE 13086AK\_INVESTIGATION DATA.GPJ COFFEY.GDT 28.3.14



# Engineering Log - Machine Borehole

 Client: **THE LAKES LTD (2012)**

 Date started: **15.1.2014**

Principal:

 Date completed: **15.1.2014**

 Project: **STAGE 3 - ZONE 2**

 Logged by: **KMJ**

Machine Borehole

 Checked by: **RBT**

 Location: **Crest of Section A-A**

 Drill model & mounting: T2 Tractor Mount      Easting: 368841.822 m      Slope: -90°      R.L. Surface: 53 m      Vane No:  
 Hole diameter: mm      Drilling fluid:      Northing: 799939.797 m      Bearing:      Datum: x/y = BOPC2000, z = Moturiki

drilling information				material substance										rock mass defects																									
stratigraphy	method	support	water	notes samples, tests, etc	RL	depth metres	graphic log	core recovery	classification symbol	Material Description	moisture condition	consistency/density index	weathering alteration	estimated strength					vane shear (remoulded /peak) kPa	recovery %	RQD %	defect spacing mm	defect description																
										Soil name; plasticity or grading, colour, secondary components. Moisture, sensitivity, strength. Structure, bedding, cementation, defects. Origin, additional observations. Rock name; grain size & type, colour, fabric, inclusions & minor components. Weathering, moisture, strength, defects.				EW	VW	W	MS	S	VS	ES	25	50	75	100	125	150	175	30	100	300	1000	3000	number, type, orientation, shape, roughness, aperture, infill description (refer to defect description explanation sheet)						
VOLCANIC ASHES	TT	C				47.0	6.0		SP (cont)	SAND, fine to medium grained, brown, mottled orange/black/white. (continued)	W	VL										93																	
				SPT 1,1,0 N*=1	46.5	6.5				CH	Clayey SILT/Silty CLAY, medium to high plasticity, trace fine sand. - sand pockets, fine grained from 6.6 to 6.7m		F											100															
MATUA SUBGROUP						46.0	7.0			- increasing sand content from 8 to 8.5m																													
				SPT 0,1,1 N*=2	45.5	7.5					- becoming pale grey, minor yellow-green mottles from 8.5 to 8.7m		D-M																										
				SPT 2,3,4 N*=7	44.0	9.0						- becoming dry to moist, non to low plasticity from 8.7m																											
				SPT 1,1,1 N*=2	43.5	9.5						- pale orange staining from 10.3 to 10.5m		M-W																									
					42.0	11.0			ML	SILT, low plasticity, pink-grey, mottled orange-brown, black specks.																													

<b>method</b> AD auger drilling OB open barrel TT triple tube W washbore <b>support</b> N nil C casing <b>vane shear (kPa)</b> ● remoulded × peak >>> peak greater than 200kPa UTP unable to penetrate	<b>classification symbols and soil description</b> based on Field Description of Soil and Rock, New Zealand Geotechnical Society Inc 2005 <b>notes, samples, tests</b> U <sub>50</sub> undisturbed sample 50mm diameter U <sub>63</sub> undisturbed sample 63mm diameter D disturbed sample N* SPT - sample recovered Nc SPT with solid cone Bs bulk sample E environmental sample	<b>water</b> ▼ 10/1/98 water level on date shown ▲ water inflow ▲ partial drill fluid loss ▲ complete drill fluid loss <b>moisture</b> D dry M moist W wet S saturated	<b>consistency/ density index</b> VS very soft S soft F firm St stiff VSt very stiff H hard VL very loose L loose MD medium dense D dense VD very dense	<b>weathering</b> UW unweathered SW slightly weathered MW moderately weathered HW highly weathered CW completely weathered RS residual soil <b>rock mass strength</b> EW extremely weak VW very weak W weak MS moderately strong S strong VS very strong ES extremely strong
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# Engineering Log - Machine Borehole

 Client: **THE LAKES LTD (2012)**

 Date started: **15.1.2014**

Principal:

 Date completed: **15.1.2014**

 Project: **STAGE 3 - ZONE 2**

 Logged by: **KMJ**

Machine Borehole

 Checked by: **RBT**

 Location: **Crest of Section A-A**

 Drill model & mounting: T2 Tractor Mount      Easting: 368841.822 m      Slope: -90°      R.L. Surface: 53 m      Vane No:  
 Hole diameter: mm      Drilling fluid:      Northing: 799939.797 m      Bearing:      Datum: x/y = BOPC2000, z = Moturiki

drilling information				material substance										rock mass defects																							
stratigraphy	method	support	water	notes samples, tests, etc	RL	depth metres	graphic log	core recovery	classification symbol	Material Description	moisture condition	consistency/density index	weathering alteration	estimated strength					vane shear (remoulded /peak) kPa	recovery %	RQD %	defect spacing mm	defect description														
										Soil name; plasticity or grading, colour, secondary components. Moisture, sensitivity, strength. Structure, bedding, cementation, defects. Origin, additional observations. Rock name; grain size & type, colour, fabric, inclusions & minor components. Weathering, moisture, strength, defects.				EW	VW	W	MS	S	VS	ES	25	50	75	100	125	150	175	30	100	300	1000	5000	number, type, orientation, shape, roughness, aperture, infill description (refer to defect description explanation sheet)				
TT	C					41.5	11.5	XXXXXX	ML (cont)	SILT, low plasticity, pink-grey, mottled orange-brown, black specks. (continued) - orange staining - becoming pale grey with orange staining	M-W	F																									
						41.0	12.0	XXXXXX	ML	SILT, non to low plasticity, pink-orange with black & orange staining, mottled grey & black.																											
				SPT 0,0,0 N*=0		40.5	12.5	XXXXXX		- grey silt mottles from 12.8 to 13.0m																											
						40.0	13.0	XXXXXX		- trace fine sand																											
						39.5	13.5	XXXXXX	ML	SILT, no plasticity, dark orange-brown with significant limonite staining, trace to minor sand, very stiff to hard. Sample has fragmented to angular, hard & soft pieces in silt/sand matrix.		S																									
				SPT 0,0,0 N*=0		39.0	14.0	XXXXXX	SM																												
						38.5	14.5	XXXXXX	ML	Mixed silts & sands with some clay seams, brown, dark orange & black; soft, wet to saturated. Sample probably disturbed by SPT.																											
						38.0	15.0	XXXXXX	MH	Sandy Clayey SILT, low plasticity, pink-orange, dark orange staining; sand is fine grained, dark orange-brown. - increasing clay content, high plasticity; minor sand - increasing dark orange sand content, low to medium plasticity																											
				SPT 1,0,1 N*=1		37.5	15.5	XXXXXX		SILT, medium to high plasticity, orange-grey, trace fine sand.																											
						37.0	16.0	XXXXXX	SM	- some dark orange sand pockets, with some dark orange staining - becoming low to medium plasticity																											
						37.0	16.0	XXXXXX	MH	Silty SAND, fine to medium grained, black, trace silt. - becoming orange-brown, mottled black & orange		W																									
						36.5	16.5	XXXXXX		SILT, medium to high plasticity, pink-orange grey.		F																									

<b>method</b> AD auger drilling OB open barrel TT triple tube W washbore <b>support</b> N nil C casing <b>vane shear (kPa)</b> ● remoulded × peak >>> peak greater than 200kPa UTP unable to penetrate	<b>classification symbols and soil description</b> based on Field Description of Soil and Rock, New Zealand Geotechnical Society Inc 2005 <b>notes, samples, tests</b> U <sub>50</sub> undisturbed sample 50mm diameter U <sub>63</sub> undisturbed sample 63mm diameter D disturbed sample N* SPT - sample recovered Nc SPT with solid cone Bs bulk sample E environmental sample	<b>water</b> ▼ 10/1/98 water level on date shown ▲ water inflow ▲ partial drill fluid loss ▲ complete drill fluid loss <b>moisture</b> D dry M moist W wet S saturated	<b>consistency/ density index</b> VS very soft S soft F firm St stiff VSt very stiff H hard VL very loose L loose MD medium dense D dense VD very dense	<b>weathering</b> UW unweathered SW slightly weathered MW moderately weathered HW highly weathered CW completely weathered RS residual soil <b>rock mass strength</b> EW extremely weak VW very weak W weak MS moderately strong S strong VS very strong ES extremely strong
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## **Appendix D - Post Development Investigation Data**

# Engineering Log - Hand Auger

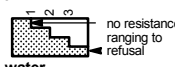
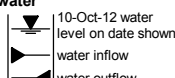
Borehole ID: **HAL413**  
 sheet: 1 of 1  
 project no: **GENZTAUC13086AP**  
 date started: **17 Aug 2016**  
 date completed: **17 Aug 2016**  
 logged by: **ODS**  
 checked by: **RBT**

client: **THE LAKES**  
 principal:  
 project: **THE LAKES STAGE 3GH**  
 location: **Centre of lot 413**

position: Not Specified surface elevation: Not Specified angle from horizontal: 90°  
 drill model: drilling fluid: hole diameter : 50 mm vane id.: SL588

drilling information				material substance					structure and additional observations			
method & support	penetration	samples & field tests	water	RL (m)	depth (m)	graphic log	classification symbol	material description	moisture condition	consistency / relative density	vane shear (kPa)	structure and additional observations
HA N Net Encountered	1	VS >202 kPa			0.0			<b>ORGANIC SILT:</b> non plastic, black.	D to M	VSt to H		<b>TOPSOIL</b>
	2	VS 190/41 kPa			0.5			<b>SILT:</b> non plastic to low plasticity, orange brown with mottled grey and brown, with trace fine to coarse grained sand.	M			<b>FILL</b>
	3	VS 160/18 kPa			1.0			<b>SILT:</b> non plastic to low plasticity, pale brown, with trace fine to coarse grained sand and with trace clay. 0.6 m: with minor to some fine to coarse grained sand 0.8 m: with minor to some fine grained sand				<b>MATUA SUBGROUP</b>
		VS >202 kPa			1.5			<b>SAND:</b> fine to coarse grained, pale brown, with trace silt.				
		VS >202 kPa			2.0			<b>Clayey SILT:</b> low to medium plasticity, brown, with trace fine grained sand.				
		VS >202 kPa			2.5			<b>SILT:</b> low plasticity, orange brown, with trace clay and with trace fine grained sand.				
		VS >202 kPa			3.0			1.8 m: with some clay 2.0 m: sand becomes absent				
		VS 163/46 kPa			3.5			2.5 m: low to medium plasticity				
		VS 122/32 kPa			4.0							
		VS >202 kPa			4.5							
	VS 178/46 kPa			5.0								
Hand Auger HAL413 terminated at 3.5 m Target depth												

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<b>method</b> AD auger drilling* AS auger screwing* HA hand auger W washbore HA hand auger	<b>support</b> M mud N nil C casing <b>penetration</b>  <b>water</b> 	<b>samples &amp; field tests</b> B bulk disturbed sample D disturbed sample E environmental sample SS split spoon sample U## undisturbed sample ##mm diameter HP hand penetrometer (kPa) N standard penetration test (SPT) N* SPT - sample recovered Nc SPT with solid cone VS vane shear; peak/remoulded (kPa) R refusal HB hammer bouncing	<b>classification symbol &amp; soil description</b> based on Unified Classification System <b>moisture</b> D dry M moist W wet S saturated Wp plastic limit Wl liquid limit	<b>consistency / relative density</b> VS very soft S soft F firm St stiff VSt very stiff H hard Fb friable VL very loose L loose MD medium dense D dense VD very dense
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\* bit shown by suffix  
 e.g. AD/T  
 B blank bit  
 T TC bit  
 V V bit

# Engineering Log - Hand Auger


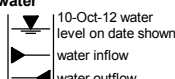
client: **THE LAKES**  
 principal:  
 project: **THE LAKES STAGE 3GH**  
 location: **Centre of lot 415**

Borehole ID: **HAL415**  
 sheet: 1 of 1  
 project no: **GENZTAUC13086AP**  
 date started: **17 Aug 2016**  
 date completed: **17 Aug 2016**  
 logged by: **ODS**  
 checked by: **RBT**

position: Not Specified surface elevation: Not Specified angle from horizontal: 90°  
 drill model: drilling fluid: hole diameter : 50 mm vane id.: SL588

drilling information				material substance								
method & support	penetration	water	samples & field tests	RL (m)	depth (m)	graphic log	classification symbol	material description	moisture condition	consistency / relative density	vane shear	structure and additional observations
	1 2 3							SOIL TYPE: plasticity or particle characteristic, colour, secondary and minor components			90 100 150 200 (kPa)	
HA	N							ORGANIC SILT: non plastic, black.	D	VSt to H		TOPSOIL
		Not Encountered	VS >202 kPa		0.5			SILT: non plastic to low plasticity, orange brown, with trace fine grained sand. Clayey SILT: low to medium plasticity, brown.	D to M M			MATUA SUBGROUP
			VS >202 kPa		1.0			1.0 m: becoming orange brown, low plasticity				
			VS >202 kPa		1.5			1.8 m: becoming medium plasticity				
			VS 122/29 kPa		2.0							
			VS 102/42 kPa		2.5			Hand Auger HAL415 terminated at 2.5 m Target depth				
					3.0							
					3.5							
					4.0							
					4.5							
					5.0							

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<b>method</b> AD auger drilling* AS auger screwing* HA hand auger W washbore HA hand auger	<b>support</b> M mud N nil C casing	<b>samples &amp; field tests</b> B bulk disturbed sample D disturbed sample E environmental sample SS split spoon sample U## undisturbed sample ##mm diameter HP hand penetrometer (kPa) N standard penetration test (SPT) N* SPT - sample recovered Nc SPT with solid cone VS vane shear; peak/remoued (kPa) R refusal HB hammer bouncing	<b>classification symbol &amp; soil description</b> based on Unified Classification System	<b>consistency / relative density</b> VS very soft S soft F firm St stiff VSt very stiff H hard Fb friable VL very loose L loose MD medium dense D dense VD very dense
* bit shown by suffix e.g. AD/T B blank bit T TC bit V V bit	<b>penetration</b>  <b>water</b> 	<b>moisture</b> D dry M moist W wet S saturated Wp plastic limit Wl liquid limit		

# Engineering Log - Hand Auger

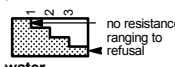
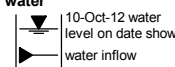
Borehole ID: **HAL417**  
 sheet: 1 of 1  
 project no: **GENZTAUC13086AP**  
 date started: **17 Aug 2016**  
 date completed: **17 Aug 2016**  
 logged by: **ODS**  
 checked by: **RBT**

client: **THE LAKES**  
 principal:  
 project: **THE LAKES STAGE 3GH**  
 location: **Centre of lot 417**

position: Not Specified surface elevation: Not Specified angle from horizontal: 90°  
 drill model: drilling fluid: hole diameter : 50 mm vane id.: SL588

drilling information				material substance								
method & support	penetration	water	samples & field tests	RL (m)	depth (m)	graphic log	classification symbol	material description	moisture condition	consistency / relative density	vane shear (kPa)	structure and additional observations
HA N	1 2 3	Not Encountered	VS >202 kPa		0.5	[Hand Auger Log]	[Classification Symbols]	ORGANIC SILT: non plastic, black.	D	St to VSt		TOPSOIL
			VS 165/25 kPa		0.5			SILT: low plasticity, orange brown, with minor clay and with trace manganese.	D to M		MATUA SUBGROUP	
			VS 125/15 kPa		1.0			0.5 m: with some clay. Becomes greasy when reworked	M			
			VS 85/15 kPa		1.0			0.9 m: with trace fine to coarse sand				
			VS 173/58 kPa		1.5			1.0 to 1.6 m: sensitive when disturbed				
			VS 122/32 kPa		2.0			1.2 m: sand becomes absent				
			VS 79/24 kPa		2.1			1.8 m: becoming pinky brown and sensitive when disturbed				
			VS 98/29 kPa		2.5			2.1 m: becoming pink				
					2.5			Hand Auger HAL417 terminated at 2.5 m Target depth				

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<b>method</b> AD auger drilling* AS auger screwing* HA hand auger W washbore HA hand auger	<b>support</b> M mud N nil C casing <b>penetration</b>  no resistance ranging to refusal <b>water</b>  10-Oct-12 water level on date shown water inflow water outflow	<b>samples &amp; field tests</b> B bulk disturbed sample D disturbed sample E environmental sample SS split spoon sample U## undisturbed sample ##mm diameter HP hand penetrometer (kPa) N standard penetration test (SPT) N* SPT - sample recovered Nc SPT with solid cone VS vane shear; peak/remouded (kPa) R refusal HB hammer bouncing	<b>classification symbol &amp; soil description</b> based on Unified Classification System <b>moisture</b> D dry M moist W wet S saturated Wp plastic limit Wl liquid limit	<b>consistency / relative density</b> VS very soft S soft F firm St stiff VSt very stiff H hard Fb friable VL very loose L loose MD medium dense D dense VD very dense
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\* bit shown by suffix  
 e.g. AD/T  
 B blank bit  
 T TC bit  
 V V bit

# Engineering Log - Hand Auger


client: **THE LAKES**  
 principal:  
 project: **THE LAKES STAGE 3GH**  
 location: **Centre of lot 419**

Borehole ID: **HAL419**  
 sheet: 1 of 1  
 project no: **GENZTAUC13086AP**  
 date started: **17 Aug 2016**  
 date completed: **17 Aug 2016**  
 logged by: **ODS**  
 checked by: **RBT**

position: Not Specified surface elevation: Not Specified angle from horizontal: 90°  
 drill model: drilling fluid: hole diameter : 50 mm vane id.: SL588

drilling information				material substance				
method & support	penetration	samples & field tests	RL (m)	depth (m)	material description	moisture condition	consistency / relative density	structure and additional observations
HA N Not Encountered	1	VS >202 kPa		0.0 - 0.5	<b>ORGANIC SILT:</b> non plastic, black. <b>SILT:</b> non plastic to low plasticity, orange brown with mottled brown and grey, with trace fine grained sand. <b>SILT:</b> low plasticity, orange brown, with some clay and with trace fine to coarse grained sand.	M	St to VSt	TOPSOIL FILL MATUA SUBGROUP
	2	VS 112/ 19 kPa		0.5 - 1.0	0.8 m: with trace manganese 0.9 m: becomes sticky/greasy when reworked			
	3	VS 85/ 15 kPa		1.0 - 1.5				
		VS 83/ 19 kPa		1.5 - 2.0				
		VS 117/ 35 kPa		2.0 - 2.5				
		VS 124/ 29 kPa		2.5 - 2.6				
		VS 112/ 18 kPa		2.6 - 2.7	<b>Clayey SILT:</b> low plasticity, pink orange-brown, with trace fine grained sand. Sticky.			
		VS 102/ 26 kPa		2.7 - 2.5	Hand Auger HAL419 terminated at 2.5 m Target depth			

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<b>method</b> AD auger drilling* AS auger screwing* HA hand auger W washbore HA hand auger	<b>support</b> M mud N nil C casing <b>penetration</b>  no resistance ranging to refusal <b>water</b> 10-Oct-12 water level on date shown water inflow water outflow	<b>samples &amp; field tests</b> B bulk disturbed sample D disturbed sample E environmental sample SS split spoon sample U## undisturbed sample ##mm diameter HP hand penetrometer (kPa) N standard penetration test (SPT) N* SPT - sample recovered Nc SPT with solid cone VS vane shear; peak/remoued (kPa) R refusal HB hammer bouncing	<b>classification symbol &amp; soil description</b> based on Unified Classification System <b>moisture</b> D dry M moist W wet S saturated Wp plastic limit Wl liquid limit	<b>consistency / relative density</b> VS very soft S soft F firm St stiff VSt very stiff H hard Fb friable VL very loose L loose MD medium dense D dense VD very dense
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\* bit shown by suffix  
 e.g. AD/T  
 B blank bit  
 T TC bit  
 V V bit



# Engineering Log - Hand Auger

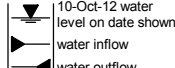
client: **THE LAKES**  
 principal:  
 project: **THE LAKES STAGE 3GH**  
 location: **Centre of lot 420**

Borehole ID: **HAL420**  
 sheet: 1 of 1  
 project no: **GENZTAUC13086AP**  
 date started: **17 Aug 2016**  
 date completed: **17 Aug 2016**  
 logged by: **ODS**  
 checked by: **RBT**

position: Not Specified surface elevation: Not Specified angle from horizontal: 90°  
 drill model: drilling fluid: hole diameter : 50 mm vane id.: SL588

drilling information				material substance								
method & support	penetration	water	samples & field tests	RL (m)	depth (m)	graphic log	classification symbol	material description	moisture condition	consistency / relative density	vane shear (kPa)	structure and additional observations
HA N Not Encountered	1		VS >202 kPa		0.0 - 0.5			<b>ORGANIC SILT:</b> non plastic, black.	D to M	VSt to H		<b>TOPSOIL</b>
	2		VS >202 kPa		0.5 - 1.0			<b>SILT:</b> non plastic to low plasticity, orange brown, with trace fine grained sand. 0.5 m: with trace clay	M			<b>YOUNGER ASH DEPOSIT</b>
	3		VS >202 kPa		1.0 - 1.5			<b>SILT:</b> non plastic to low plasticity, orange brown, with trace fine to coarse grained sand, with trace clay and with trace manganese. Greasy when reworked.				<b>MATUA SUBGROUP</b>
			VS 177/29 kPa		1.5 - 2.0			<b>Sandy SILT:</b> non plastic, orange brown, sand is fine to coarse grained.	St			
			VS 98/26 kPa		2.0 - 2.5			<b>SILT:</b> low plasticity, orange brown, with minor clay and with trace fine to coarse grained sand.				
			VS 78/26 kPa		2.5 - 2.5			Hand Auger HAL420 terminated at 2.5 m Target depth				
		VS 71/24 kPa		2.5 - 3.0								
		VS 71/26 kPa		3.0 - 3.5								
				3.5 - 4.0								
				4.0 - 4.5								
				4.5 - 5.0								

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<b>method</b> AD auger drilling* AS auger screwing* HA hand auger W washbore HA hand auger	<b>support</b> M mud N nil C casing <b>penetration</b>  <b>water</b> 	<b>samples &amp; field tests</b> B bulk disturbed sample D disturbed sample E environmental sample SS split spoon sample U## undisturbed sample ##mm diameter HP hand penetrometer (kPa) N standard penetration test (SPT) N* SPT - sample recovered Nc SPT with solid cone VS vane shear; peak/remoulded (kPa) R refusal HB hammer bouncing	<b>classification symbol &amp; soil description</b> based on Unified Classification System <b>moisture</b> D dry M moist W wet S saturated Wp plastic limit Wl liquid limit	<b>consistency / relative density</b> VS very soft S soft F firm St stiff VSt very stiff H hard Fb friable VL very loose L loose MD medium dense D dense VD very dense
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\* bit shown by suffix  
 e.g. AD/T  
 B blank bit  
 T TC bit  
 V V bit

# Engineering Log - Hand Auger

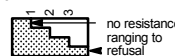
client: **THE LAKES**  
 principal:  
 project: **THE LAKES STAGE 3GH**  
 location: **Centre of lot 424**

Borehole ID: **HAL424**  
 sheet: 1 of 1  
 project no: **GENZTAUC13086AP**  
 date started: **17 Aug 2016**  
 date completed: **17 Aug 2016**  
 logged by: **ODS**  
 checked by: **RBT**

position: Not Specified surface elevation: Not Specified angle from horizontal: 90°  
 drill model: drilling fluid: hole diameter : 50 mm vane id.: SL588

drilling information				material substance				
method & support	penetration	samples & field tests	RL (m)	depth (m)	material description	moisture condition	consistency / relative density	structure and additional observations
HA N Not Encountered	1	VS >202 kPa		0.0 - 0.5	ORGANIC SILT: non plastic, black.	M	VSt to H	TOPSOIL
	2	VS 148/41 kPa		0.5 - 1.0	SILT: low plasticity, orange brown, with trace fine grained sand and trace clay. 0.7 m: with minor clay. Low to medium plasticity			YOUNGER ASH DEPOSIT
	3	VS 139/19 kPa		1.0 - 1.5	1.5 m: with trace clay and with trace fine grained sand. Non to low plasticity			
		VS >202 kPa		1.5 - 2.0	SILT: non plastic, orange brown, with some fine to coarse grained sand.			MATUA SUBGROUP
		VS >202 kPa		2.0 - 2.5	SAND: fine to coarse grained, yellow brown, with trace silt. 1.9 m: with some silt			
		VS 173/46 kPa VS 146/29 kPa		2.5 - 2.5	SILT: non plastic to low plasticity, brown, with trace fine to coarse grained sand and with trace clay. Sticky. Hand Auger HAL424 terminated at 2.5 m Target depth			

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<b>method</b> AD auger drilling* AS auger screwing* HA hand auger W washbore HA hand auger	<b>support</b> M mud N nil C casing <b>penetration</b>  no resistance ranging to refusal <b>water</b> 10-Oct-12 water level on date shown water inflow water outflow	<b>samples &amp; field tests</b> B bulk disturbed sample D disturbed sample E environmental sample SS split spoon sample U## undisturbed sample ##mm diameter HP hand penetrometer (kPa) N standard penetration test (SPT) N* SPT - sample recovered Nc SPT with solid cone VS vane shear; peak/remoulded (kPa) R refusal HB hammer bouncing	<b>classification symbol &amp; soil description</b> based on Unified Classification System <b>moisture</b> D dry M moist W wet S saturated Wp plastic limit Wl liquid limit	<b>consistency / relative density</b> VS very soft S soft F firm St stiff VSt very stiff H hard Fb friable VL very loose L loose MD medium dense D dense VD very dense
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\* bit shown by suffix  
 e.g. AD/T  
 B blank bit  
 T TC bit  
 V V bit

# Engineering Log - Hand Auger

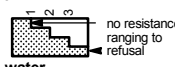
Borehole ID: **HAL426**  
 sheet: 1 of 1  
 project no: **GENZTAUC13086AP**  
 date started: **17 Aug 2016**  
 date completed: **17 Aug 2016**  
 logged by: **ODS**  
 checked by: **RBT**

client: **THE LAKES**  
 principal:  
 project: **THE LAKES STAGE 3GH**  
 location: **Centre of lot 426**

position: Not Specified surface elevation: Not Specified angle from horizontal: 90°  
 drill model: drilling fluid: hole diameter : 50 mm vane id.: SL588

drilling information				material substance								
method & support	penetration	water	samples & field tests	RL (m)	depth (m)	graphic log	classification symbol	material description	moisture condition	consistency / relative density	vane shear	structure and additional observations
	1 2 3							SOIL TYPE: plasticity or particle characteristic, colour, secondary and minor components			⊕ ⊗ ⊙ ⊚	
HA	N		VS >202 kPa					ORGANIC SILT: non plastic, black.	D to M	VSt to H		TOPSOIL
			VS >202 kPa		0.5			SILT: non plastic to low plasticity, orange brown, with trace fine grained sand.	M			YOUNGER ASH DEPOSIT
		Not Encountered	VS 156/35 kPa		1.0			0.9 m: with trace clay. Low plasticity				
			VS >202 kPa		1.5			1.2 m: sand becomes absent				
			VS 197/58 kPa		2.0			1.4 m: with minor to some clay. Low to medium plasticity				
			VS >202 kPa		2.5			Hand Auger HAL426 terminated at 2.5 m Target depth				
					3.0							
					3.5							
					4.0							
					4.5							
					5.0							

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<b>method</b> AD auger drilling* AS auger screwing* HA hand auger W washbore HA hand auger	<b>support</b> M mud N nil C casing	<b>samples &amp; field tests</b> B bulk disturbed sample D disturbed sample E environmental sample SS split spoon sample U## undisturbed sample ##mm diameter HP hand penetrometer (kPa) N standard penetration test (SPT) N* SPT - sample recovered Nc SPT with solid cone VS vane shear; peak/remoulded (kPa) R refusal HB hammer bouncing	<b>classification symbol &amp; soil description</b> based on Unified Classification System	<b>consistency / relative density</b> VS very soft S soft F firm St stiff VSt very stiff H hard Fb friable VL very loose L loose MD medium dense D dense VD very dense
* bit shown by suffix e.g. AD/T B blank bit T TC bit V V bit	<b>penetration</b>  no resistance ranging to refusal <b>water</b> 10-Oct-12 water level on date shown water inflow water outflow	<b>moisture</b> D dry M moist W wet S saturated Wp plastic limit Wl liquid limit		

# Engineering Log - Hand Auger

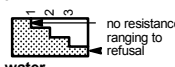
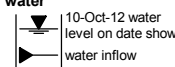
Borehole ID: **HAL428**  
 sheet: 1 of 1  
 project no: **GENZTAUC13086AP**  
 date started: **17 Aug 2016**  
 date completed: **17 Aug 2016**  
 logged by: **ODS**  
 checked by: **RBT**

client: **THE LAKES**  
 principal:  
 project: **THE LAKES STAGE 3GH**  
 location: **Centre of lot 428**

position: Not Specified surface elevation: Not Specified angle from horizontal: 90°  
 drill model: drilling fluid: hole diameter : 50 mm vane id.:

drilling information				material substance				
method & support	penetration	water	samples & field tests	depth (m)	material description	moisture condition	consistency / relative density	structure and additional observations
HA N Not Encountered	1		VS >202 kPa	0.5	ORGANIC SILT: non plastic, black.	D to M	VSt to H	TOPSOIL
	2		VS >202 kPa	0.8	SILT: non plastic to low plasticity, orange brown, with trace fine grained sand.	M		YOUNGER ASH DEPOSIT
	3		VS 156/44 kPa	1.4	0.8 m: with fine grained sand			
			VS >202 kPa	1.4	1.4 m: with minor clay. Low plasticity			
			VS 166/44 kPa	2.2	2.2 m: becomes low to medium plasticity			
			VS 182/109 kPa	2.5	Hand Auger HAL428 terminated at 2.5 m Target depth			

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<b>method</b> AD auger drilling* AS auger screwing* HA hand auger W washbore HA hand auger	<b>support</b> M mud N nil C casing <b>penetration</b>  no resistance ranging to refusal <b>water</b>  10-Oct-12 water level on date shown water inflow water outflow	<b>samples &amp; field tests</b> B bulk disturbed sample D disturbed sample E environmental sample SS split spoon sample U## undisturbed sample ##mm diameter HP hand penetrometer (kPa) N standard penetration test (SPT) N* SPT - sample recovered Nc SPT with solid cone VS vane shear; peak/remoulded (kPa) R refusal HB hammer bouncing	<b>classification symbol &amp; soil description</b> based on Unified Classification System <b>moisture</b> D dry M moist W wet S saturated Wp plastic limit Wl liquid limit	<b>consistency / relative density</b> VS very soft S soft F firm St stiff VSt very stiff H hard Fb friable VL very loose L loose MD medium dense D dense VD very dense
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\* bit shown by suffix  
 e.g. AD/T  
 B blank bit  
 T TC bit  
 V V bit

# Engineering Log - Hand Auger


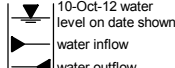
client: **THE LAKES**  
 principal:  
 project: **THE LAKES STAGE 3GH**  
 location: **Centre of lot 430**

Borehole ID: **HAL430**  
 sheet: 1 of 1  
 project no: **GENZTAUC13086AP**  
 date started: **17 Aug 2016**  
 date completed: **17 Aug 2016**  
 logged by: **NM**  
 checked by: **RBT**

position: Not Specified surface elevation: Not Specified angle from horizontal: 90°  
 drill model: drilling fluid: hole diameter : 50 mm vane id.: DR2244

drilling information				material substance							
method & support	penetration	samples & field tests	RL (m)	depth (m)	graphic log	classification symbol	material description	moisture condition	consistency / relative density	vane shear (kPa)	structure and additional observations
HA N	1 2 3	VS >182 kPa VS >182 kPa VS >182 kPa VS >182 kPa VS >182 kPa		0.5 1.0			ORGANIC SILT: non plastic, black.	D to M	VSt		TOPSOIL
							SILT: non plastic, orange brown, with minor fine grained sand. 0.6 m: becoming fine to medium grained sand				FILL
HA N	1 2 3	VS >182 kPa VS 164/29 kPa VS 148/36 kPa VS 158/30 kPa VS 166/30 kPa VS 91/24 kPa		1.5 2.0 2.5			SILT: non plastic, black, with minor fine to medium grained sand. SILT: non plastic, orange brown with mottled brown, with minor fine to medium grained sand, becoming grey brown with minor fine grained sand	M  M to W			YOUNGER ASH DEPOSIT
							Hand Auger HAL430 terminated at 2.5 m Target depth				

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<b>method</b> AD auger drilling* AS auger screwing* HA hand auger W washbore HA hand auger  * bit shown by suffix e.g. AD/T B blank bit T TC bit V V bit	<b>support</b> M mud N nil C casing  <b>penetration</b>  no resistance ranging to refusal  <b>water</b>  10-Oct-12 water level on date shown water inflow water outflow	<b>samples &amp; field tests</b> B bulk disturbed sample D disturbed sample E environmental sample SS split spoon sample U## undisturbed sample ##mm diameter HP hand penetrometer (kPa) N standard penetration test (SPT) N* SPT - sample recovered Nc SPT with solid cone VS vane shear; peak/remoulded (kPa) R refusal HB hammer bouncing	<b>classification symbol &amp; soil description</b> based on Unified Classification System  <b>moisture</b> D dry M moist W wet S saturated Wp plastic limit Wl liquid limit	<b>consistency / relative density</b> VS very soft S soft F firm St stiff VSt very stiff H hard Fb friable VL very loose L loose MD medium dense D dense VD very dense
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# Engineering Log - Hand Auger


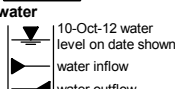
Borehole ID: **HAL432**  
 sheet: 1 of 1  
 project no: **GENZTAUC13086AP**  
 date started: **17 Aug 2016**  
 date completed: **17 Aug 2016**  
 logged by: **ODS**  
 checked by: **RBT**

client: **THE LAKES**  
 principal:  
 project: **THE LAKES STAGE 3GH**  
 location: **Centre of lot 432**

position: Not Specified surface elevation: Not Specified angle from horizontal: 90°  
 drill model: drilling fluid: hole diameter : 50 mm vane id.: SL588

drilling information				material substance								
method & support	penetration	water	samples & field tests	RL (m)	depth (m)	graphic log	classification symbol	material description	moisture condition	consistency / relative density	vane shear	structure and additional observations
	1 2 3							<b>SOIL TYPE:</b> plasticity or particle characteristic, colour, secondary and minor components			remoulded peak	
HA	N	Not Encountered	VS 187/ 46 kPa VS 156/ 38 kPa VS 122/ 26 kPa VS 134/ 29 kPa VS 156/ 44 kPa VS >202 kPa VS 187/ 44 kPa VS 156/ 58 kPa		0.5 1.0 1.5 2.0 2.5			<b>ORGANIC SILT:</b> non plastic, black.  <b>SILT:</b> low plasticity, orange brown, with trace fine grained sand and with trace clay.  1.2 m: with some clay and with trace fine to coarse grained sand  <b>SAND:</b> fine to coarse grained, orange, with trace silt.  <b>SILT:</b> non plastic to low plasticity, pale brown with mottled orange brown, with minor clay and with trace fine to coarse grained sand.  Hand Auger HAL432 terminated at 2.5 m Target depth	D D to M M	VSt		<b>TOPSOIL</b> <b>YOUNGER ASH DEPOSIT</b>  <b>ROTOEHU ASH</b> <b>MATUA SUBGROUP</b>

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<b>method</b> AD auger drilling* AS auger screwing* HA hand auger W washbore HA hand auger  * bit shown by suffix e.g. AD/T B blank bit T TC bit V V bit	<b>support</b> M mud N nil C casing  <b>penetration</b>  water 	<b>samples &amp; field tests</b> B bulk disturbed sample D disturbed sample E environmental sample SS split spoon sample U## undisturbed sample ##mm diameter HP hand penetrometer (kPa) N standard penetration test (SPT) N* SPT - sample recovered Nc SPT with solid cone VS vane shear; peak/remoulded (kPa) R refusal HB hammer bouncing	<b>classification symbol &amp; soil description</b> based on Unified Classification System  <b>moisture</b> D dry M moist W wet S saturated Wp plastic limit Wl liquid limit	<b>consistency / relative density</b> VS very soft S soft F firm St stiff VSt very stiff H hard Fb friable VL very loose L loose MD medium dense D dense VD very dense
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# Engineering Log - Hand Auger


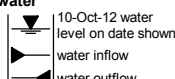
Borehole ID: **HAL434**  
 sheet: 1 of 1  
 project no: **GENZTAUC13086AP**  
 date started: **18 Aug 2016**  
 date completed: **18 Aug 2016**  
 logged by: **ODS**  
 checked by: **RBT**

client: **THE LAKES**  
 principal:  
 project: **THE LAKES STAGE 3GH**  
 location: **Centre of lot 434**

position: Not Specified surface elevation: Not Specified angle from horizontal: 90°  
 drill model: drilling fluid: hole diameter : 50 mm vane id.: SL588

drilling information				material substance												
method & support	penetration	water	samples & field tests	RL (m)	depth (m)	graphic log	classification symbol	material description SOIL TYPE: plasticity or particle characteristic, colour, secondary and minor components	moisture condition	consistency / relative density	vane shear (kPa) remoulded peak	structure and additional observations				
HA N	1 2 3	Not Encountered	VS >202 kPa	0.5	0.5			SILT: non plastic, brown with mottled orange brown, with trace fine grained sand.	D	VSt		FILL				
			VS >202 kPa					VS >202 kPa								
HA N	1 2 3	Not Encountered	VS >202 kPa	1.0	1.0			SILT: non plastic, orange brown, with trace fine to medium grained sand.  0.9 m: with minor clay, low plasticity	D to M			YOUNGER ASH DEPOSIT				
			VS 166/32 kPa					VS 148/29 kPa								
			VS 187/44 kPa					VS 122/38 kPa								
			VS 96/24 kPa													
HA N	1 2 3	Not Encountered		2.5	2.5			2.4 m: with trace fine to coarse grained sand  Hand Auger HAL434 terminated at 2.5 m Target depth								

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<b>method</b> AD auger drilling* AS auger screwing* HA hand auger W washbore HA hand auger	<b>support</b> M mud N nil C casing	<b>samples &amp; field tests</b> B bulk disturbed sample D disturbed sample E environmental sample SS split spoon sample U## undisturbed sample ##mm diameter HP hand penetrometer (kPa) N standard penetration test (SPT) N* SPT - sample recovered Nc SPT with solid cone VS vane shear; peak/remoulded (kPa) R refusal HB hammer bouncing	<b>classification symbol &amp; soil description</b> based on Unified Classification System	<b>consistency / relative density</b> VS very soft S soft F firm St stiff VSt very stiff H hard Fb friable VL very loose L loose MD medium dense D dense VD very dense
<b>penetration</b>  no resistance ranging to refusal	<b>water</b>  10-Oct-12 water level on date shown water inflow water outflow	<b>moisture</b> D dry M moist W wet S saturated Wp plastic limit Wl liquid limit		



\* bit shown by suffix  
 e.g. AD/T  
 B blank bit  
 T TC bit  
 V V bit

# Engineering Log - Hand Auger


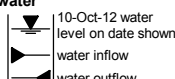
Borehole ID: **HAL436**  
 sheet: 1 of 1  
 project no: **GENZTAUC13086AP**  
 date started: **18 Aug 2016**  
 date completed: **18 Aug 2016**  
 logged by: **ODS**  
 checked by: **RBT**

client: **THE LAKES**  
 principal:  
 project: **THE LAKES STAGE 3GH**  
 location: **Centre of lot 436**

position: Not Specified surface elevation: Not Specified angle from horizontal: 90°  
 drill model: drilling fluid: hole diameter : 50 mm vane id.: SL588

drilling information				material substance							
method & support	penetration	water	samples & field tests	depth (m)	graphic log	classification symbol	material description	moisture condition	consistency / relative density	vane shear	structure and additional observations
HA N Not Encountered	1		VS >202 kPa	0.5			<b>ORGANIC SAND:</b> non plastic, black.	D to M	VSt to H		<b>TOPSOIL</b>
	2		VS >202 kPa	1.0			<b>SILT:</b> non plastic to low plasticity, orange brown with mottled grey and brown, with trace to minor fine to coarse grained sand.				<b>FILL</b>
	3		VS >202 kPa	1.5			<b>SILT:</b> non plastic to low plasticity, orange brown, with trace fine grained sand.	M			<b>YOUNGER ASH DEPOSIT</b>
			VS 192/49 kPa	1.5			1.5 m: with trace clay. Low plasticity				
			VS 161/36 kPa	1.8			1.8 m: with minor clay.				
		VS 185/39 kPa	2.0								
		VS 146/31 kPa	2.5								
				2.5			Hand Auger HAL436 terminated at 2.5 m Target depth				
				3.0							
				3.5							
				4.0							
				4.5							
				5.0							

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<b>method</b> AD auger drilling* AS auger screwing* HA hand auger W washbore HA hand auger	<b>support</b> M mud N nil C casing <b>penetration</b>  no resistance ranging to refusal <b>water</b>  10-Oct-12 water level on date shown water inflow water outflow	<b>samples &amp; field tests</b> B bulk disturbed sample D disturbed sample E environmental sample SS split spoon sample U## undisturbed sample ##mm diameter HP hand penetrometer (kPa) N standard penetration test (SPT) N* SPT - sample recovered Nc SPT with solid cone VS vane shear; peak/remoulded (kPa) R refusal HB hammer bouncing	<b>classification symbol &amp; soil description</b> based on Unified Classification System <b>moisture</b> D dry M moist W wet S saturated Wp plastic limit Wl liquid limit	<b>consistency / relative density</b> VS very soft S soft F firm St stiff VSt very stiff H hard Fb friable VL very loose L loose MD medium dense D dense VD very dense
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\* bit shown by suffix  
 e.g. AD/T  
 B blank bit  
 T TC bit  
 V V bit



# Engineering Log - Hand Auger


Borehole ID: **HAL438**  
 sheet: 1 of 1  
 project no: **GENZTAUC13086AP**  
 date started: **18 Aug 2016**  
 date completed: **18 Aug 2016**  
 logged by: **ODS**  
 checked by: **RBT**

client: **THE LAKES**  
 principal:  
 project: **THE LAKES STAGE 3GH**  
 location: **Centre of lot 438**

position: Not Specified surface elevation: Not Specified angle from horizontal: 90°  
 drill model: drilling fluid: hole diameter : 50 mm vane id.: SL588

drilling information				material substance				
method & support	penetration	samples & field tests	RL (m)	depth (m)	material description	moisture condition	consistency / relative density	structure and additional observations
HA N Not Encountered	1	VS >202 kPa		0.5	<b>ORGANIC SILT:</b> non plastic, black. <b>SILT:</b> non plastic to low plasticity, orange brown with mottled grey and brown, with trace to minor fine to coarse grained sand. <b>Sandy SILT:</b> non plastic, grey brown, sand is fine to coarse. With trace fine to coarse grained gravel. <b>SILT:</b> non plastic to low plasticity, orange brown, with trace fine grained sand.	D to M	VSt to H	TOPSOIL FILL
	2	VS >202 kPa		1.0		M		YOUNGER ASH DEPOSIT
	3	VS >202 kPa		1.5	1.4 m: becomes brown. With trace clay. Low plasticity			
		VS >202 kPa		1.7	1.7 m: with minor clay			
		VS 173/41 kPa		2.0				
		VS 125/29 kPa		2.5				
				2.5	Hand Auger HAL438 terminated at 2.5 m Target depth			

CDF\_0\_9\_06\_LIBRARY.GLB rev:AT Log COF BOREHOLE: NON CORED - STAGE 3GH - ODS.GPJ <-DrawingFiles> 10/01/2017 09:49

<b>method</b> AD auger drilling* AS auger screwing* HA hand auger W washbore HA hand auger	<b>support</b> M mud N nil C casing <b>penetration</b>  no resistance ranging to refusal <b>water</b> 10-Oct-12 water level on date shown water inflow water outflow	<b>samples &amp; field tests</b> B bulk disturbed sample D disturbed sample E environmental sample SS split spoon sample U## undisturbed sample ##mm diameter HP hand penetrometer (kPa) N standard penetration test (SPT) N* SPT - sample recovered Nc SPT with solid cone VS vane shear; peak/remouded (kPa) R refusal HB hammer bouncing	<b>classification symbol &amp; soil description</b> based on Unified Classification System <b>moisture</b> D dry M moist W wet S saturated Wp plastic limit Wl liquid limit	<b>consistency / relative density</b> VS very soft S soft F firm St stiff VSt very stiff H hard Fb friable VL very loose L loose MD medium dense D dense VD very dense
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\* bit shown by suffix  
 e.g. AD/T  
 B blank bit  
 T TC bit  
 V V bit

# Engineering Log - Hand Auger

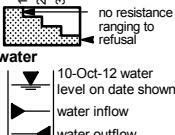
Borehole ID: **HAL441**  
 sheet: 1 of 1  
 project no: **GENZTAUC13086AP**  
 date started: **18 Aug 2016**  
 date completed: **18 Aug 2016**  
 logged by: **NM**  
 checked by: **RBT**

client: **THE LAKES**  
 principal:  
 project: **THE LAKES STAGE 3GH**  
 location: **Centre of lot 441**

position: Not Specified surface elevation: Not Specified angle from horizontal: 90°  
 drill model: drilling fluid: hole diameter : 50 mm vane id.: DR2244

drilling information				material substance										
method & support	penetration	water	samples & field tests	RL (m)	depth (m)	graphic log	classification symbol	material description	moisture condition	consistency / relative density	vane shear (kPa)	structure and additional observations		
HA N Not Encountered	1		VS >182 kPa					<b>ORGANIC SILT:</b> non plastic, black.	D	VSt		<b>TOPSOIL</b>		
	2		VS >182 kPa		0.5			<b>SILT:</b> non plastic, orange brown, with some fine grained sand. 0.4 m: with trace clay					<b>FILL</b>	
	3		VS >182 kPa						0.8 m: becoming mottled dark brown and with some fine to medium grained sand	D to M				
			VS >182 kPa		1.0				1.0 m: becoming mottled dark brown and white					
			VS UTP											
			VS >182 kPa		1.5				<b>SILT:</b> non plastic, dark brown, with some organic silt and with minor fine grained sand.	D				<b>YOUNGER ASH DEPOSIT</b>
			VS >182 kPa						<b>SILT:</b> non plastic, yellow brown, with some fine grained sand.					
			VS >182 kPa		2.0						M			
			VS 116/23 kPa											
			VS 148/33 kPa		2.5					Hand Auger HAL441 terminated at 2.5 m Target depth	M to W			
					3.0									
					3.5									
					4.0									
					4.5									
					5.0									

CDF\_0\_9\_06\_LIBRARY.GLB rev:AT Log COF BOREHOLE: NON CORED 13086AP - STAGE 3GH - ODS.GPJ <<DrawingFiles>> 10/01/2017 09:49

<b>method</b> AD auger drilling* AS auger screwing* HA hand auger W washbore HA hand auger	<b>support</b> M mud N nil C casing <b>penetration</b>  10-Oct-12 water level on date shown water inflow water outflow	<b>samples &amp; field tests</b> B bulk disturbed sample D disturbed sample E environmental sample SS split spoon sample U## undisturbed sample ##mm diameter HP hand penetrometer (kPa) N standard penetration test (SPT) N* SPT - sample recovered Nc SPT with solid cone VS vane shear; peak/remoulded (kPa) R refusal HB hammer bouncing	<b>classification symbol &amp; soil description</b> based on Unified Classification System <b>moisture</b> D dry M moist W wet S saturated Wp plastic limit Wl liquid limit	<b>consistency / relative density</b> VS very soft S soft F firm St stiff VSt very stiff H hard Fb friable VL very loose L loose MD medium dense D dense VD very dense
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\* bit shown by suffix  
 e.g. AD/T  
 B blank bit  
 T TC bit  
 V V bit

# Engineering Log - Hand Auger

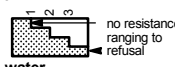
Borehole ID: **HAL442**  
 sheet: 1 of 1  
 project no: **GENZTAUC13086AP**  
 date started: **18 Aug 2016**  
 date completed: **18 Aug 2016**  
 logged by: **ODS**  
 checked by: **RBT**

client: **THE LAKES**  
 principal:  
 project: **THE LAKES STAGE 3GH**  
 location: **Centre of lot 442**

position: Not Specified surface elevation: Not Specified angle from horizontal: 90°  
 drill model: drilling fluid: hole diameter : 50 mm vane id.: SL588

drilling information				material substance								
method & support	penetration	water	samples & field tests	RL (m)	depth (m)	graphic log	classification symbol	material description	moisture condition	consistency / relative density	vane shear	structure and additional observations
	1 2 3							SOIL TYPE: plasticity or particle characteristic, colour, secondary and minor components			remoulded peak	
HA	N	Not Encountered	VS >202 kPa		0.5			SILT: non plastic to low plasticity, orange brown with mottled brown, with trace fine to coarse grained sand.	D	VSt		FILL
			VS >202 kPa		1.0			1.1 to 1.2 m: with mottled black 1.2 to 1.3 m: with trace rootlets				
			VS >202 kPa		1.5			SILT: non plastic to low plasticity, orange brown, with trace fine grained sand.	D to M			YOUNGER ASH DEPOSIT
			VS 156/ 34 kPa		2.0			1.8 m: with trace fine grained sand and with trace clay				
			VS 133/ 26 kPa		2.5			Hand Auger HAL442 terminated at 2.5 m Target depth				
			VS 112/ 22 kPa		3.0							
					3.5							
					4.0							
					4.5							
					5.0							

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<b>method</b> AD auger drilling* AS auger screwing* HA hand auger W washbore HA hand auger	<b>support</b> M mud N nil C casing <b>penetration</b>  10-Oct-12 water level on date shown water inflow water outflow	<b>samples &amp; field tests</b> B bulk disturbed sample D disturbed sample E environmental sample SS split spoon sample U## undisturbed sample ##mm diameter HP hand penetrometer (kPa) N standard penetration test (SPT) N* SPT - sample recovered Nc SPT with solid cone VS vane shear; peak/remoulded (kPa) R refusal HB hammer bouncing	<b>classification symbol &amp; soil description</b> based on Unified Classification System <b>moisture</b> D dry M moist W wet S saturated Wp plastic limit Wl liquid limit	<b>consistency / relative density</b> VS very soft S soft F firm St stiff VSt very stiff H hard Fb friable VL very loose L loose MD medium dense D dense VD very dense
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\* bit shown by suffix  
 e.g. AD/T  
 B blank bit  
 T TC bit  
 V V bit

# Engineering Log - Hand Auger

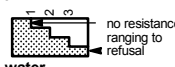
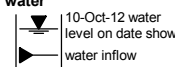
Borehole ID: **HAL445**  
 sheet: 1 of 1  
 project no: **GENZTAUC13086AP**  
 date started: **18 Aug 2016**  
 date completed: **18 Aug 2016**  
 logged by: **NM**  
 checked by: **RBT**

client: **THE LAKES**  
 principal:  
 project: **THE LAKES STAGE 3GH**  
 location: **Centre of lot 445**

position: Not Specified surface elevation: Not Specified angle from horizontal: 90°  
 drill model: drilling fluid: hole diameter : 50 mm vane id.: DR2244

drilling information				material substance									
method & support	penetration	water	samples & field tests	RL (m)	depth (m)	graphic log	classification symbol	material description	moisture condition	consistency / relative density	vane shear (kPa)	structure and additional observations	
HA N Not Encountered	1		VS >182 kPa					<b>ORGANIC SILT:</b> non plastic, black.	M	VSt		<b>TOPSOIL</b>	
	2		VS >182 kPa		0.5			<b>SILT:</b> non plastic, orange brown, with minor fine grained sand.				<b>FILL</b>	
	3		VS >182 kPa					<b>Sandy SILT:</b> fine to coarse grained, non plastic, grey with mottled white, with fine to coarse grained sand and with trace angular gravel.	D			<b>YOUNGER ASH DEPOSIT</b>	
			VS >182 kPa	VS 173/36 kPa	1.0			<b>SILT:</b> low to medium plasticity, orange brown, with minor clay and with trace fine grained sand.					
				VS >182 kPa		1.5			1.2 m: becoming mottled red brown	M			
				VS >182 kPa		2.0			1.4 m: red brown mottling becomes absent. Becoming flecked white				
				VS >182 kPa		2.1			2.1 m: becoming brown				
				VS >182 kPa		2.2			2.2 m: becoming black with mottled orange brown, non plastic, with minor fine to medium grained sand and with faint organic odour	D			
			VS >182 kPa		2.5			Hand Auger HAL445 terminated at 2.5 m Target depth					

CDF\_0\_9\_06\_LIBRARY.GLB rev:AT Log COF BOREHOLE: NON CORED 13086AP - STAGE 3GH - ODS.GPJ <-DrawingFiles> 10/01/2017 09:49

<b>method</b> AD auger drilling* AS auger screwing* HA hand auger W washbore HA hand auger	<b>support</b> M mud N nil C casing <b>penetration</b>  no resistance ranging to refusal <b>water</b>  10-Oct-12 water level on date shown water inflow water outflow	<b>samples &amp; field tests</b> B bulk disturbed sample D disturbed sample E environmental sample SS split spoon sample U## undisturbed sample ##mm diameter HP hand penetrometer (kPa) N standard penetration test (SPT) N* SPT - sample recovered Nc SPT with solid cone VS vane shear; peak/remoulded (kPa) R refusal HB hammer bouncing	<b>classification symbol &amp; soil description</b> based on Unified Classification System <b>moisture</b> D dry M moist W wet S saturated Wp plastic limit Wl liquid limit	<b>consistency / relative density</b> VS very soft S soft F firm St stiff VSt very stiff H hard Fb friable VL very loose L loose MD medium dense D dense VD very dense
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\* bit shown by suffix  
 e.g. AD/T  
 B blank bit  
 T TC bit  
 V V bit

# Engineering Log - Hand Auger

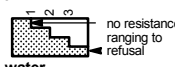
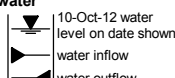
Borehole ID: **HAL447**  
 sheet: 1 of 1  
 project no: **GENZTAUC13086AP**  
 date started: **18 Aug 2016**  
 date completed: **18 Aug 2016**  
 logged by: **ODS**  
 checked by: **RBT**

client: **THE LAKES**  
 principal:  
 project: **THE LAKES STAGE 3GH**  
 location: **Centre of lot 447**

position: Not Specified surface elevation: Not Specified angle from horizontal: 90°  
 drill model: drilling fluid: hole diameter : 50 mm vane id.: SL588

drilling information				material substance								
method & support	penetration	water	samples & field tests	RL (m)	depth (m)	graphic log	classification symbol	material description	moisture condition	consistency / relative density	vane shear (kPa)	structure and additional observations
HA N Not Encountered	1		VS >202 kPa		0.5	[Cross-hatched pattern]		SILT: non plastic, orange brown with mottled brown and black, with trace fine to coarse grained sand.	D	VSt		FILL
	2		VS 166/54 kPa					SILT: non plastic, black, with trace fine grained sand and with faint organic odour.	D to M			
	3		VS >202 kPa		1.0			SILT: non plastic to low plasticity, orange brown with mottled brown and black, with trace fine to medium grained sand and with trace clay.				
			VS 160/54 kPa		1.5			1.2 m: orange brown with mottled brown and with trace to minor clay				
			VS >202 kPa		2.0							
			VS >202 kPa		2.5			2.4 m: with mottled black				
			VS >202 kPa		2.5			Hand Auger HAL447 terminated at 2.5 m Target depth				

CDF\_0\_9\_06\_LIBRARY.GLB rev:AT Log COF BOREHOLE: NON CORED 13086AP - STAGE 3GH - ODS.GPJ <<DrawingFiles>> 10/01/2017 09:49


<b>method</b> AD auger drilling* AS auger screwing* HA hand auger W washbore HA hand auger	<b>support</b> M mud N nil C casing	<b>samples &amp; field tests</b> B bulk disturbed sample D disturbed sample E environmental sample SS split spoon sample U## undisturbed sample ##mm diameter HP hand penetrometer (kPa) N standard penetration test (SPT) N* SPT - sample recovered Nc SPT with solid cone VS vane shear; peak/remoulded (kPa) R refusal HB hammer bouncing	<b>classification symbol &amp; soil description</b> based on Unified Classification System	<b>consistency / relative density</b> VS very soft S soft F firm St stiff VSt very stiff H hard Fb friable VL very loose L loose MD medium dense D dense VD very dense
* bit shown by suffix e.g. AD/T B blank bit T TC bit V V bit	<b>penetration</b>  <b>water</b> 	<b>moisture</b> D dry M moist W wet S saturated Wp plastic limit Wl liquid limit		

# Engineering Log - Hand Auger


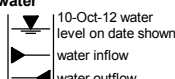
client: **THE LAKES**  
 principal:  
 project: **THE LAKES STAGE 3GH**  
 location: **Centre of lot 449**

Borehole ID: **HAL449**  
 sheet: 1 of 1  
 project no: **GENZTAUC13086AP**  
 date started: **18 Aug 2016**  
 date completed: **18 Aug 2016**  
 logged by: **NM**  
 checked by: **RBT**

position: Not Specified surface elevation: Not Specified angle from horizontal: 90°  
 drill model: drilling fluid: hole diameter : 50 mm vane id.: DR2244

drilling information				material substance								
method & support	penetration	water	samples & field tests	RL (m)	depth (m)	graphic log	classification symbol	material description	moisture condition	consistency / relative density	vane shear	structure and additional observations
	1 2 3							SOIL TYPE: plasticity or particle characteristic, colour, secondary and minor components			peak remoulded	
HA	N	Not Encountered	VS >182 kPa		0.5			SILT: non plastic, orange brown with mottled brown, with minor fine grained sand.	D to M	VSt	○	FILL
			VS UTP					SAND: fine to medium grained, purple grey.			○	
			VS >182 kPa		1.0			SILT: non plastic to low plasticity, orange brown, with minor clay.		VSt	○	
			VS >182 kPa		1.1			1.1 m: becoming mottled purple grey, white and red brown	M to W		○	
			VS >182 kPa		1.5			1.4 m: becoming brown with mottled orange brown	D to M		○	
			VS >182 kPa		2.0						○	
			VS >182 kPa		2.5			SILT: non plastic, yellow brown, with some fine grained sand.	D		○	YOUNGER ASH DEPOSIT
			VS >182 kPa		2.5			Hand Auger HAL449 terminated at 2.5 m Target depth			○	
					3.0							
					3.5							
					4.0							
					4.5							
					5.0							

CDF\_0\_9\_06\_LIBRARY.GLB rev:AT Log COF BOREHOLE: NON CORED 13086AP - STAGE 3GH - ODS.GPJ <-DrawingFiles> 10/01/2017 09:49

<b>method</b> AD auger drilling* AS auger screwing* HA hand auger W washbore HA hand auger	<b>support</b> M mud N nil C casing	<b>samples &amp; field tests</b> B bulk disturbed sample D disturbed sample E environmental sample SS split spoon sample U## undisturbed sample ##mm diameter HP hand penetrometer (kPa) N standard penetration test (SPT) N* SPT - sample recovered Nc SPT with solid cone VS vane shear; peak/remoulded (kPa) R refusal HB hammer bouncing	<b>classification symbol &amp; soil description</b> based on Unified Classification System	<b>consistency / relative density</b> VS very soft S soft F firm St stiff VSt very stiff H hard Fb friable VL very loose L loose MD medium dense D dense VD very dense
* bit shown by suffix e.g. AD/T B blank bit T TC bit V V bit	<b>penetration</b>  <b>water</b> 	<b>moisture</b> D dry M moist W wet S saturated Wp plastic limit Wl liquid limit		

# Engineering Log - Hand Auger

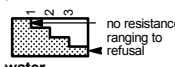
Borehole ID: **HAL452**  
 sheet: 1 of 1  
 project no: **GENZTAUC13086AP**  
 date started: **18 Aug 2016**  
 date completed: **18 Aug 2016**  
 logged by: **ODS**  
 checked by: **RBT**

client: **THE LAKES**  
 principal:  
 project: **THE LAKES STAGE 3GH**  
 location: **Centre of lot 452**

position: Not Specified surface elevation: Not Specified angle from horizontal: 90°  
 drill model: drilling fluid: hole diameter : 50 mm vane id.: SL588

drilling information				material substance				
method & support	penetration	water	samples & field tests	depth (m)	material description	moisture condition	consistency / relative density	structure and additional observations
HA N Not Encountered	1		VS >202 kPa	0.0 - 0.5	<b>ORGANIC SILT:</b> non plastic, black. <b>SILT:</b> non plastic to low plasticity, orange brown with mottled brown, with trace fine to coarse grained sand and with trace clay.	D	VSt	TOPSOIL
	2		VS >202 kPa	0.5 - 1.0				FILL
	3		VS >202 kPa	1.0 - 1.5				
			VS >202 kPa	1.5 - 2.0				
			VS >202 kPa	2.0 - 2.5				
			VS >202 kPa	2.5 - 2.8				
			VS 101/29 kPa	2.8 - 2.5				<b>SILT:</b> non plastic to low plasticity, orange brown, with trace fine grained sand and with trace clay.
				2.5	Hand Auger HAL452 terminated at 2.5 m Target depth			

CDF\_0\_9\_06\_LIBRARY.GLB rev:AT Log COF BOREHOLE: NON CORED 13086AP - STAGE 3GH - ODS.GPJ <<DrawingFiles>> 10/01/2017 09:49

<b>method</b> AD auger drilling* AS auger screwing* HA hand auger W washbore HA hand auger	<b>support</b> M mud N nil C casing <b>penetration</b>  no resistance ranging to refusal <b>water</b> 10-Oct-12 water level on date shown water inflow water outflow	<b>samples &amp; field tests</b> B bulk disturbed sample D disturbed sample E environmental sample SS split spoon sample U## undisturbed sample ##mm diameter HP hand penetrometer (kPa) N standard penetration test (SPT) N* SPT - sample recovered Nc SPT with solid cone VS vane shear; peak/remoulded (kPa) R refusal HB hammer bouncing	<b>classification symbol &amp; soil description</b> based on Unified Classification System <b>moisture</b> D dry M moist W wet S saturated Wp plastic limit Wl liquid limit	<b>consistency / relative density</b> VS very soft S soft F firm St stiff VSt very stiff H hard Fb friable VL very loose L loose MD medium dense D dense VD very dense
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\* bit shown by suffix  
 e.g. AD/T  
 B blank bit  
 T TC bit  
 V V bit

# Engineering Log - Hand Auger


client: **THE LAKES**  
 principal:  
 project: **THE LAKES STAGE 3GH**  
 location: **Centre of lot 453**

Borehole ID: **HAL453**  
 sheet: 1 of 1  
 project no: **GENZTAUC13086AP**  
 date started: **18 Aug 2016**  
 date completed: **18 Aug 2016**  
 logged by: **ODS**  
 checked by: **RBT**

position: Not Specified surface elevation: Not Specified angle from horizontal: 90°  
 drill model: drilling fluid: hole diameter : 50 mm vane id.: SL588

drilling information				material substance					
method & support	penetration	water	samples & field tests	depth (m)	material description	moisture condition	consistency / relative density	structure and additional observations	
HA N Not Encountered	1		VS >202 kPa	0.0 - 0.5	ORGANIC SILT: non plastic, black.	D to M	VSt to H	TOPSOIL	
	2		VS >202 kPa	0.5 - 1.0	SILT: non plastic to low plasticity, orange brown with mottled brown and grey, with trace fine to coarse grained sand.			FILL	
	3		VS >202 kPa	1.0 - 1.5					
			VS >202 kPa	1.5 - 2.0					
			VS >202 kPa	2.0 - 2.5		SILT: non plastic, black.			YOUNGER ASH DEPOSIT
			VS 194/46 kPa	2.5 - 2.5		SILT: non plastic to low plasticity, orange brown, with trace fine grained sand.			
				2.5	Hand Auger HAL453 terminated at 2.5 m Target depth				

CDF\_0\_9\_06\_LIBRARY.GLB rev:AT Log COF BOREHOLE: NON CORED - STAGE 3GH - ODS.GPJ <-DrawingFiles> 10/01/2017 09:49

<b>method</b> AD auger drilling* AS auger screwing* HA hand auger W washbore HA hand auger	<b>support</b> M mud N nil C casing <b>penetration</b>  no resistance ranging to refusal <b>water</b> 10-Oct-12 water level on date shown water inflow water outflow	<b>samples &amp; field tests</b> B bulk disturbed sample D disturbed sample E environmental sample SS split spoon sample U## undisturbed sample ##mm diameter HP hand penetrometer (kPa) N standard penetration test (SPT) N* SPT - sample recovered Nc SPT with solid cone VS vane shear; peak/remoulded (kPa) R refusal HB hammer bouncing	<b>classification symbol &amp; soil description</b> based on Unified Classification System <b>moisture</b> D dry M moist W wet S saturated Wp plastic limit Wl liquid limit	<b>consistency / relative density</b> VS very soft S soft F firm St stiff VSt very stiff H hard Fb friable VL very loose L loose MD medium dense D dense VD very dense
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\* bit shown by suffix  
 e.g. AD/T  
 B blank bit  
 T TC bit  
 V V bit








# Engineering Log - Hand Auger

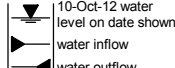
client: **THE LAKES**  
 principal:  
 project: **THE LAKES STAGE 3GH**  
 location: **Centre of lot 455**

Borehole ID: **HAL455**  
 sheet: 1 of 1  
 project no: **GENZTAUC13086AP**  
 date started: **18 Aug 2016**  
 date completed: **18 Aug 2016**  
 logged by: **ODS**  
 checked by: **RBT**

position: Not Specified surface elevation: Not Specified angle from horizontal: 90°  
 drill model: drilling fluid: hole diameter : 50 mm vane id.: SL588

drilling information				material substance			
method & support	penetration	water	samples & field tests	depth (m)	graphic log	material description	structure and additional observations
HA N Not Encountered	1		VS >202 kPa	0.0 - 0.5		<b>ORGANIC SILT:</b> non plastic, black.	<b>TOPSOIL</b>
	2		VS >202 kPa	0.5 - 1.0		<b>SILT:</b> non plastic to low plasticity, orange brown with mottled brown and grey, with trace fine to coarse grained sand.	<b>FILL</b>
	3		VS >202 kPa	1.0 - 1.5			
			VS >202 kPa	1.5 - 2.0		<b>SILT:</b> non plastic to low plasticity, orange brown, with trace fine grained sand.	<b>YOUNGER ASH DEPOSIT</b>
			VS 190/51 kPa	2.0 - 2.5			
		VS 173/85 kPa	2.5	2.5		Hand Auger HAL455 terminated at 2.5 m Target depth	

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<b>method</b> AD auger drilling* AS auger screwing* HA hand auger W washbore HA hand auger	<b>support</b> M mud N nil C casing <b>penetration</b>  no resistance ranging to refusal <b>water</b>  10-Oct-12 water level on date shown water inflow water outflow	<b>samples &amp; field tests</b> B bulk disturbed sample D disturbed sample E environmental sample SS split spoon sample U## undisturbed sample ##mm diameter HP hand penetrometer (kPa) N standard penetration test (SPT) N* SPT - sample recovered Nc SPT with solid cone VS vane shear; peak/remouded (kPa) R refusal HB hammer bouncing	<b>classification symbol &amp; soil description</b> based on Unified Classification System <b>moisture</b> D dry M moist W wet S saturated Wp plastic limit Wl liquid limit	<b>consistency / relative density</b> VS very soft S soft F firm St stiff VSt very stiff H hard Fb friable VL very loose L loose MD medium dense D dense VD very dense
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\* bit shown by suffix  
 e.g. AD/T  
 B blank bit  
 T TC bit  
 V V bit

# Engineering Log - Hand Auger


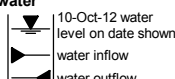
client: **THE LAKES**  
 principal:  
 project: **THE LAKES STAGE 3GH**  
 location: **Centre of lot 457**

Borehole ID: **HAL457**  
 sheet: 1 of 1  
 project no: **GENZTAUC13086AP**  
 date started: **18 Aug 2016**  
 date completed: **18 Aug 2016**  
 logged by: **ODS**  
 checked by: **RBT**

position: Not Specified surface elevation: Not Specified angle from horizontal: 90°  
 drill model: drilling fluid: hole diameter : 50 mm vane id.: SL588

drilling information				material substance							
method & support	penetration	water	samples & field tests	depth (m)	graphic log	classification symbol	material description	moisture condition	consistency / relative density	vane shear (kPa)	structure and additional observations
HA N Not Encountered	1		VS >202 kPa	0.0 - 0.5			<b>ORGANIC SILT:</b> non plastic, black.	D to M	H	90 100 150 200	<b>TOPSOIL</b>
	2		VS >202 kPa	0.5 - 1.0			<b>SILT:</b> non plastic to low plasticity, orange brown with mottled brown and grey, with trace fine to coarse grained sand.				<b>FILL</b>
	3		VS >202 kPa	1.0 - 1.5							
				VS >202 kPa	1.5 - 2.0						
			VS >202 kPa	2.0 - 2.5			<b>SILT:</b> non plastic to low plasticity, orange brown, with trace fine to coarse grained sand.				<b>YOUNGER ASH DEPOSIT</b>
			VS >202 kPa	2.5 - 2.5			Hand Auger HAL457 terminated at 2.5 m Target depth				

CDF\_0\_9\_06\_LIBRARY.GLB rev:AT Log COF BOREHOLE: NON CORED 13086AP - STAGE 3GH - ODS.GPJ <-DrawingFiles> 10/01/2017 09:49

<b>method</b> AD auger drilling* AS auger screwing* HA hand auger W washbore HA hand auger	<b>support</b> M mud N nil C casing	<b>samples &amp; field tests</b> B bulk disturbed sample D disturbed sample E environmental sample SS split spoon sample U## undisturbed sample ##mm diameter HP hand penetrometer (kPa) N standard penetration test (SPT) N* SPT - sample recovered Nc SPT with solid cone VS vane shear; peak/remoued (kPa) R refusal HB hammer bouncing	<b>classification symbol &amp; soil description</b> based on Unified Classification System	<b>consistency / relative density</b> VS very soft S soft F firm St stiff VSt very stiff H hard Fb friable VL very loose L loose MD medium dense D dense VD very dense
* bit shown by suffix e.g. AD/T B blank bit T TC bit V V bit	<b>penetration</b>  no resistance ranging to refusal	<b>moisture</b> D dry M moist W wet S saturated Wp plastic limit Wl liquid limit	<b>water</b>  10-Oct-12 water level on date shown water inflow water outflow	

# Engineering Log - Hand Auger

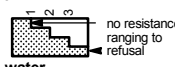
client: **THE LAKES**  
 principal:  
 project: **THE LAKES STAGE 3GH**  
 location: **Centre of lot 459**

Borehole ID: **HAL459**  
 sheet: 1 of 1  
 project no: **GENZTAUC13086AP**  
 date started: **18 Aug 2016**  
 date completed: **18 Aug 2016**  
 logged by: **ODS**  
 checked by: **RBT**

position: Not Specified surface elevation: Not Specified angle from horizontal: 90°  
 drill model: drilling fluid: hole diameter : 50 mm vane id.: SL588

drilling information				material substance							
method & support	penetration	samples & field tests	RL (m)	depth (m)	graphic log	classification symbol	material description	moisture condition	consistency / relative density	vane shear	structure and additional observations
HA N Not Encountered	1	VS >202 kPa		0.0			<b>ORGANIC SILT:</b> non plastic, black.	D to M	VSt to H		<b>TOPSOIL</b>
	2	VS >202 kPa		0.5			<b>SILT:</b> low plasticity, orange brown with mottled brown, with trace fine to coarse grained sand.				<b>FILL</b>
	3	VS >202 kPa		1.0							
		VS >202 kPa		1.5							
		VS >202 kPa		2.0				<b>SILT:</b> low plasticity, brown, with trace fine grained sand.	M		
	VS 153/29 kPa		2.5				<b>Clayey SILT:</b> low to medium plasticity, orange brown, with fine grained sand.				
				2.5			Hand Auger HAL459 terminated at 2.5 m Target depth				
				3.0							
				3.5							
				4.0							
				4.5							
				5.0							

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<b>method</b> AD auger drilling* AS auger screwing* HA hand auger W washbore HA hand auger	<b>support</b> M mud N nil C casing <b>penetration</b>  no resistance ranging to refusal <b>water</b> 10-Oct-12 water level on date shown water inflow water outflow	<b>samples &amp; field tests</b> B bulk disturbed sample D disturbed sample E environmental sample SS split spoon sample U## undisturbed sample ##mm diameter HP hand penetrometer (kPa) N standard penetration test (SPT) N* SPT - sample recovered Nc SPT with solid cone VS vane shear; peak/remoulded (kPa) R refusal HB hammer bouncing	<b>classification symbol &amp; soil description</b> based on Unified Classification System <b>moisture</b> D dry M moist W wet S saturated Wp plastic limit Wl liquid limit	<b>consistency / relative density</b> VS very soft S soft F firm St stiff VSt very stiff H hard Fb friable VL very loose L loose MD medium dense D dense VD very dense
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\* bit shown by suffix  
 e.g. AD/T  
 B blank bit  
 T TC bit  
 V V bit

# Engineering Log - Hand Auger


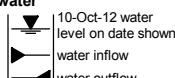
Borehole ID: **HAL460**  
 sheet: 1 of 1  
 project no: **GENZTAUC13086AP**  
 date started: **22 Aug 2016**  
 date completed: **22 Aug 2016**  
 logged by: **ODS**  
 checked by: **RBT**

client: **THE LAKES**  
 principal:  
 project: **THE LAKES STAGE 3GH**  
 location: **Centre of lot 460**

position: Not Specified surface elevation: Not Specified angle from horizontal: 90°  
 drill model: drilling fluid: hole diameter : 50 mm vane id.: SL588

drilling information				material substance								
method & support	penetration	water	samples & field tests	RL (m)	depth (m)	graphic log	classification symbol	material description	moisture condition	consistency / relative density	vane shear	structure and additional observations
	1 2 3							SOIL TYPE: plasticity or particle characteristic, colour, secondary and minor components			⊕ ⊗ ⊙ ⊚	
			VS >202 kPa					<b>ORGANIC SILT:</b> non plastic, black.	D to M	VSt		<b>TOPSOIL</b>
			VS 177/ 44 kPa		0.5			<b>SILT:</b> non plastic to low plasticity, orange brown, with trace fine grained sand.  0.6 m: with trace clay			⊕ ⊙	<b>YOUNGER ASH DEPOSIT</b>
			VS 117/ 38 kPa		1.0			<b>SILT:</b> low plasticity, orange brown, with trace clay and with trace fine to coarse grained sand. Greasy when reworked.	M		⊕ ⊙	<b>MATUA SUBGROUP</b>
			VS 113/ 52 kPa		1.5			<b>SILT:</b> non plastic, pale brown, with some fine to coarse grained sand.			⊕ ⊙	
			VS 109/ 32 kPa		2.0						⊕ ⊙	
			VS 121/ 31 kPa		2.5			2.3 m: with trace fine to coarse grained sand. Is sensitive in hand sample			⊕ ⊙	
			VS >202 kPa		3.0			<b>Clayey SILT:</b> low to medium plasticity, brown, with trace fine grained sand.			⊕ ⊙	
			VS >202 kPa		3.5						⊕ ⊙	
			VS >202 kPa		4.0						⊕ ⊙	
			VS >202 kPa		4.5						⊕ ⊙	
			VS >202 kPa		5.0						⊕ ⊙	
					3.5			Hand Auger HAL460 terminated at 3.5 m Target depth				

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<b>method</b> AD auger drilling* AS auger screwing* HA hand auger W washbore HA hand auger	<b>support</b> M mud N nil C casing <b>penetration</b>  no resistance ranging to refusal <b>water</b>  10-Oct-12 water level on date shown water inflow water outflow	<b>samples &amp; field tests</b> B bulk disturbed sample D disturbed sample E environmental sample SS split spoon sample U## undisturbed sample ##mm diameter HP hand penetrometer (kPa) N standard penetration test (SPT) N* SPT - sample recovered Nc SPT with solid cone VS vane shear; peak/remoulded (kPa) R refusal HB hammer bouncing	<b>classification symbol &amp; soil description</b> based on Unified Classification System <b>moisture</b> D dry M moist W wet S saturated Wp plastic limit Wl liquid limit	<b>consistency / relative density</b> VS very soft S soft F firm St stiff VSt very stiff H hard Fb friable VL very loose L loose MD medium dense D dense VD very dense
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\* bit shown by suffix  
 e.g. AD/T  
 B blank bit  
 T TC bit  
 V V bit

# Engineering Log - Hand Auger

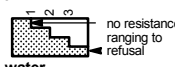
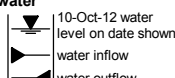
Borehole ID: **HAL461**  
 sheet: 1 of 1  
 project no: **GENZTAUC13086AP**  
 date started: **22 Aug 2016**  
 date completed: **22 Aug 2016**  
 logged by: **ODS**  
 checked by: **RBT**

client: **THE LAKES**  
 principal:  
 project: **THE LAKES STAGE 3GH**  
 location: **Centre of lot 461**

position: Not Specified surface elevation: Not Specified angle from horizontal: 90°  
 drill model: drilling fluid: hole diameter : 50 mm vane id.: SL588

drilling information				material substance				
method & support	penetration	water	samples & field tests	depth (m)	material description	moisture condition	consistency / relative density	structure and additional observations
HA	N	Not Encountered	VS >202 kPa	0.0 - 0.5	ORGANIC SILT: non plastic, black.	D	VSt	TOPSOIL
			VS >202 kPa	0.5 - 1.0	SILT: low plasticity, brown, with minor clay.	M		MATUA SUBGROUP
			VS 184/ 34 kPa	1.0 - 1.5	0.5 m: becoming orange brown			
			VS >202 kPa	1.5 - 2.0	1.8 m: becomes sticky/greasy when reworked		St	
			VS 156/ 41 kPa	2.0 - 2.5	2.0 m: with trace fine grained sand			
			VS 71/ 22 kPa					
			VS 71/ 21 kPa					
			VS 75/ 18 kPa					
				2.5	Hand Auger HAL461 terminated at 2.5 m Target depth			
				3.0				
				3.5				
				4.0				
				4.5				
				5.0				

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<b>method</b> AD auger drilling* AS auger screwing* HA hand auger W washbore HA hand auger	<b>support</b> M mud N nil C casing <b>penetration</b>  no resistance ranging to refusal <b>water</b>  10-Oct-12 water level on date shown water inflow water outflow	<b>samples &amp; field tests</b> B bulk disturbed sample D disturbed sample E environmental sample SS split spoon sample U## undisturbed sample ##mm diameter HP hand penetrometer (kPa) N standard penetration test (SPT) N* SPT - sample recovered Nc SPT with solid cone VS vane shear; peak/remouded (kPa) R refusal HB hammer bouncing	<b>classification symbol &amp; soil description</b> based on Unified Classification System <b>moisture</b> D dry M moist W wet S saturated Wp plastic limit Wl liquid limit	<b>consistency / relative density</b> VS very soft S soft F firm St stiff VSt very stiff H hard Fb friable VL very loose L loose MD medium dense D dense VD very dense
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\* bit shown by suffix  
 e.g. AD/T  
 B blank bit  
 T TC bit  
 V V bit

# Engineering Log - Hand Auger


client: **THE LAKES**  
 principal:  
 project: **THE LAKES STAGE 3GH**  
 location: **Centre of lot 463**

Borehole ID: **HAL463**  
 sheet: 1 of 1  
 project no: **GENZTAUC13086AP**  
 date started: **22 Aug 2016**  
 date completed: **22 Aug 2016**  
 logged by: **ODS**  
 checked by: **RBT**

position: Not Specified surface elevation: Not Specified angle from horizontal: 90°  
 drill model: drilling fluid: hole diameter : 50 mm vane id.: SL588

drilling information				material substance								
method & support	penetration	water	samples & field tests	RL (m)	depth (m)	graphic log	classification symbol	material description	moisture condition	consistency / relative density	vane shear	structure and additional observations
	1 2 3							SOIL TYPE: plasticity or particle characteristic, colour, secondary and minor components			⊕ ⊗ ⊙ ⊚	
HA	N	Not Encountered	VS >202 kPa		0.5			ORGANIC SILT: non plastic, black.	D	VSt to H		TOPSOIL
			VS 184/ 39 kPa		1.0			SILT: low plasticity, orange brown, with trace fine grained sand with trace clay.	M		⊕ ⊗ ⊙ ⊚	YOUNGER ASH DEPOSIT
			VS 166/ 29 kPa		1.5							
			VS 158/ 29 kPa		2.0			1.6 m: with trace fine to coarse grained sand				
			VS >202 kPa		2.5			SAND: fine to coarse grained, orange brown, with minor silt.				MATUA SUBGROUP
			VS >202 kPa		3.0			Hand Auger HAL463 terminated at 2.5 m Target depth				
			VS 187/ 65 kPa		3.5							
					4.0							
					4.5							
					5.0							

CDF\_0\_9\_06\_LIBRARY.GLB rev:AT Log COF BOREHOLE: NON CORED - STAGE 3GH - ODS.GPJ <-DrawingFiles> 10/01/2017 09:49

<b>method</b> AD auger drilling* AS auger screwing* HA hand auger W washbore HA hand auger	<b>support</b> M mud N nil C casing	<b>samples &amp; field tests</b> B bulk disturbed sample D disturbed sample E environmental sample SS split spoon sample U## undisturbed sample ##mm diameter HP hand penetrometer (kPa) N standard penetration test (SPT) N* SPT - sample recovered Nc SPT with solid cone VS vane shear; peak/remoulded (kPa) R refusal HB hammer bouncing	<b>classification symbol &amp; soil description</b> based on Unified Classification System	<b>consistency / relative density</b> VS very soft S soft F firm St stiff VSt very stiff H hard Fb friable VL very loose L loose MD medium dense D dense VD very dense
* bit shown by suffix e.g. AD/T B blank bit T TC bit V V bit	<b>penetration</b> 	<b>moisture</b> D dry M moist W wet S saturated Wp plastic limit Wl liquid limit		

# Engineering Log - Hand Auger


Borehole ID: **HAL465**  
 sheet: 1 of 1  
 project no: **GENZTAUC13086AP**  
 date started: **22 Aug 2016**  
 date completed: **22 Aug 2016**  
 logged by: **ODS**  
 checked by: **RBT**

client: **THE LAKES**  
 principal:  
 project: **THE LAKES STAGE 3GH**  
 location: **Centre of lot 465**

position: Not Specified surface elevation: Not Specified angle from horizontal: 90°  
 drill model: drilling fluid: hole diameter : 50 mm vane id.: SL588

drilling information				material substance				
method & support	penetration	water	samples & field tests	depth (m)	material description	moisture condition	consistency / relative density	structure and additional observations
HA N Not Encountered	1 2 3	VS >202 kPa  VS >202 kPa  VS >202 kPa  VS 194/44 kPa  VS 122/24 kPa  VS 151/39 kPa	RL (m) depth (m)	0.0 - 0.5	ORGANIC SILT: non plastic, black.	D to M	VSt to H	TOPSOIL
				0.5 - 1.0	SILT: non plastic to low plasticity, orange brown with mottled brown, with trace fine to coarse grained sand.			FILL
				1.0 - 2.5	1.3 m: with trace clay. Low plasticity	M		YOUNGER ASH DEPOSIT
				2.5	Hand Auger HAL465 terminated at 2.5 m Target depth			

CDF\_0\_9\_06\_LIBRARY.GLB rev:AT Log COF BOREHOLE: NON CORED - STAGE 3GH - ODS.GPJ <<DrawingFile>> 10/01/2017 09:49

<b>method</b> AD auger drilling* AS auger screwing* HA hand auger W washbore HA hand auger	<b>support</b> M mud N nil C casing <b>penetration</b>  no resistance ranging to refusal <b>water</b> 10-Oct-12 water level on date shown water inflow water outflow	<b>samples &amp; field tests</b> B bulk disturbed sample D disturbed sample E environmental sample SS split spoon sample U## undisturbed sample ##mm diameter HP hand penetrometer (kPa) N standard penetration test (SPT) N* SPT - sample recovered Nc SPT with solid cone VS vane shear; peak/remoulded (kPa) R refusal HB hammer bouncing	<b>classification symbol &amp; soil description</b> based on Unified Classification System <b>moisture</b> D dry M moist W wet S saturated Wp plastic limit Wl liquid limit	<b>consistency / relative density</b> VS very soft S soft F firm St stiff VSt very stiff H hard Fb friable VL very loose L loose MD medium dense D dense VD very dense
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\* bit shown by suffix  
 e.g. AD/T  
 B blank bit  
 T TC bit  
 V V bit

# Engineering Log - Hand Auger


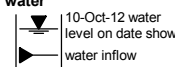
client: **THE LAKES**  
 principal:  
 project: **THE LAKES STAGE 3GH**  
 location: **Centre of lot 467**

Borehole ID: **HAL467**  
 sheet: 1 of 1  
 project no: **GENZTAUC13086AP**  
 date started: **22 Aug 2016**  
 date completed: **22 Aug 2016**  
 logged by: **ODS**  
 checked by: **RBT**

position: Not Specified surface elevation: Not Specified angle from horizontal: 90°  
 drill model: drilling fluid: hole diameter : 50 mm vane id.: SL588

drilling information				material substance				
method & support	penetration	water	samples & field tests	depth (m)	material description	moisture condition	consistency / relative density	structure and additional observations
HA N Not Encountered	1		VS >202 kPa	0.0 - 0.5	<b>ORGANIC SILT:</b> non plastic, black.	D to M	VSt to H	<b>TOPSOIL</b>
	2		VS >202 kPa	0.5 - 1.0	<b>SILT:</b> non plastic to low plasticity, orange brown with mottled brown, with trace fine to coarse grained sand.			<b>FILL</b>
	3		VS >202 kPa	1.0 - 1.5				
			VS >202 kPa	1.5 - 2.0	1.5 m: becomes dark brown with mottled orange brown	M		<b>YOUNGER ASH DEPOSIT</b>
			VS >202 kPa	2.0 - 2.5	<b>SILT:</b> non plastic to low plasticity, orange brown, with trace fine sand. 2.0 m: with trace clay			
			VS 112/35 kPa	2.5 - 2.5	Hand Auger HAL467 terminated at 2.5 m Target depth			

CDF\_0\_9\_06\_LIBRARY.GLB rev:AT Log COF BOREHOLE: NON CORED - STAGE 3GH - ODS.GPJ <<DrawingFiles>> 10/01/2017 09:49

<b>method</b> AD auger drilling* AS auger screwing* HA hand auger W washbore HA hand auger  * bit shown by suffix e.g. AD/T B blank bit T TC bit V V bit	<b>support</b> M mud N nil C casing  <b>penetration</b>  <b>water</b> 	<b>samples &amp; field tests</b> B bulk disturbed sample D disturbed sample E environmental sample SS split spoon sample U## undisturbed sample ##mm diameter HP hand penetrometer (kPa) N standard penetration test (SPT) N* SPT - sample recovered Nc SPT with solid cone VS vane shear; peak/remouded (kPa) R refusal HB hammer bouncing	<b>classification symbol &amp; soil description</b> based on Unified Classification System  <b>moisture</b> D dry M moist W wet S saturated Wp plastic limit Wl liquid limit	<b>consistency / relative density</b> VS very soft S soft F firm St stiff VSt very stiff H hard Fb friable VL very loose L loose MD medium dense D dense VD very dense
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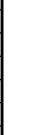


# Engineering Log - Hand Auger

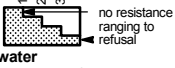
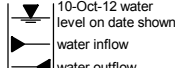
Borehole ID: **HAL469**  
 sheet: 1 of 1  
 project no: **GENZTAUC13086AP**  
 date started: **22 Aug 2016**  
 date completed: **22 Aug 2016**  
 logged by: **ODS**  
 checked by: **RBT**

client: **THE LAKES**  
 principal:  
 project: **THE LAKES STAGE 3GH**  
 location: **Centre of lot 469**

position: Not Specified surface elevation: Not Specified angle from horizontal: 90°  
 drill model: drilling fluid: hole diameter : 50 mm vane id.: SL588

drilling information				material substance							
method & support	penetration	water	samples & field tests	depth (m)	graphic log	classification symbol	material description	moisture condition	consistency / relative density	vane shear	structure and additional observations
HA N Not Encountered	1		VS >202 kPa	0.0 - 0.5			<b>ORGANIC SILT:</b> non plastic, black.	D to M	VSt to H		<b>TOPSOIL</b>
	2		VS >202 kPa	0.5 - 1.0			<b>SILT:</b> non plastic to low plasticity, orange brown with mottled grey and brown, with trace fine to coarse grained sand.				<b>FILL</b>
	3		VS 197/ 58 kPa	1.0 - 1.5			<b>SILT:</b> non plastic to low plasticity, orange brown, with trace fine sand. 1.0 m: with trace clay	M			<b>YOUNGER ASH DEPOSIT</b>
			VS >202 kPa	1.5 - 2.0					St		
			VS 71/ 38 kPa	2.0 - 2.5							
			VS 96/ 29 kPa	2.5 - 2.5			Hand Auger HAL469 terminated at 2.5 m Target depth				

CDF\_0\_9\_06\_LIBRARY.GLB rev:AT Log COF BOREHOLE: NON CORED 13086AP - STAGE 3GH - ODS.GPJ <<DrawingFile>> 10/01/2017 09:49

<b>method</b> AD auger drilling* AS auger screwing* HA hand auger W washbore HA hand auger	<b>support</b> M mud N nil C casing <b>penetration</b>  no resistance ranging to refusal <b>water</b>  10-Oct-12 water level on date shown water inflow water outflow	<b>samples &amp; field tests</b> B bulk disturbed sample D disturbed sample E environmental sample SS split spoon sample U## undisturbed sample ##mm diameter HP hand penetrometer (kPa) N standard penetration test (SPT) N* SPT - sample recovered Nc SPT with solid cone VS vane shear; peak/remoulded (kPa) R refusal HB hammer bouncing	<b>classification symbol &amp; soil description</b> based on Unified Classification System <b>moisture</b> D dry M moist W wet S saturated Wp plastic limit Wl liquid limit	<b>consistency / relative density</b> VS very soft S soft F firm St stiff VSt very stiff H hard Fb friable VL very loose L loose MD medium dense D dense VD very dense
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\* bit shown by suffix  
 e.g. AD/T  
 B blank bit  
 T TC bit  
 V V bit

# Engineering Log - Hand Auger

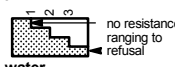
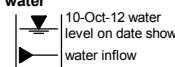
Borehole ID: **HAL471**  
 sheet: 1 of 1  
 project no: **GENZTAUC13086AP**  
 date started: **22 Aug 2016**  
 date completed: **22 Aug 2016**  
 logged by: **ODS**  
 checked by: **RBT**

client: **THE LAKES**  
 principal:  
 project: **THE LAKES STAGE 3GH**  
 location: **Centre of lot 471**

position: Not Specified surface elevation: Not Specified angle from horizontal: 90°  
 drill model: drilling fluid: hole diameter : 50 mm vane id.: SL588

drilling information				material substance							
method & support	penetration	water	samples & field tests	depth (m)	graphic log	classification symbol	material description	moisture condition	consistency / relative density	vane shear	structure and additional observations
HA N Not Encountered	1		VS >202 kPa	0.0 - 0.5	[Cross-hatched pattern]		<b>ORGANIC SILT:</b> non plastic, black.	D to M	VSt to H	○	<b>TOPSOIL</b>
	2		VS >202 kPa	0.5 - 1.0	[Cross-hatched pattern]		<b>SILT:</b> non plastic to low plasticity, orange brown with mottled grey and brown, with trace fine to coarse grained sand.			○	<b>FILL</b>
	3		VS >202 kPa	1.0 - 1.5	[Cross-hatched pattern]					○	
				VS >202 kPa	1.5 - 2.0	[Cross-hatched pattern]		<b>SILT:</b> non plastic to low plasticity, orange brown, with trace fine to coarse grained sand.	M		○
			VS >202 kPa	2.0 - 2.5	[Cross-hatched pattern]		2.0 m: with trace clay			○	
			VS 187/52 kPa	2.5 - 2.5	[Cross-hatched pattern]		Hand Auger HAL471 terminated at 2.5 m Target depth			○	

CDF\_0\_9\_06\_LIBRARY.GLB rev:AT Log COF BOREHOLE: NON CORED - STAGE 3GH - ODS.GPJ <-DrawingFiles> 10/01/2017 09:49

<b>method</b> AD auger drilling* AS auger screwing* HA hand auger W washbore HA hand auger	<b>support</b> M mud N nil C casing <b>penetration</b>  <b>water</b> 	<b>samples &amp; field tests</b> B bulk disturbed sample D disturbed sample E environmental sample SS split spoon sample U## undisturbed sample ##mm diameter HP hand penetrometer (kPa) N standard penetration test (SPT) N* SPT - sample recovered Nc SPT with solid cone VS vane shear; peak/remoulded (kPa) R refusal HB hammer bouncing	<b>classification symbol &amp; soil description</b> based on Unified Classification System <b>moisture</b> D dry M moist W wet S saturated Wp plastic limit Wl liquid limit	<b>consistency / relative density</b> VS very soft S soft F firm St stiff VSt very stiff H hard Fb friable VL very loose L loose MD medium dense D dense VD very dense
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

\* bit shown by suffix  
 e.g. AD/T  
 B blank bit  
 T TC bit  
 V V bit

# Engineering Log - Hand Auger

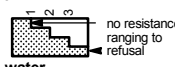
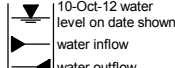
client: **THE LAKES**  
 principal:  
 project: **THE LAKES STAGE 3GH**  
 location: **Centre of lot 472**

Borehole ID: **HAL472**  
 sheet: 1 of 1  
 project no: **GENZTAUC13086AP**  
 date started: **30 Aug 2016**  
 date completed: **30 Aug 2016**  
 logged by: **ODS**  
 checked by: **RBT**

position: Not Specified surface elevation: Not Specified angle from horizontal: 90°  
 drill model: drilling fluid: hole diameter : 50 mm vane id.: SL588

drilling information				material substance								
method & support	penetration	water	samples & field tests	RL (m)	depth (m)	graphic log	classification symbol	material description	moisture condition	consistency / relative density	vane shear	structure and additional observations
	1 2 3							SOIL TYPE: plasticity or particle characteristic, colour, secondary and minor components			⊕ ⊙ ⊚ ⊛	
HA	N	Not Encountered	VS >202 kPa		0.5			ORGANIC SILT: non plastic, black.	D to M	VSt to H		TOPSOIL
			VS >202 kPa		0.7 to 0.8 m			SILT: non plastic to low plasticity, orange brown with mottled brown, with trace fine to coarse grained sand.				FILL
			VS >202 kPa		1.0			0.7 to 0.8 m: with trace fine to coarse angular gravel				
			VS >202 kPa		1.25 to 1.35 m			1.25 to 1.35 m: dark brown with mottled grey and brown with trace organic odour				
			VS >202 kPa		1.5			SILT: non plastic to low plasticity, orange brown, with trace fine to coarse grained sand.				YOUNGER ASH DEPOSIT
			VS >202 kPa		2.0			Hand Auger HAL472 terminated at 2.0 m Target depth				
					2.5							
					3.0							
					3.5							
					4.0							
					4.5							
					5.0							

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<b>method</b> AD auger drilling* AS auger screwing* HA hand auger W washbore HA hand auger	<b>support</b> M mud N nil C casing	<b>samples &amp; field tests</b> B bulk disturbed sample D disturbed sample E environmental sample SS split spoon sample U## undisturbed sample ##mm diameter HP hand penetrometer (kPa) N standard penetration test (SPT) N* SPT - sample recovered Nc SPT with solid cone VS vane shear; peak/remouded (kPa) R refusal HB hammer bouncing	<b>classification symbol &amp; soil description</b> based on Unified Classification System	<b>consistency / relative density</b> VS very soft S soft F firm St stiff VSt very stiff H hard Fb friable VL very loose L loose MD medium dense D dense VD very dense
* bit shown by suffix e.g. AD/T B blank bit T TC bit V V bit	<b>penetration</b>  no resistance ranging to refusal	<b>moisture</b> D dry M moist W wet S saturated Wp plastic limit Wl liquid limit	<b>water</b>  10-Oct-12 water level on date shown water inflow water outflow	

# Engineering Log - Hand Auger

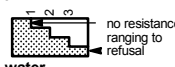
client: **THE LAKES**  
 principal:  
 project: **THE LAKES STAGE 3GH**  
 location: **Centre of lot 476**

Borehole ID: **HAL476**  
 sheet: 1 of 1  
 project no: **GENZTAUC13086AP**  
 date started: **22 Aug 2016**  
 date completed: **22 Aug 2016**  
 logged by: **NM**  
 checked by: **RBT**

position: Not Specified surface elevation: Not Specified angle from horizontal: 90°  
 drill model: drilling fluid: hole diameter : 50 mm vane id.: DR2244

drilling information				material substance								
method & support	penetration	water	samples & field tests	RL (m)	depth (m)	graphic log	classification symbol	material description	moisture condition	consistency / relative density	vane shear	structure and additional observations
	1 2 3							<b>SOIL TYPE:</b> plasticity or particle characteristic, colour, secondary and minor components			⊕ ⊗ ⊙ ⊚ ⊛ ⊜ ⊝ ⊞ ⊟ ⊠ ⊡ ⊢ ⊣ ⊤ ⊥ ⊦ ⊧ ⊨ ⊩ ⊪ ⊫ ⊬ ⊭ ⊮ ⊯ ⊰ ⊱ ⊲ ⊳ ⊴ ⊵ ⊶ ⊷ ⊸ ⊹ ⊺ ⊻ ⊼ ⊽ ⊾ ⊿ ⊠ ⊡ ⊢ ⊣ ⊤ ⊥ ⊦ ⊧ ⊨ ⊩ ⊪ ⊫ ⊬ ⊭ ⊮ ⊯ ⊰ ⊱ ⊲ ⊳ ⊴ ⊵ ⊶ ⊷ ⊸ ⊹ ⊺ ⊻ ⊼ ⊽ ⊾ ⊿	
HA	N	Not Encountered	VS >182 kPa		0.5			<b>ORGANIC SILT:</b> non plastic, black.	D	VSt		<b>TOPSOIL</b>
			VS >182 kPa		0.6			<b>SILT:</b> non plastic, orange brown, with minor fine grained sand.				<b>FILL</b>
			VS >182 kPa		0.9			0.6 m: becoming flecked white and purple	M			
			VS >182 kPa		1.0			0.9 m: becoming mottled brown with white and purple flecks absent, with trace clay	M to W			
			VS >182 kPa		1.3			1.3 m: with minor clay and with trace fine to medium grained angular gravel				
			VS >182 kPa		1.5							
			VS >182 kPa		2.0			<b>SILT:</b> non plastic, yellow brown, with minor fine grained sand.				<b>YOUNGER ASH DEPOSIT</b>
			VS 127/42 kPa		2.5							
			VS 116/21 kPa		2.5			Hand Auger HAL476 terminated at 2.5 m Target depth				
					3.0							
					3.5							
					4.0							
					4.5							
					5.0							

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<b>method</b> AD auger drilling* AS auger screwing* HA hand auger W washbore HA hand auger	<b>support</b> M mud N nil C casing <b>penetration</b>  no resistance ranging to refusal <b>water</b> 10-Oct-12 water level on date shown water inflow water outflow	<b>samples &amp; field tests</b> B bulk disturbed sample D disturbed sample E environmental sample SS split spoon sample U## undisturbed sample ##mm diameter HP hand penetrometer (kPa) N standard penetration test (SPT) N* SPT - sample recovered Nc SPT with solid cone VS vane shear; peak/remoulded (kPa) R refusal HB hammer bouncing	<b>classification symbol &amp; soil description</b> based on Unified Classification System <b>moisture</b> D dry M moist W wet S saturated Wp plastic limit Wl liquid limit	<b>consistency / relative density</b> VS very soft S soft F firm St stiff VSt very stiff H hard Fb friable VL very loose L loose MD medium dense D dense VD very dense
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\* bit shown by suffix  
 e.g. AD/T  
 B blank bit  
 T TC bit  
 V V bit

# Engineering Log - Hand Auger

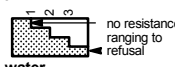
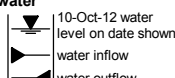
Borehole ID: **HAL478**  
 sheet: 1 of 1  
 project no: **GENZTAUC13086AP**  
 date started: **22 Aug 2016**  
 date completed: **22 Aug 2016**  
 logged by: **ODS**  
 checked by: **RBT**

client: **THE LAKES**  
 principal:  
 project: **THE LAKES STAGE 3GH**  
 location: **Centre of lot 478**

position: Not Specified surface elevation: Not Specified angle from horizontal: 90°  
 drill model: drilling fluid: hole diameter : 50 mm vane id.: SL588

drilling information				material substance									
method & support	penetration	water	samples & field tests	RL (m)	depth (m)	graphic log	classification symbol	material description	moisture condition	consistency / relative density	vane shear (kPa)	structure and additional observations	
HA N Not Encountered	1		VS >202 kPa		0.5			ORGANIC SILT: non plastic, black.	D to M	H		TOPSOIL	
	2		VS >202 kPa		1.0			SILT: non plastic to low plasticity, orange brown with mottled brown and grey, with trace fine grained sand.				FILL	
	3		VS >202 kPa		1.5								
				VS >202 kPa		2.0			1.8 to 1.9 m: becomes brown with mottled black 1.95 m: with trace coarse grained gravel				
				VS >202 kPa		2.5			SILT: non plastic, black, with trace fine grained sand. Trace organic odour. SILT: non plastic to low plasticity, orange brown, with trace fine grained sand.				YOUNGER ASH DEPOSIT
				VS >202 kPa		2.5			Hand Auger HAL478 terminated at 2.5 m Target depth				

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<b>method</b> AD auger drilling* AS auger screwing* HA hand auger W washbore HA hand auger	<b>support</b> M mud N nil C casing <b>penetration</b>  no resistance ranging to refusal <b>water</b>  10-Oct-12 water level on date shown water inflow water outflow	<b>samples &amp; field tests</b> B bulk disturbed sample D disturbed sample E environmental sample SS split spoon sample U## undisturbed sample ##mm diameter HP hand penetrometer (kPa) N standard penetration test (SPT) N* SPT - sample recovered Nc SPT with solid cone VS vane shear; peak/remoulded (kPa) R refusal HB hammer bouncing	<b>classification symbol &amp; soil description</b> based on Unified Classification System <b>moisture</b> D dry M moist W wet S saturated Wp plastic limit Wl liquid limit	<b>consistency / relative density</b> VS very soft S soft F firm St stiff VSt very stiff H hard Fb friable VL very loose L loose MD medium dense D dense VD very dense
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\* bit shown by suffix  
 e.g. AD/T  
 B blank bit  
 T TC bit  
 V V bit

# Engineering Log - Hand Auger


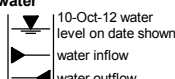
client: **THE LAKES**  
 principal:  
 project: **THE LAKES STAGE 3GH**  
 location: **Centre of lot 480**

Borehole ID: **HAL480**  
 sheet: 1 of 1  
 project no: **GENZTAUC13086AP**  
 date started: **22 Aug 2016**  
 date completed: **22 Aug 2016**  
 logged by: **ODS**  
 checked by: **RBT**

position: Not Specified surface elevation: Not Specified angle from horizontal: 90°  
 drill model: drilling fluid: hole diameter : 50 mm vane id.: SL588

drilling information				material substance								
method & support	penetration	water	samples & field tests	RL (m)	depth (m)	graphic log	classification symbol	material description	moisture condition	consistency / relative density	vane shear	structure and additional observations
	1 2 3							SOIL TYPE: plasticity or particle characteristic, colour, secondary and minor components			peak remoulded	
HA N	Not Encountered	Not Encountered	VS >202 kPa		0.5			ORGANIC SILT: non plastic, black.	D to M	VSt to H		TOPSOIL
			VS >202 kPa		1.0			SILT: non plastic to low plasticity, orange brown with mottled brown and grey, with trace fine grained sand.				FILL
			VS >202 kPa		1.5	SILT: non plastic to low plasticity, orange brown, with trace fine grained sand.	M		YOUNGER ASH DEPOSIT			
			VS >202 kPa		2.0	1.9 m: with trace to minor clay. Low to medium plasticity.						
			VS 175/44 kPa		2.5	Hand Auger HAL480 terminated at 2.5 m Target depth						
			VS 173/44 kPa		2.5							

CDF\_0\_9\_06\_LIBRARY.GLB rev:AT Log COF BOREHOLE: NON CORED - STAGE 3GH - ODS.GPJ <<DrawingFiles>> 10/01/2017 09:49


<b>method</b> AD auger drilling* AS auger screwing* HA hand auger W washbore HA hand auger	<b>support</b> M mud N nil C casing	<b>samples &amp; field tests</b> B bulk disturbed sample D disturbed sample E environmental sample SS split spoon sample U## undisturbed sample ##mm diameter HP hand penetrometer (kPa) N standard penetration test (SPT) N* SPT - sample recovered Nc SPT with solid cone VS vane shear; peak/remoulded (kPa) R refusal HB hammer bouncing	<b>classification symbol &amp; soil description</b> based on Unified Classification System	<b>consistency / relative density</b> VS very soft S soft F firm St stiff VSt very stiff H hard Fb friable VL very loose L loose MD medium dense D dense VD very dense
* bit shown by suffix e.g. AD/T B blank bit T TC bit V V bit	<b>penetration</b>  no resistance ranging to refusal	<b>moisture</b> D dry M moist W wet S saturated Wp plastic limit Wl liquid limit	<b>water</b>  10-Oct-12 water level on date shown water inflow water outflow	

# Engineering Log - Hand Auger


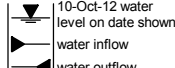
client: **THE LAKES**  
 principal:  
 project: **THE LAKES STAGE 3GH**  
 location: **Centre of lot 482**

Borehole ID: **HAL482**  
 sheet: 1 of 1  
 project no: **GENZTAUC13086AP**  
 date started: **22 Aug 2016**  
 date completed: **22 Aug 2016**  
 logged by: **ODS**  
 checked by: **RBT**

position: Not Specified surface elevation: Not Specified angle from horizontal: 90°  
 drill model: drilling fluid: hole diameter : 50 mm vane id.: SL588

drilling information				material substance								
method & support	penetration	water	samples & field tests	RL (m)	depth (m)	graphic log	classification symbol	material description	moisture condition	consistency / relative density	vane shear	structure and additional observations
	1 2 3							SOIL TYPE: plasticity or particle characteristic, colour, secondary and minor components			⊕ ⊗ ⊙ ⊚	
HA	N	Not Encountered	VS >202 kPa		0.5			ORGANIC SILT: non plastic, black.	D to M	VSt to H		TOPSOIL
			VS >202 kPa					SILT: non plastic to low plasticity, orange brown with mottled brown and grey, with trace fine to coarse grained sand.			⊕	FILL
			VS >202 kPa		1.0			SILT: non plastic to low plasticity, orange brown, with trace fine to coarse grained sand.			⊕	YOUNGER ASH DEPOSIT
			VS >202 kPa		1.5			1.5 m: with trace fine grained sand			⊕	
			VS >202 kPa		2.0						⊕	
			VS 185/39 kPa		2.5			Hand Auger HAL482 terminated at 2.5 m Target depth			⊕	
			VS 185/39 kPa		2.5						⊕	
					3.0							
					3.5							
					4.0							
					4.5							
					5.0							

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<b>method</b> AD auger drilling* AS auger screwing* HA hand auger W washbore HA hand auger	<b>support</b> M mud N nil C casing	<b>samples &amp; field tests</b> B bulk disturbed sample D disturbed sample E environmental sample SS split spoon sample U## undisturbed sample ##mm diameter HP hand penetrometer (kPa) N standard penetration test (SPT) N* SPT - sample recovered Nc SPT with solid cone VS vane shear; peak/remoulded (kPa) R refusal HB hammer bouncing	<b>classification symbol &amp; soil description</b> based on Unified Classification System	<b>consistency / relative density</b> VS very soft S soft F firm St stiff VSt very stiff H hard Fb friable VL very loose L loose MD medium dense D dense VD very dense
* bit shown by suffix e.g. AD/T B blank bit T TC bit V V bit	<b>penetration</b>  no resistance ranging to refusal	<b>moisture</b> D dry M moist W wet S saturated Wp plastic limit Wl liquid limit	<b>water</b>  10-Oct-12 water level on date shown water inflow water outflow	

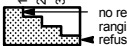
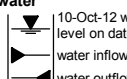
# Engineering Log - Hand Auger

client: **THE LAKES**  
 principal:  
 project: **THE LAKES STAGE 3GH**  
 location: **Centre of lot 484**

Borehole ID: **HAL484**  
 sheet: 1 of 1  
 project no: **GENZTAUC13086AP**  
 date started: **23 Aug 2016**  
 date completed: **23 Aug 2016**  
 logged by: **ODS**  
 checked by: **RBT**

position: Not Specified surface elevation: Not Specified angle from horizontal: 90°  
 drill model: drilling fluid: hole diameter : 50 mm vane id.: SL588

drilling information				material substance							
method & support	penetration	water	samples & field tests	depth (m)	graphic log	classification symbol	material description	moisture condition	consistency / relative density	vane shear	structure and additional observations
HA N Not Encountered	1 2 3	Not Encountered	VS >202 kPa	0.0 - 0.5		SOIL TYPE: plasticity or particle characteristic, colour, secondary and minor components  <b>ORGANIC SILT:</b> non plastic, black.	D to M	VSt to H	50 100 150 200		TOPSOIL
			VS >202 kPa	0.5 - 1.0							<b>SILT:</b> non plastic to low plasticity, orange brown with mottled brown and grey, with trace fine to coarse grained sand.
			VS >202 kPa	1.0 - 1.5		<b>SILT:</b> non plastic to low plasticity, orange brown, with trace fine to coarse grained sand.	1.7 m: with trace fine grained sand, and with minor clay. Low to medium plasticity	YOUNGER ASH DEPOSIT			
			VS 201/ 58 kPa	1.5 - 2.0		Hand Auger HAL484 terminated at 2.5 m Target depth					
			VS 139/ 38 kPa	2.0 - 2.5							
			VS 173/ 58 kPa	2.5 - 2.5							
				2.5 - 3.0							
				3.0 - 3.5							
				3.5 - 4.0							
				4.0 - 4.5							
				4.5 - 5.0							
				5.0 - 5.5							

<b>method</b> AD auger drilling* AS auger screwing* HA hand auger W washbore HA hand auger	<b>support</b> M mud N nil C casing  <b>penetration</b>  no resistance ranging to refusal  <b>water</b>  10-Oct-12 water level on date shown water inflow water outflow	<b>samples &amp; field tests</b> B bulk disturbed sample D disturbed sample E environmental sample SS split spoon sample U## undisturbed sample ##mm diameter HP hand penetrometer (kPa) N standard penetration test (SPT) N* SPT - sample recovered Nc SPT with solid cone VS vane shear; peak/remoulded (kPa) R refusal HB hammer bouncing	<b>classification symbol &amp; soil description</b> based on Unified Classification System  <b>moisture</b> D dry M moist W wet S saturated Wp plastic limit Wl liquid limit	<b>consistency / relative density</b> VS very soft S soft F firm St stiff VSt very stiff H hard Fb friable VL very loose L loose MD medium dense D dense VD very dense
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# Engineering Log - Hand Auger

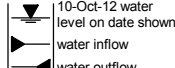
Borehole ID: **HAL486**  
 sheet: 1 of 1  
 project no: **GENZTAUC13086AP**  
 date started: **23 Aug 2016**  
 date completed: **23 Aug 2016**  
 logged by: **ODS**  
 checked by: **RBT**

client: **THE LAKES**  
 principal:  
 project: **THE LAKES STAGE 3GH**  
 location: **Centre of lot 486**

position: Not Specified surface elevation: Not Specified angle from horizontal: 90°  
 drill model: drilling fluid: hole diameter : 50 mm vane id.: SL588

drilling information				material substance								
method & support	penetration	water	samples & field tests	RL (m)	depth (m)	graphic log	classification symbol	material description	moisture condition	consistency / relative density	vane shear	structure and additional observations
HA N Not Encountered	1		VS >202 kPa		0.5			<b>ORGANIC SILT:</b> non plastic, black.	M	VSt to H		<b>TOPSOIL</b>
	2		VS >202 kPa		1.0			<b>SILT:</b> non plastic to low plasticity, orange brown with mottled brown, with trace fine grained sand.				<b>FILL</b>
	3		VS >202 kPa		1.5			<b>SILT:</b> low plasticity, orange brown, with trace fine to coarse grained sand.				<b>YOUNGER ASH DEPOSIT</b>
				VS 177/ 44 kPa		2.0			1.5 m: with trace clay			
			VS 172/ 32 kPa		2.5			Hand Auger HAL486 terminated at 2.5 m Target depth				
			VS >202 kPa		3.0							
					3.5							
					4.0							
					4.5							
					5.0							

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<b>method</b> AD auger drilling* AS auger screwing* HA hand auger W washbore HA hand auger	<b>support</b> M mud N nil C casing	<b>samples &amp; field tests</b> B bulk disturbed sample D disturbed sample E environmental sample SS split spoon sample U## undisturbed sample ##mm diameter HP hand penetrometer (kPa) N standard penetration test (SPT) N* SPT - sample recovered Nc SPT with solid cone VS vane shear; peak/remoulded (kPa) R refusal HB hammer bouncing	<b>classification symbol &amp; soil description</b> based on Unified Classification System	<b>consistency / relative density</b> VS very soft S soft F firm St stiff VSt very stiff H hard Fb friable VL very loose L loose MD medium dense D dense VD very dense
* bit shown by suffix e.g. AD/T B blank bit T TC bit V V bit	<b>penetration</b>  no resistance ranging to refusal	<b>moisture</b> D dry M moist W wet S saturated Wp plastic limit Wl liquid limit	<b>water</b>  10-Oct-12 water level on date shown water inflow water outflow	

# Engineering Log - Hand Auger


Borehole ID: **HAL488**  
 sheet: 1 of 1  
 project no: **GENZTAUC13086AP**  
 date started: **23 Aug 2016**  
 date completed: **23 Aug 2016**  
 logged by: **ODS**  
 checked by: **RBT**

client: **THE LAKES**  
 principal:  
 project: **THE LAKES STAGE 3GH**  
 location: **Centre of lot 488**

position: Not Specified surface elevation: Not Specified angle from horizontal: 90°  
 drill model: drilling fluid: hole diameter : 50 mm vane id.: SL588

drilling information				material substance							
method & support	penetration	water	samples & field tests	depth (m)	graphic log	classification symbol	material description	moisture condition	consistency / relative density	vane shear (kPa)	structure and additional observations
HA N Not Encountered	1 2 3	VS >202 kPa  VS 190/ 61 kPa  VS 89/ 22 kPa  VS 92/ 51 kPa  VS 156/ 67 kPa  VS 114/ 29 kPa  VS >202 kPa	RL (m) depth (m)	0.0		SOIL TYPE: plasticity or particle characteristic, colour, secondary and minor components	<b>ORGANIC SILT:</b> non plastic, black.	D to M	VSt	50 100 150 200	<b>TOPSOIL</b>
				0.4			<b>SILT:</b> low plasticity, orange brown, with minor clay and with trace fine grained sand. 0.4 m: with trace fine to coarse grained sand. Greasy when reworked	M to W	VSt		<b>YOUNGER ASH DEPOSIT</b>
				1.0			<b>Sandy SILT:</b> non plastic, orange brown, sand is fine to coarse grained.	M	St		<b>MATUA SUBGROUP</b>
				1.6			1.6 m: becomes pale brown	M to W	VSt		
				2.0			<b>SILT:</b> low plasticity, pale brown, with trace clay and with trace fine to coarse grained sand.	M			
2.5	<b>Silty CLAY:</b> medium plasticity, brown, with trace fine grained sand.										
Hand Auger HAL488 terminated at 2.5 m Target depth											

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<b>method</b> AD auger drilling* AS auger screwing* HA hand auger W washbore HA hand auger	<b>support</b> M mud N nil C casing <b>penetration</b>  <b>water</b> 10-Oct-12 water level on date shown water inflow water outflow	<b>samples &amp; field tests</b> B bulk disturbed sample D disturbed sample E environmental sample SS split spoon sample U## undisturbed sample ##mm diameter HP hand penetrometer (kPa) N standard penetration test (SPT) N* SPT - sample recovered Nc SPT with solid cone VS vane shear; peak/remoulded (kPa) R refusal HB hammer bouncing	<b>classification symbol &amp; soil description</b> based on Unified Classification System <b>moisture</b> D dry M moist W wet S saturated Wp plastic limit Wl liquid limit	<b>consistency / relative density</b> VS very soft S soft F firm St stiff VSt very stiff H hard Fb friable VL very loose L loose MD medium dense D dense VD very dense
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\* bit shown by suffix  
 e.g. AD/T  
 B blank bit  
 T TC bit  
 V V bit

# Engineering Log - Hand Auger

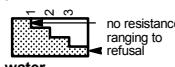
Borehole ID: **HAL490**  
 sheet: 1 of 1  
 project no: **GENZTAUC13086AP**  
 date started: **23 Aug 2016**  
 date completed: **23 Aug 2016**  
 logged by: **ODS**  
 checked by: **RBT**

client: **THE LAKES**  
 principal:  
 project: **THE LAKES STAGE 3GH**  
 location: **Centre of lot 490**

position: Not Specified surface elevation: Not Specified angle from horizontal: 90°  
 drill model: drilling fluid: hole diameter : 50 mm vane id.: SL588

drilling information				material substance				
method & support	penetration	water	samples & field tests	depth (m)	material description	moisture condition	consistency / relative density	structure and additional observations
HA N Not Encountered	1		VS >202 kPa	0.0 - 0.5	<b>ORGANIC SILT:</b> non plastic, black.	D to M	St to VSt	<b>TOPSOIL</b>
	2		VS 173/29 kPa	0.5 - 1.0	<b>SILT:</b> non plastic to low plasticity, orange brown with mottled grey and brown, with trace fine to coarse grained sand.	M		<b>FILL</b>
	3		VS 128/24 kPa	1.0 - 1.5	<b>SILT:</b> low plasticity, brown orange, with minor clay and with trace fine to coarse grained sand. Greasy when reworked.			<b>MATUA SUBGROUP</b>
			VS 85/18 kPa	1.5 - 2.0	1.0 m: becomes orange brown. With trace silt			
			VS 114/36 kPa	2.0 - 2.5	1.3 m: with minor fine grained sand and with trace clay			
			VS 112/24 kPa	2.5 - 3.0	<b>SAND:</b> fine to coarse grained, orange brown, with trace silt.			
			VS >202 kPa	3.0 - 5.0	<b>SILT:</b> low plasticity, brown, with some clay and with trace fine grained sand.			
			VS >202 kPa	5.0 - 5.5	Hand Auger HAL490 terminated at 2.5 m Target depth			

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<b>method</b> AD auger drilling* AS auger screwing* HA hand auger W washbore HA hand auger	<b>support</b> M mud C casing N nil	<b>samples &amp; field tests</b> B bulk disturbed sample D disturbed sample E environmental sample SS split spoon sample U## undisturbed sample ##mm diameter HP hand penetrometer (kPa) N standard penetration test (SPT) N* SPT - sample recovered Nc SPT with solid cone VS vane shear; peak/remoued (kPa) R refusal HB hammer bouncing	<b>classification symbol &amp; soil description</b> based on Unified Classification System	<b>consistency / relative density</b> VS very soft S soft F firm St stiff VSt very stiff H hard Fb friable VL very loose L loose MD medium dense D dense VD very dense
* bit shown by suffix e.g. AD/T B blank bit T TC bit V V bit	<b>penetration</b>  no resistance ranging to refusal 10-Oct-12 water level on date shown water inflow water outflow	<b>moisture</b> D dry M moist W wet S saturated Wp plastic limit Wl liquid limit		

# Engineering Log - Hand Auger


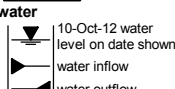
Borehole ID: **HAL493**  
 sheet: 1 of 1  
 project no: **GENZTAUC13086AP**  
 date started: **23 Aug 2016**  
 date completed: **23 Aug 2016**  
 logged by: **ODS**  
 checked by: **RBT**

client: **THE LAKES**  
 principal:  
 project: **THE LAKES STAGE 3GH**  
 location: **Centre of lot 493**

position: Not Specified surface elevation: Not Specified angle from horizontal: 90°  
 drill model: drilling fluid: hole diameter : 50 mm vane id.: SL588

drilling information				material substance					structure and additional observations					
method & support	penetration	water	samples & field tests	RL (m)	depth (m)	graphic log	classification symbol	material description	moisture condition	consistency / relative density	vane shear (kPa)	structure and additional observations		
method & support: 1 penetration 2 water 3 samples & field tests	1 2 3	Not Encountered	VS 130/ 19 kPa		0.0			<b>ORGANIC SILT:</b> non plastic, black.	M	VSt to H		<b>TOPSOIL</b>		
			VS 136/ 22 kPa		0.5			<b>SILT:</b> low plasticity, orange brown, with minor clay and with trace fine to coarse grained sand.					<b>MATUA SUBGROUP</b>	
			VS 89/ 44 kPa		1.0				<b>SILTY SAND:</b> fine to coarse grained, orange brown.					
			VS 165/ 41 kPa		1.5				<b>SILT:</b> non plastic to low plasticity, pale orange brown, with trace to minor fine to coarse grained sand. 1.4 m: with some fine grained sand. Becoming pale brown					
			VS >202 kPa		2.0				<b>SAND:</b> fine to coarse grained, grey brown, with trace silt. <b>Clayey SILT:</b> low to medium plasticity, brown, with trace fine grained sand.					
			VS >202 kPa		2.5					<b>SILT:</b> non plastic to low plasticity, brown, with trace fine grained sand and with trace clay.				
			VS >202 kPa		3.0					2.8 m: becoming orange brown 2.9 m: sand becomes absent				
			VS >202 kPa		3.5					3.1 m: with trace fine grained sand and with minor clay 3.4 m: with trace manganese and becoming orange				
			VS >202 kPa		4.0					4.0 m: greasy when reworked				
			VS 104/ 38 kPa		4.5									
VS 128/ 71 kPa		5.0												
Hand Auger HAL493 terminated at 5.0 m Target depth														

CDF\_0\_9\_06\_LIBRARY\_GLB rev:AT Log\_COF\_BOREHOLE:NON CORED - STAGE 3GH - ODS.GPJ <-DrawingFiles> 10/01/2017 09:49

<b>method</b> AD auger drilling* AS auger screwing* HA hand auger W washbore HA hand auger	<b>support</b> M mud N nil C casing	<b>samples &amp; field tests</b> B bulk disturbed sample D disturbed sample E environmental sample SS split spoon sample U## undisturbed sample ##mm diameter HP hand penetrometer (kPa) N standard penetration test (SPT) N* SPT - sample recovered Nc SPT with solid cone VS vane shear; peak/remoued (kPa) R refusal HB hammer bouncing	<b>classification symbol &amp; soil description</b> based on Unified Classification System	<b>consistency / relative density</b> VS very soft S soft F firm St stiff VSt very stiff H hard Fb friable VL very loose L loose MD medium dense D dense VD very dense
<b>penetration</b> 	<b>water</b> 	<b>moisture</b> D dry M moist W wet S saturated Wp plastic limit Wl liquid limit		

\* bit shown by suffix  
 e.g. AD/T  
 B blank bit  
 T TC bit  
 V V bit

# Engineering Log - Hand Auger

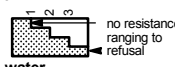
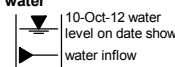
client: **THE LAKES**  
 principal:  
 project: **THE LAKES STAGE 3GH**  
 location: **Centre of lot 494**

Borehole ID: **HAL494**  
 sheet: 1 of 1  
 project no: **GENZTAUC13086AP**  
 date started: **23 Aug 2016**  
 date completed: **23 Aug 2016**  
 logged by: **ODS**  
 checked by: **RBT**

position: Not Specified surface elevation: Not Specified angle from horizontal: 90°  
 drill model: drilling fluid: hole diameter : 50 mm vane id.: SL588

drilling information				material substance								
method & support	penetration	water	samples & field tests	RL (m)	depth (m)	graphic log	classification symbol	material description	moisture condition	consistency / relative density	vane shear	structure and additional observations
	1 2 3							<b>SOIL TYPE:</b> plasticity or particle characteristic, colour, secondary and minor components			90 100 150 200 (kPa)	
HA			VS >202 kPa		0.5			<b>ORGANIC SILT:</b> non plastic, black.	D to M	VSt to H		<b>TOPSOIL</b>
			VS >202 kPa					<b>SILT:</b> low plasticity, orange brown with mottled grey and brown, with trace fine to coarse grained sand and with trace clay.				<b>FILL</b>
			VS >202 kPa		1.0			<b>SILT:</b> non plastic to low plasticity, orange brown, with trace fine sand.	M			<b>YOUNGER ASH DEPOSIT</b>
			VS 166/41 kPa		1.1			1.1 m: with trace clay				
			VS >202/58 kPa		1.5			1.6 m: with minor clay. Low plasticity				
			VS 160/36 kPa		2.0							
			VS 96 kPa		2.5			<b>SILT:</b> low plasticity, orange brown, with minor clay and with trace fine to coarse grained sand.				<b>MATUA SUBGROUP</b>
			VS >202/69 kPa		2.5			<b>Sandy SILT:</b> non plastic to low plasticity, orange brown, sand is fine to coarse grained.				
			VS 182 kPa		3.0			<b>SAND:</b> fine to coarse grained, orange brown, with trace to minor silt.				
			VS >202 kPa		3.0			<b>SILT:</b> non plastic to low plasticity, orange brown, with trace fine to coarse grained sand and with trace clay.				
			VS >202 kPa		3.5			<b>SILT:</b> non plastic, brown, with trace to minor fine grained sand.				
			VS >202 kPa		3.5			<b>SAND:</b> fine to coarse grained, grey brown, with trace silt.				
			VS >202 kPa		3.5			<b>Clayey SILT:</b> low to medium plasticity, brown, with trace fine grained sand.				
			VS >202 kPa		4.0			<b>SILT:</b> low plasticity, orange brown, with minor clay and with trace fine grained sand and with trace manganese.				
			VS 160/75 kPa		4.5							
			VS 106/52 kPa		4.6			4.6 m: with trace to minor manganese				
					5.0			Hand Auger HAL494 terminated at 5.0 m Target depth				

CDF\_0\_9\_06\_LIBRARY.GLB rev:AT Log COF BOREHOLE: NON CORED 13086AP - STAGE 3GH - ODS.GPJ <-DrawingFiles> 10/01/2017 09:50

<b>method</b> AD auger drilling* AS auger screwing* HA hand auger W washbore HA hand auger	<b>support</b> M mud N nil C casing <b>penetration</b>  no resistance ranging to refusal <b>water</b>  10-Oct-12 water level on date shown water inflow water outflow	<b>samples &amp; field tests</b> B bulk disturbed sample D disturbed sample E environmental sample SS split spoon sample U## undisturbed sample ##mm diameter HP hand penetrometer (kPa) N standard penetration test (SPT) N* SPT - sample recovered Nc SPT with solid cone VS vane shear; peak/remoulded (kPa) R refusal HB hammer bouncing	<b>classification symbol &amp; soil description</b> based on Unified Classification System <b>moisture</b> D dry M moist W wet S saturated Wp plastic limit Wl liquid limit	<b>consistency / relative density</b> VS very soft S soft F firm St stiff VSt very stiff H hard Fb friable VL very loose L loose MD medium dense D dense VD very dense
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\* bit shown by suffix  
 e.g. AD/T  
 B blank bit  
 T TC bit  
 V V bit

# Engineering Log - Hand Auger

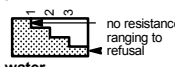
client: **THE LAKES**  
 principal:  
 project: **THE LAKES STAGE 3GH**  
 location: **Centre of lot 495**

Borehole ID: **HAL495**  
 sheet: 1 of 1  
 project no: **GENZTAUC13086AP**  
 date started: **23 Aug 2016**  
 date completed: **23 Aug 2016**  
 logged by: **ODS**  
 checked by: **RBT**

position: Not Specified surface elevation: Not Specified angle from horizontal: 90°  
 drill model: drilling fluid: hole diameter : 50 mm vane id.: SL588

drilling information				material substance								
method & support	penetration	water	samples & field tests	RL (m)	depth (m)	graphic log	classification symbol	material description	moisture condition	consistency / relative density	vane shear	structure and additional observations
	1 2 3							SOIL TYPE: plasticity or particle characteristic, colour, secondary and minor components			⊕ ⊗ ⊙ ⊚	
			VS >202 kPa					ORGANIC SILT: non plastic, black.	M	VSt to H		TOPSOIL
			VS >202 kPa		0.5			SILT: low plasticity, orange brown with mottled grey and brown, with trace fine to coarse grained sand and with trace clay.			⊕	FILL
			VS >202 kPa		1.0						⊕	
			VS >202 kPa		1.5						⊕	
			VS >202 kPa		2.0						⊕	
			VS >202 kPa		2.5			SILT: non plastic to low plasticity, orange brown, with trace fine grained sand and trace clay.			⊕	YOUNGER ASH DEPOSIT
			VS >202 kPa		3.0						⊕	
			VS >202 kPa		3.5						⊕	
			VS 173/ 52 kPa		4.0			3.7 m: with minor clay			⊕	
			VS 194/ 46 kPa		4.5			4.0 m: becoming brown. Sand becomes absent.			⊕	
			VS >202 kPa		4.5			4.5 m: with trace fine sand			⊕	
			VS >202 kPa		5.0			Hand Auger HAL495 terminated at 5.0 m Target depth			⊕	

CDF\_0\_9\_06\_LIBRARY\_GLB rev AT Log COF BOREHOLE: NON CORED - STAGE 3GH - ODS.GPJ <<DrawingFiles>> 10/01/2017 09:50

<b>method</b> AD auger drilling* AS auger screwing* HA hand auger W washbore HA hand auger	<b>support</b> M mud N nil C casing <b>penetration</b>  10-Oct-12 water level on date shown water inflow water outflow	<b>samples &amp; field tests</b> B bulk disturbed sample D disturbed sample E environmental sample SS split spoon sample U## undisturbed sample ##mm diameter HP hand penetrometer (kPa) N standard penetration test (SPT) N* SPT - sample recovered Nc SPT with solid cone VS vane shear; peak/remoulded (kPa) R refusal HB hammer bouncing	<b>classification symbol &amp; soil description</b> based on Unified Classification System <b>moisture</b> D dry M moist W wet S saturated Wp plastic limit Wl liquid limit	<b>consistency / relative density</b> VS very soft S soft F firm St stiff VSt very stiff H hard Fb friable VL very loose L loose MD medium dense D dense VD very dense
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\* bit shown by suffix  
 e.g. AD/T  
 B blank bit  
 T TC bit  
 V V bit

# Engineering Log - Hand Auger


client: **THE LAKES**  
 principal:  
 project: **THE LAKES STAGE 3GH**  
 location: **Centre of lot 499**

Borehole ID: **HAL499**  
 sheet: 1 of 1  
 project no: **GENZTAUC13086AP**  
 date started: **23 Aug 2016**  
 date completed: **23 Aug 2016**  
 logged by: **ODS**  
 checked by: **RBT**

position: Not Specified surface elevation: Not Specified angle from horizontal: 90°  
 drill model: drilling fluid: hole diameter : 50 mm vane id.: SL588

drilling information				material substance								
method & support	penetration	water	samples & field tests	RL (m)	depth (m)	graphic log	classification symbol	material description	moisture condition	consistency / relative density	vane shear	structure and additional observations
	1 2 3							SOIL TYPE: plasticity or particle characteristic, colour, secondary and minor components			90 100 150 200 (kPa)	
HA	N							ORGANIC SILT: non plastic, black.	M	VSt to H		TOPSOIL
			VS >202 kPa		0.5			SILT: non plastic to low plasticity, orange brown with mottled brown and grey, with trace fine to coarse grained sand.				FILL
			VS >202 kPa									
			VS >202 kPa		1.0							
			VS >202 kPa									
			VS >202 kPa		1.5							
			VS >202 kPa									
			VS >202 kPa		2.0							
			VS >202 kPa					2.3 m: with trace clay				
			VS 156/49 kPa		2.5							
			VS 173/52 kPa									
			VS 190/54 kPa		3.0							
			VS >202 kPa									
			VS >202 kPa		3.5							
			VS >202 kPa					3.7 to 4.0 m: becoming mottled black				
			VS >202 kPa		4.0							
			VS >202 kPa					SILT: low plasticity, orange brown, with trace fine grained sand and with trace clay.				YOUNGER ASH DEPOSIT
			VS 156/52 kPa		4.5							
			VS 154/62 kPa									
					5.0			Hand Auger HAL499 terminated at 4.9 m Squeezing				

CDF\_0\_9\_06\_LIBRARY.GLB rev:AT Log COF BOREHOLE: NON CORED 13086AP - STAGE 3GH - ODS.GPJ <<DrawingFiles>> 10/01/2017 09:50

<b>method</b> AD auger drilling* AS auger screwing* HA hand auger W washbore HA hand auger	<b>support</b> M mud N nil C casing <b>penetration</b>  no resistance ranging to refusal <b>water</b> 10-Oct-12 water level on date shown water inflow water outflow	<b>samples &amp; field tests</b> B bulk disturbed sample D disturbed sample E environmental sample SS split spoon sample U## undisturbed sample ##mm diameter HP hand penetrometer (kPa) N standard penetration test (SPT) N* SPT - sample recovered Nc SPT with solid cone VS vane shear; peak/remoulded (kPa) R refusal HB hammer bouncing	<b>classification symbol &amp; soil description</b> based on Unified Classification System <b>moisture</b> D dry M moist W wet S saturated Wp plastic limit Wl liquid limit	<b>consistency / relative density</b> VS very soft S soft F firm St stiff VSt very stiff H hard Fb friable VL very loose L loose MD medium dense D dense VD very dense
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\* bit shown by suffix  
 e.g. AD/T  
 B blank bit  
 T TC bit  
 V V bit

# Engineering Log - Hand Auger


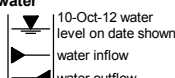
Borehole ID: **HAL501**  
 sheet: 1 of 1  
 project no: **GENZTAUC13086AP**  
 date started: **23 Aug 2016**  
 date completed: **23 Aug 2016**  
 logged by: **ODS**  
 checked by: **RBT**

client: **THE LAKES**  
 principal:  
 project: **THE LAKES STAGE 3GH**  
 location: **Centre of lot 501**

position: Not Specified surface elevation: Not Specified angle from horizontal: 90°  
 drill model: drilling fluid: hole diameter : 50 mm vane id.: SL588

drilling information				material substance								
method & support	penetration	water	samples & field tests	RL (m)	depth (m)	graphic log	classification symbol	material description	moisture condition	consistency / relative density	vane shear	structure and additional observations
	1 2 3							SOIL TYPE: plasticity or particle characteristic, colour, secondary and minor components			⊕ ⊗ ⊙ ⊚	
			VS >202 kPa		0.5			ORGANIC SILT: non plastic, black.	D to M	VSt to H		TOPSOIL
			VS >202 kPa					SILT: non plastic to low plasticity, orange brown with mottled brown and grey, with trace fine to coarse grained sand.			⊕	FILL
			VS >202 kPa		1.0						⊕	
			VS >202 kPa		1.5						⊕	
			VS >202 kPa		2.0						⊕	
			VS 156/ 62 kPa		2.5						⊕   ⊕	
			VS 190/ 62 kPa								⊕   ⊕	
			VS >202 kPa		3.0			SILT: low plasticity, orange brown, with trace to minor clay and with trace fine grained sand.	M		⊕	YOUNGER ASH DEPOSIT
			VS >202 kPa								⊕	
			VS >202 kPa		3.5						⊕	
			VS >202 kPa		4.0			3.6 m: with trace clay. Non to low plasticity			⊕	
			VS 194/ 52 kPa		4.5			4.2 m: becoming brown orange with minor clay. Low plasticity			⊕   ⊕	
			VS >202 kPa								⊕	
			VS 166/ 66 kPa		5.0						⊕   ⊕	
Hand Auger HAL501 terminated at 5.0 m Target depth												

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<b>method</b> AD auger drilling* AS auger screwing* HA hand auger W washbore HA hand auger	<b>support</b> M mud N nil C casing	<b>samples &amp; field tests</b> B bulk disturbed sample D disturbed sample E environmental sample SS split spoon sample U## undisturbed sample ##mm diameter HP hand penetrometer (kPa) N standard penetration test (SPT) N* SPT - sample recovered Nc SPT with solid cone VS vane shear; peak/remoulded (kPa) R refusal HB hammer bouncing	<b>classification symbol &amp; soil description</b> based on Unified Classification System	<b>consistency / relative density</b> VS very soft S soft F firm St stiff VSt very stiff H hard Fb friable VL very loose L loose MD medium dense D dense VD very dense
* bit shown by suffix e.g. AD/T B blank bit T TC bit V V bit	<b>penetration</b>  <b>water</b> 	<b>moisture</b> D dry M moist W wet S saturated Wp plastic limit Wl liquid limit		



# Engineering Log - Hand Auger

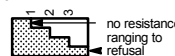
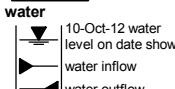
client: **THE LAKES**  
 principal:  
 project: **THE LAKES STAGE 3GH**  
 location: **Centre of lot 502**

Borehole ID: **HAL502**  
 sheet: 1 of 1  
 project no: **GENZTAUC13086AP**  
 date started: **23 Aug 2016**  
 date completed: **23 Aug 2016**  
 logged by: **ODS**  
 checked by: **RBT**

position: Not Specified surface elevation: Not Specified angle from horizontal: 90°  
 drill model: drilling fluid: hole diameter : 50 mm vane id.: SL588

drilling information				material substance								
method & support	penetration	water	samples & field tests	RL (m)	depth (m)	graphic log	classification symbol	material description	moisture condition	consistency / relative density	vane shear	structure and additional observations
	1 2 3							SOIL TYPE: plasticity or particle characteristic, colour, secondary and minor components			90 100 150 200 (kPa)	
			VS >202 kPa					<b>ORGANIC SILT:</b> non plastic, black.	D to M	VSt to H		<b>TOPSOIL</b>
			VS >202 kPa		0.5			<b>SILT:</b> non plastic to low plasticity, orange brown with mottled brown and grey, with trace fine to coarse grained sand.				<b>FILL</b>
			VS >202 kPa		1.0			<b>SILT:</b> non plastic, orange brown, with trace fine sand.				<b>YOUNGER ASH DEPOSIT</b>
			VS >202 kPa		1.5			1.4 m: with trace clay. Non to low plasticity				
			VS >202 kPa		2.0			2.3 m: becoming mottled brown				
			VS >202 kPa		2.5			2.6 m: becoming brown				
			VS >202 kPa		3.0			2.9 m: becoming orange brown				
			VS 178/ 39 kPa		3.5			3.3 m: with minor clay. Low plasticity				
			VS 184/ 46 kPa									
			VS 148/ 35 kPa		4.0			<b>Clayey SILT:</b> low to medium plasticity, orange brown, with trace fine grained sand.	M			<b>MATUA SUBGROUP</b>
			VS 190/ 52 kPa		4.5							
			VS >202 kPa		4.6			Hand Auger HAL502 terminated at 4.6 m Squeezing				
					5.0							

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<b>method</b> AD auger drilling* AS auger screwing* HA hand auger W washbore HA hand auger	<b>support</b> M mud C casing N nil	<b>samples &amp; field tests</b> B bulk disturbed sample D disturbed sample E environmental sample SS split spoon sample U## undisturbed sample ##mm diameter HP hand penetrometer (kPa) N standard penetration test (SPT) N* SPT - sample recovered Nc SPT with solid cone VS vane shear; peak/remoulded (kPa) R refusal HB hammer bouncing	<b>classification symbol &amp; soil description</b> based on Unified Classification System	<b>consistency / relative density</b> VS very soft S soft F firm St stiff VSt very stiff H hard Fb friable VL very loose L loose MD medium dense D dense VD very dense
* bit shown by suffix e.g. AD/T B blank bit T TC bit V V bit	<b>penetration</b>  no resistance ranging to refusal	<b>moisture</b> D dry M moist W wet S saturated Wp plastic limit Wl liquid limit	<b>water</b>  10-Oct-12 water level on date shown water inflow water outflow	

# Engineering Log - Hand Auger

client: **THE LAKES**  
 principal:  
 project: **THE LAKES STAGE 3GH**  
 location: **Centre of lot 503**

Borehole ID: **HAL503**  
 sheet: 1 of 1  
 project no: **GENZTAUC13086AP**  
 date started: **23 Aug 2016**  
 date completed: **23 Aug 2016**  
 logged by: **ODS**  
 checked by: **RBT**

position: Not Specified surface elevation: Not Specified angle from horizontal: 90°  
 drill model: drilling fluid: hole diameter : 50 mm vane id.: SL588

drilling information				material substance								
method & support	penetration	water	samples & field tests	RL (m)	depth (m)	graphic log	classification symbol	material description	moisture condition	consistency / relative density	vane shear	structure and additional observations
	1 2 3							SOIL TYPE: plasticity or particle characteristic, colour, secondary and minor components			⊕ ⊗ ⊙ ⊚	
HA	N	Not Encountered	VS >202 kPa		0.5			<b>ORGANIC SILT:</b> non plastic, black.	D to M	VSt to H		<b>TOPSOIL</b>
			VS >202 kPa					<b>SILT:</b> non plastic to low plasticity, orange brown with mottled grey, with trace fine to coarse grained sand.	M		⊕	<b>FILL</b>
			VS >202 kPa		1.0			<b>SILT:</b> non plastic to low plasticity, orange brown, with trace fine sand.  0.8 m: with trace fine to coarse grained sand 0.9 m: with trace clay. Low plasticity.			⊕	<b>YOUNGER ASH DEPOSIT</b>
			VS 156/38 kPa		1.5						⊕	
			VS 156/38 kPa		2.0			<b>SILT:</b> low plasticity, brown orange, with minor clay and with trace fine to coarse grained sand. Greasy when reworked.			⊕	<b>MATUA SUBGROUP</b>
			VS 194/49 kPa		2.5						⊕	
			VS 170/38 kPa		3.0						⊕	
			VS >202 kPa		3.5						⊕	
			VS >202 kPa		4.0			<b>SILT:</b> non plastic to low plasticity, brown, with trace clay and with trace fine grained sand. 2.9 m: with some clay. Low plasticity			⊕	
			VS >202 kPa		4.5						⊕	
			VS >202 kPa		5.0						⊕	
			VS >202 kPa		5.5						⊕	
			VS >202 kPa		6.0						⊕	
			VS >202 kPa		6.5						⊕	
			VS >202 kPa		7.0						⊕	
			VS >202 kPa		7.5						⊕	
			VS >202 kPa		8.0						⊕	
			VS >202 kPa		8.5						⊕	
			VS >202 kPa		9.0						⊕	
			VS >202 kPa		9.5						⊕	
			VS >202 kPa		10.0						⊕	
			VS >202 kPa		10.5						⊕	
			VS >202 kPa		11.0						⊕	
			VS >202 kPa		11.5						⊕	
			VS >202 kPa		12.0						⊕	
			VS >202 kPa		12.5						⊕	
			VS >202 kPa		13.0						⊕	
			VS >202 kPa		13.5						⊕	
			VS >202 kPa		14.0						⊕	
			VS >202 kPa		14.5						⊕	
			VS >202 kPa		15.0						⊕	
			VS >202 kPa		15.5						⊕	
			VS >202 kPa		16.0						⊕	
			VS >202 kPa		16.5						⊕	
			VS >202 kPa		17.0						⊕	
			VS >202 kPa		17.5						⊕	
			VS >202 kPa		18.0						⊕	
			VS >202 kPa		18.5						⊕	
			VS >202 kPa		19.0						⊕	
			VS >202 kPa		19.5						⊕	
			VS >202 kPa		20.0						⊕	
			VS >202 kPa		20.5						⊕	
			VS >202 kPa		21.0						⊕	
			VS >202 kPa		21.5						⊕	
			VS >202 kPa		22.0						⊕	
			VS >202 kPa		22.5						⊕	
			VS >202 kPa		23.0						⊕	
			VS >202 kPa		23.5						⊕	
			VS >202 kPa		24.0						⊕	
			VS >202 kPa		24.5						⊕	
			VS >202 kPa		25.0						⊕	
			VS >202 kPa		25.5						⊕	
			VS >202 kPa		26.0						⊕	
			VS >202 kPa		26.5						⊕	
			VS >202 kPa		27.0						⊕	
			VS >202 kPa		27.5						⊕	
			VS >202 kPa		28.0						⊕	
			VS >202 kPa		28.5						⊕	
			VS >202 kPa		29.0						⊕	
			VS >202 kPa		29.5						⊕	
			VS >202 kPa		30.0						⊕	
			VS >202 kPa		30.5						⊕	
			VS >202 kPa		31.0						⊕	
			VS >202 kPa		31.5						⊕	
			VS >202 kPa		32.0						⊕	
			VS >202 kPa		32.5						⊕	
			VS >202 kPa		33.0						⊕	
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			VS >202 kPa		37.0						⊕	
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			VS >202 kPa		41.0						⊕	
			VS >202 kPa		41.5						⊕	
			VS >202 kPa		42.0						⊕	
			VS >202 kPa		42.5						⊕	
			VS >202 kPa		43.0						⊕	
			VS >202 kPa		43.5						⊕	
			VS >202 kPa		44.0						⊕	
			VS >202 kPa		44.5						⊕	
			VS >202 kPa		45.0						⊕	
			VS >202 kPa		45.5						⊕	
			VS >202 kPa		46.0						⊕	
			VS >202 kPa		46.5						⊕	
			VS >202 kPa		47.0						⊕	
			VS >202 kPa		47.5						⊕	
			VS >202 kPa		48.0						⊕	
			VS >202 kPa		48.5						⊕	
			VS >202 kPa		49.0						⊕	
			VS >202 kPa		49.5						⊕	
			VS >202 kPa		50.0						⊕	
			VS >202 kPa		50.5						⊕	
			VS >202 kPa		51.0						⊕	
			VS >202 kPa		51.5						⊕	
			VS >202 kPa		52.0						⊕	
			VS >202 kPa		52.5						⊕	
			VS >202 kPa		53.0						⊕	
			VS >202 kPa		53.5						⊕	
			VS >202 kPa		54.0						⊕	
			VS >202 kPa		54.5						⊕	
			VS >202 kPa		55.0						⊕	
			VS >202 kPa		55.5						⊕	
			VS >202 kPa		56.0						⊕	
			VS >202 kPa		56.5						⊕	
			VS >202 kPa		57.0						⊕	
			VS >202 kPa		57.5						⊕	
			VS >202 kPa		58.0						⊕	
			VS >202 kPa		58.5						⊕	
			VS >202 kPa		59.0						⊕	
			VS >202 kPa		59.5						⊕	
			VS >202 kPa		60.0						⊕	
			VS >202 kPa		60.5						⊕	
			VS >202 kPa		61.0						⊕	
			VS >202 kPa		61.5						⊕	
			VS >202 kPa		62.0						⊕	

# Engineering Log - Hand Auger

client: **The Lakes 2012 LTD**

principal: -

project: **The Lakes Stage 3 GCR**

location: **Centre of Lot 236**

Borehole ID: **HAL236**

sheet: 1 of 1

project no: **GENZTAUC13086AP**

date started: **16 Mar 2016**

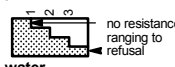
date completed: **16 Mar 2016**

logged by: **NM**

checked by: **RBT**

position: Not Specified	surface elevation: Not Specified	angle from horizontal: 90°	DCP id.:
drill model: Hand Auger	drilling fluid:	hole diameter : 50 mm	vane id.:

drilling information				material substance									
method & support	penetration	water	samples & field tests	RL (m)	depth (m)	graphic log	classification symbol	material description	moisture condition	consistency / relative density	vane shear (kPa)	DCP (blows/100 mm)	structure and additional observations
HA N Not Encountered	1		VS >240 kPa		0.0		ML	<b>TOPSOIL: SILT:</b> low plasticity, brown, with minor fine grained sand, trace fine grained angular gravel.	D	H			<b>TOPSOIL</b>
	2		VS 147/40 kPa		0.5		ML	<b>SILT:</b> non plastic to low plasticity, orange brown, with some fine grained sand.	D to M	VSt			<b>YOUNGER ASH</b>
	3		VS 111/25 kPa		1.0		ML	<b>Sandy SILT:</b> non plastic, orange brown, with fine to medium grained sand.					
			VS 103/25 kPa		1.0		SP	<b>SILTY SAND:</b> fine to medium grained, orange brown.		MD to D			
			VS 78/18 kPa		1.5		ML	<b>Sandy SILT:</b> low plasticity, pale pink, with lenses of fine to medium grained pale pink sand.		St			
			VS 206/40 kPa		2.0		SP	<b>SAND:</b> fine to medium grained, orange brown. At 1.6m: becoming white.		MD			
					2.0		ML	<b>SILT:</b> low plasticity, orange brown, with trace fine grained sand. Hand Auger HA3D-236 terminated at 2.0 m Target depth		H			

<b>method</b> AD auger drilling* AS auger screwing* HA hand auger W washbore HA hand auger	<b>support</b> M mud C casing N nil	<b>samples &amp; field tests</b> B bulk disturbed sample D disturbed sample E environmental sample SS split spoon sample U## undisturbed sample ##mm diameter HP hand penetrometer (kPa) N standard penetration test (SPT) N* SPT - sample recovered Nc SPT with solid cone VS vane shear; peak/remoulded (kPa) R refusal HB hammer bouncing	<b>classification symbol &amp; soil description</b> based on Unified Classification System	<b>consistency / relative density</b> VS very soft S soft F firm St stiff VSt very stiff H hard Fb friable VL very loose L loose MD medium dense D dense VD very dense
<b>penetration</b>  no resistance ranging to refusal	<b>water</b> 10-Oct-12 water level on date shown water inflow water outflow	<b>moisture</b> D dry M moist W wet S saturated Wp plastic limit Wl liquid limit		


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# Engineering Log - Hand Auger


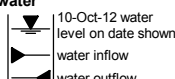
Borehole ID: **HAL237**  
 sheet: 1 of 1  
 project no: **GENZTAUC13086AP**  
 date started: **16 Mar 2016**  
 date completed: **16 Mar 2016**  
 logged by: **ODS**  
 checked by: **RBT**

client: **The Lakes 2012 LTD**  
 principal: -  
 project: **The Lakes Stage 3 GCR**  
 location: **Centre of Lot 237**

position: Not Specified surface elevation: Not Specified angle from horizontal: 90° DCP id.:  
 drill model: Hand Auger drilling fluid: hole diameter : 50 mm vane id.: 2244-02

drilling information				material substance											
method & support	penetration	water	samples & field tests	RL (m)	depth (m)	graphic log	classification symbol	material description	moisture condition	consistency / relative density	vane shear (kPa)	DCP (blows/100 mm)	structure and additional observations		
HA N Not Encountered	1 2 3	Not Encountered	VS >183 kPa		0.0 - 0.5			<b>SILT:</b> low plasticity, brown mottled pink, white and orange, with minor fine grained sand, trace fine to medium grained angular gravel. <b>SILTY SAND:</b> fine to coarse grained, brown with mottled pink brown, with trace fine to medium gravel.	D	MD	50 100 150 200	2 4 6 8 10	<b>TOPSOIL</b>  <b>FILL</b>		
			VS >183 kPa		0.5 - 1.0		0.7 m: becoming mottled dark brown <b>SILT:</b> non plastic, orange brown, with some fine to medium sand. 1.0 m: sand becomes trace and plasticity becomes low 1.25 m: becoming mottled pink	D to M	VSt	50 100 150 200	2 4 6 8 10				
			VS >183 kPa		1.0 - 1.5		<b>SILT:</b> low plasticity, orange brown, with trace fine sand. 1.85 m: becoming mottled pale pink and dark brown					50 100 150 200	2 4 6 8 10		
			VS >183 kPa		1.5 - 2.0		Hand Auger HA3D-237 terminated at 2.0 m Target depth						50 100 150 200	2 4 6 8 10	
			VS >183 kPa		2.0 - 2.5								50 100 150 200	2 4 6 8 10	

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<b>method</b> AD auger drilling* AS auger screwing* HA hand auger W washbore HA hand auger	<b>support</b> M mud N nil C casing <b>penetration</b>  no resistance ranging to refusal <b>water</b>  10-Oct-12 water level on date shown water inflow water outflow	<b>samples &amp; field tests</b> B bulk disturbed sample D disturbed sample E environmental sample SS split spoon sample U## undisturbed sample ##mm diameter HP hand penetrometer (kPa) N standard penetration test (SPT) N* SPT - sample recovered Nc SPT with solid cone VS vane shear; peak/remoulded (kPa) R refusal HB hammer bouncing	<b>classification symbol &amp; soil description</b> based on Unified Classification System <b>moisture</b> D dry M moist W wet S saturated Wp plastic limit Wl liquid limit	<b>consistency / relative density</b> VS very soft S soft F firm St stiff VSt very stiff H hard Fb friable VL very loose L loose MD medium dense D dense VD very dense
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\* bit shown by suffix  
 e.g. AD/T  
 B blank bit  
 T TC bit  
 V V bit

# Engineering Log - Hand Auger

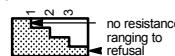
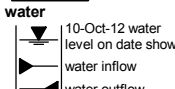
Borehole ID: **HAL238**  
 sheet: 1 of 1  
 project no: **GENZTAUC13086AP**  
 date started: **16 Mar 2016**  
 date completed: **16 Mar 2016**  
 logged by: **NM**  
 checked by: **RBT**

client: **The Lakes 2012 LTD**  
 principal: -  
 project: **The Lakes Stage 3 GCR**  
 location: **Centre of Lot 238**

position: Not Specified surface elevation: Not Specified angle from horizontal: 90° DCP id.:  
 drill model: Hand Auger drilling fluid: hole diameter : 50 mm vane id.:

drilling information				material substance									
method & support	penetration	water	samples & field tests	RL (m)	depth (m)	graphic log	classification symbol	material description	moisture condition	consistency / relative density	vane shear (kPa)	DCP (blows/100 mm)	structure and additional observations
HA N Not Encountered	1		VS 176/33 kPa		0.5		ML	<b>SILT:</b> low plasticity, brown mottled pink, white and orange, with minor fine grained sand, trace fine to medium grained angular gravel.	D	VSt	50	100	FILL
	2		VS >240 kPa			ML	<b>SILT:</b> low plasticity, orange brown mottled brown, with trace fine grained sand, trace pockets of sandy silt.	H			150	200	
	3		VS >240 kPa			ML	<b>SILT:</b> non plastic, pale orange, with some fine to medium grained sand.				250		
				VS >240 kPa		1.0		ML	<b>Sandy SILT:</b> non plastic, pale brown mottled white and orange, streaked black, with fine to medium grained sand..				
				VS >240 kPa		1.5							
				VS >240 kPa		2.0		ML	<b>SILT:</b> low plasticity, orange brown, with trace fine grained sand, trace clay.				
			VS >240 kPa		2.0			Hand Auger HA3D-238 terminated at 2.0 m Target depth					

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<b>method</b> AD auger drilling* AS auger screwing* HA hand auger W washbore HA hand auger	<b>support</b> M mud N nil C casing	<b>samples &amp; field tests</b> B bulk disturbed sample D disturbed sample E environmental sample SS split spoon sample U## undisturbed sample ##mm diameter HP hand penetrometer (kPa) N standard penetration test (SPT) N* SPT - sample recovered Nc SPT with solid cone VS vane shear; peak/remoulded (kPa) R refusal HB hammer bouncing	<b>classification symbol &amp; soil description</b> based on Unified Classification System	<b>consistency / relative density</b> VS very soft S soft F firm St stiff VSt very stiff H hard Fb friable VL very loose L loose MD medium dense D dense VD very dense
* bit shown by suffix e.g. AD/T B blank bit T TC bit V V bit	<b>penetration</b> 	<b>moisture</b> D dry M moist W wet S saturated Wp plastic limit Wl liquid limit	<b>water</b> 	

# Engineering Log - Hand Auger

client: **The Lakes 2012 LTD**

principal: -

project: **The Lakes Stage 3 GCR**

location: **Centre of Lot 239**

Borehole ID: **HAL239**

sheet: 1 of 1

project no: **GENZTAUC13086AP**

date started: **16 Mar 2016**

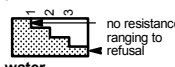
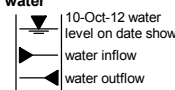
date completed: **16 Mar 2016**

logged by: **ODS**

checked by: **RBT**

position: Not Specified	surface elevation: Not Specified	angle from horizontal: 90°	DCP id.:
drill model: Hand Auger	drilling fluid:	hole diameter : 50 mm	vane id.: 2244-02

drilling information				material substance					structure and additional observations			
method & support	penetration	samples & field tests	RL (m)	depth (m)	graphic log	classification symbol	material description	moisture condition		consistency / relative density	vane shear (kPa)	DCP (blows/100 mm)
HA N Not Encountered	1	VS >183 kPa		0.0			<b>SILT:</b> low plasticity, brown mottled pink, white and orange, with minor fine grained sand, trace fine to medium grained angular gravel.	D	VSt	50	2	
	2	VS >183 kPa		0.5			<b>SILT:</b> non plastic to low plasticity, orange brown with mottled pale pink, with trace clay and trace fine sand. 0.5 m: trace gravel becoming present- are grey, medium to coarse and angular	D to M		100	4	
	3	VS >183 kPa		1.0			<b>SILT:</b> low plasticity, pink with mottled dark brown, with trace clay and trace to minor manganese. <b>SAND:</b> fine to coarse grained, pale brown, with some silt. 1.0 m: silt becomes trace 1.1 m: becomes brown 1.2 m: silt becomes minor		MD	150	6	
		VS >183 kPa		1.5			<b>SILT:</b> non plastic to low plasticity, orange brown, with some sand.			200	8	
		VS >183 kPa		2.0			<b>SILTY SAND:</b> fine to coarse grained, orange brown with mottled pale brown.			250	10	
		VS >183 kPa		2.0			Hand Auger HA3D-239 terminated at 2.0 m Target depth					
		VS >183 kPa		2.0								

<b>method</b> AD auger drilling* AS auger screwing* HA hand auger W washbore HA hand auger	<b>support</b> M mud C casing N nil	<b>samples &amp; field tests</b> B bulk disturbed sample D disturbed sample E environmental sample SS split spoon sample U## undisturbed sample ##mm diameter HP hand penetrometer (kPa) N standard penetration test (SPT) N* SPT - sample recovered Nc SPT with solid cone VS vane shear; peak/remoulded (kPa) R refusal HB hammer bouncing	<b>classification symbol &amp; soil description</b> based on Unified Classification System	<b>consistency / relative density</b> VS very soft S soft F firm St stiff VSt very stiff H hard Fb friable VL very loose L loose MD medium dense D dense VD very dense
* bit shown by suffix e.g. AD/T B blank bit T TC bit V V bit	<b>penetration</b> 	<b>moisture</b> D dry M moist W wet S saturated Wp plastic limit Wl liquid limit	<b>water</b> 	

CDF\_0\_9\_06\_LIBRARY.GLB rev:AT Log\_COF\_BOREHOLE:NON CORED + DCP\_GCR HA - 09-03-2016 ODS.GPJ <<DrawingFile>> 10/01/2017 14:26

## **Appendix E – Fill Test Summary Tables**

FILL TEST RESULTS FROM 2013 - 2015 EARTHWORKS PERIOD						
Summary of earthfill test data						
Test Number	Date	Test RL (m)	Result			Pass/Fail
			Air Voids (%)	Shear Vane (kPa)	Scala (blows per 100mm)	
A-5	18/10/2013	58.44	0.8	127	-	Fail - area reworked
A-6		58.83	2.2	209	-	Pass
A-7		58.91	0.4	UTP	-	Pass
A-8		58.38	2.7	236+	-	Pass
A-9		59.09	1.9	UTP	-	Pass
A-10		58.77	3.8	236+	-	Pass
A-11		58.51	4.3	176	-	Pass
A-12		58.71	3.5	86	-	Fail - Retested HAL447
A-13		58.08	3.7	UTP	-	Pass
A-29		30/10/2013	28.83	1.6	UTP	-
A-30	59.33		2.6	236+	-	Pass
A-31	58.46		1.6	149	-	Pass
A-32	59.00		0.0	180	-	Pass
A-33	58.32		4.4	171	-	Pass
A-34	58.81		0.0	220	-	Pass
A-35	58.22		0.8	138	-	Marginal Pass
A-36	58.67		0.3	UTP	-	Pass
A-37	58.01		0.0	236+	-	Pass
A-38	58.50		0.0	236+	-	Pass
A-39	57.76		0.0	195	-	Pass
A-40	58.28		5.6	UTP	-	Pass
A-41	58.18		0.0	97	-	Fail - Retested HAL457
A-42	58.24		4.9	UTP	-	Pass
A-43	58.24		0.5	205	-	Pass
A-44	58.53		0.0	197	-	Pass
A-45	58.86		6.3	236+	-	Pass
A-46	59.58		3.0	138	-	Marginal Pass
A-47	59.43		1.3	9999	-	Pass
A-48	59.23		5.8	236+	-	Pass
B-01	15/10/2014	52.59	1.5	112	-	Pass - Retest done, see B11
B-02		52.13	2.8	200	-	Pass
B-03		52.06	-0.3	187	-	Pass
B-04		51.71	-0.4	154	-	Pass
B-05		52.2	0.2	84	-	Pass - Retest done, see B28
B-06		58.72	2.6	226	-	Pass
B-07		58.51	1.5	170	-	Pass
B-08		58.77	-0.3	119	-	Fail - Retested HAL469-HAL471
B-09		59.11	0.5	112	-	Fail - Retested HAL472
B-10		59.09	1.8	167	-	Pass
B-11	5/11/2014	52.8	3.6	187	-	Pass
B-12		52.59	2.5	140	-	Pass
B-13		52.08	0.5	109	-	Pass - Retest done, see B28
B-14		53.62	4.1	204	-	Pass
B-15		53.19	9.4	179	-	Pass
B-16		53.58	2.4	158	-	Pass
B-17		53.4	-0.1	171	-	Pass
B-18		53.05	0.4	166	-	Pass
B-19		53.06	4.5	189	-	Pass
B-20		53.53	0.4	169	-	Pass
B-21	53.06	1	164	-	Pass	
B-22	52.68	2.4	157	-	Pass	
B-26	14/11/2014	51.85	5.5	227	-	Pass
B-27		53.12	6.2	184	-	Pass
B-28		52.07	4	148	-	Pass
B-29	27/11/2014	55.4	2.4	179	-	Pass
B-30		54.9	1.3	231	-	Pass
B-31		55.1	3.9	176	-	Pass
B-32		54.76	1.6	198	-	Pass
B-33	54.26	6.4	187	-	Pass	
B-48	1/12/2014	55.55	4.5	166	-	Pass
B-49		55.44	7.6	209	-	Pass
B-50		55.22	4.8	150	-	Pass
B-51		54.95	6	174	-	Pass
B-52	54.68	6.3	193	-	Pass	
B-53	5/12/2014	56.26	3.2	219	-	Pass
B-54		55.97	2	193	-	Pass
B-55		55.98	1.2	231	-	Pass
B-56		56.35	-0.2	213	-	Pass
B-57		55.95	2.8	222	-	Pass
B-58		56.06	11.3	220	-	Pass
B-59		56.47	4.5	231	-	Pass
B-60		57.02	6.6	227	-	Pass



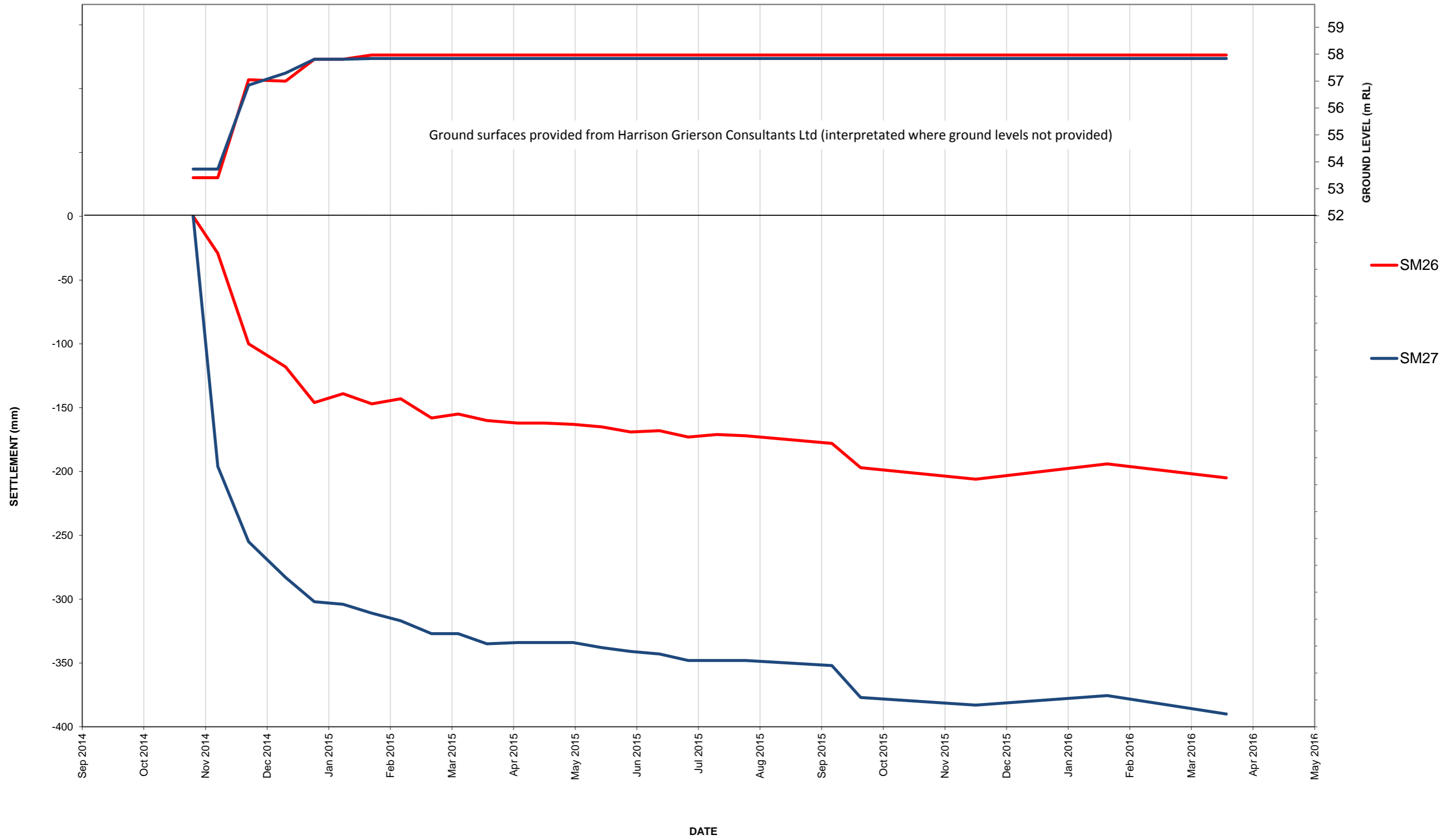
Test Number	Date	Test RL (m)	Result			Pass/Fail
			Air Voids (%)	Shear Vane (kPa)	Scala (blows per 100mm)	
B-61	9/12/2014	57.06	1.9	159	-	Pass
B-62		56.9	-1.9	222	-	Pass
B-63		56.81	1.2	163	-	Pass
B-64		56.65	3.1	204	-	Pass
B-65		56.06	4.5	221	-	Pass
B-168	16/02/2015	46.99	5	232	-	Pass
B-169		45.83	1.5	231	-	Pass
B-170		45.35	3.8	230	-	Pass
B-175	20/02/2015	49.28	-2.9	224	-	Pass
B-176		48.50	1.5	210	-	Pass
B-177	24/02/2015	48.99	1.8	220	-	Pass
B-178		48.76	7.7	225	-	Pass
B-179		49.55	0.8	203	-	Pass
B-180		50.17	1.3	232	-	Pass
B-181		47.50	1.4	232	-	Pass
B-182	26/02/2015	47.00	4.4	195	-	Pass
B-183		34.00	4.4	219	-	Pass
B-186	3/03/2015	53.69	2.5	232	-	Pass
B-187		53.67	2.1	230	-	Pass
B-190		56.91	-1.6	232	-	Pass
B-191	9/03/2015	57.67	4.3	195	-	Pass
B-192		57.37	11.9	210	-	Pass
B-193		58.66	4.7	226	-	Pass

#### Notes

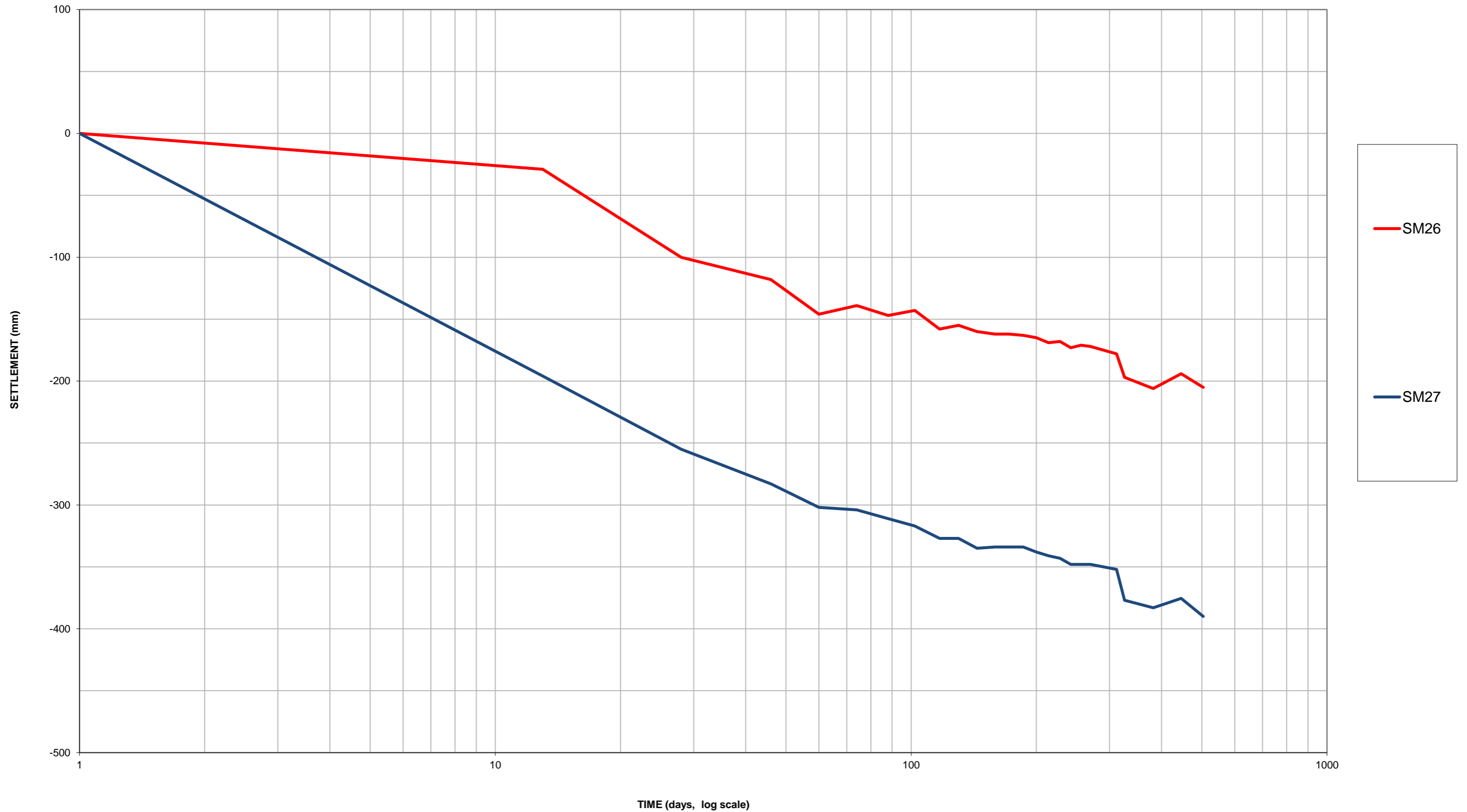
- 1 Shear strength for NDM tests calculated from average of 4 vane tests at each test location.
- 2 A target Soilds Density of 2.44 t/m<sup>3</sup> to 2.60 t/m<sup>3</sup> was assumed for silt/ash fill.
- 3 UTP = Unable to Penetrate
- 4 Failed test areas were observed by Coffey and retested with sheervane and/or scala penetrometer.
- 5 All test locations and elevations surveyed by JMC Ltd.

## **Appendix F – Static Settlement Results**

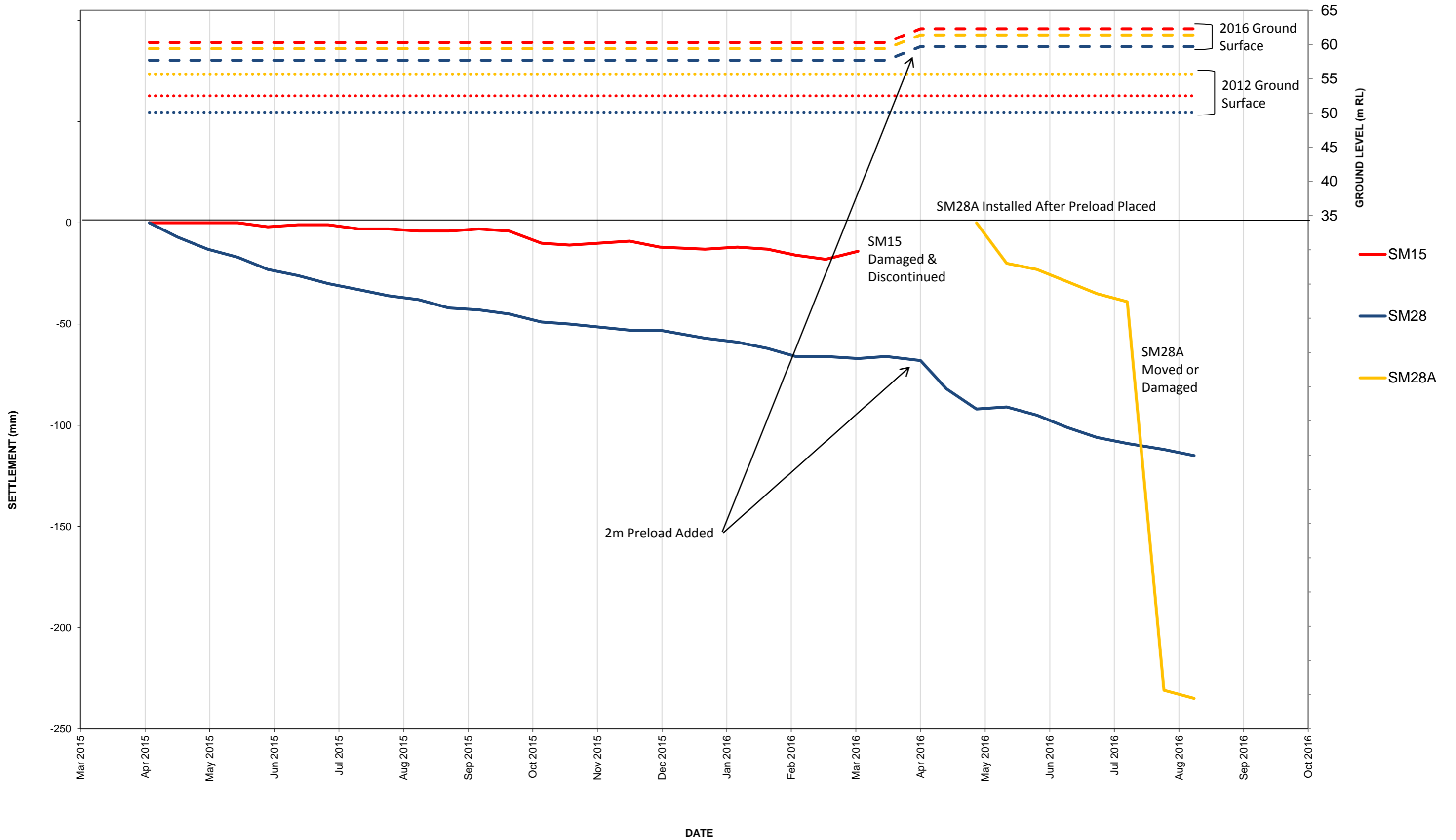
**SETTLEMENT VS TIME**



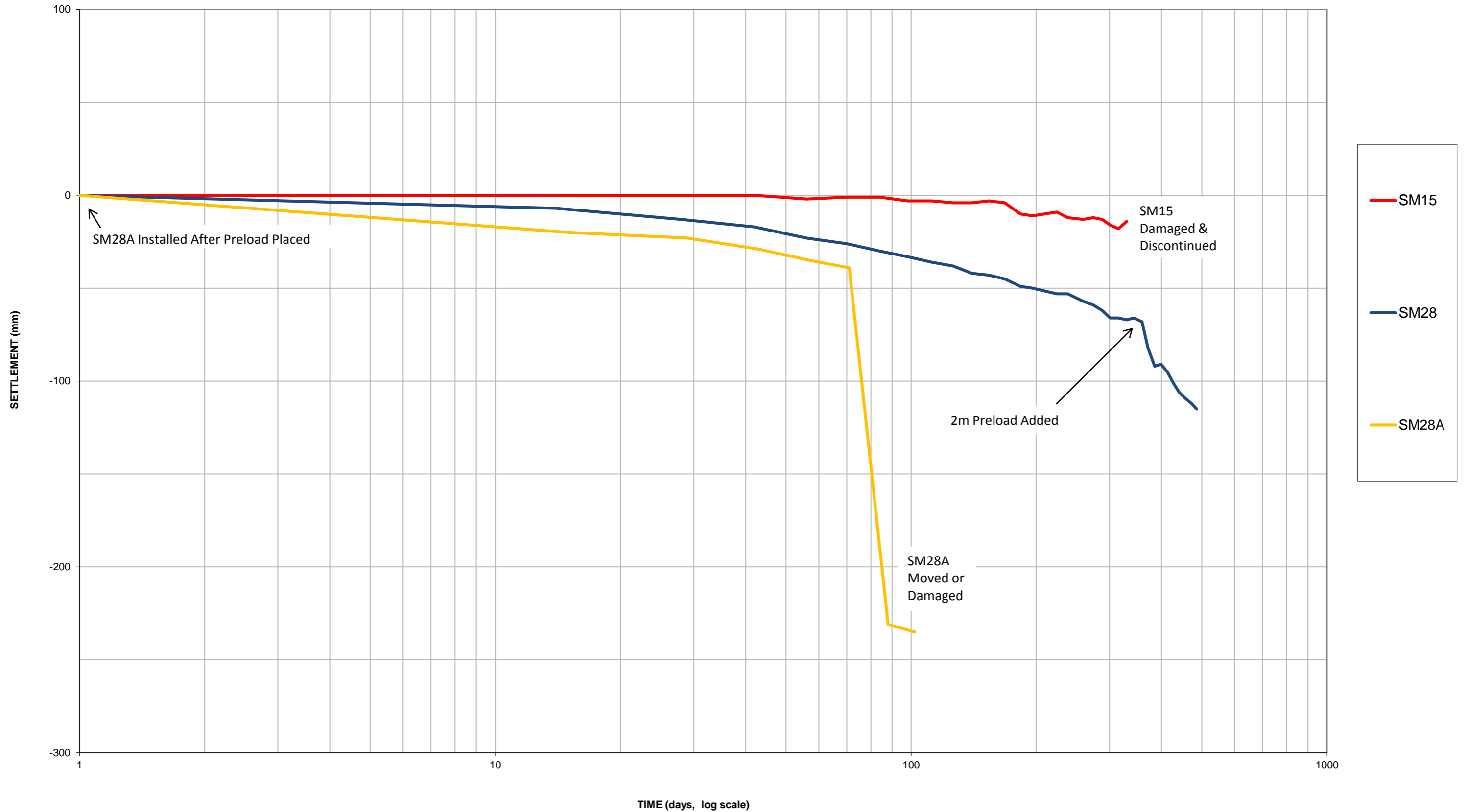
SETTLEMENT VS TIME (LOG SCALE)



**SETTLEMENT VS TIME**



**SETTLEMENT VS TIME (LOG SCALE)**



**Appendix G – Stage 3G Retaining Wall  
Certification**

2 February 2017

Our ref: GENZTAUC13086AB-AF

The Lakes (2012) Ltd  
C/- Harrison Grierson Consultants Ltd  
Level 1 Harrison Grierson House  
141 Cameron Road  
Tauranga

Attention: Tony Mills

Dear Tony

**The Lakes Stage 3G – Northern Boundary Retaining Wall Observation and Certification**

This letter confirms that Coffey Services (NZ) Ltd (Coffey) visited the above site on numerous occasions to observe works associated with the construction of the timber pole retaining wall which runs along the northern boundary of Stage 3G. The observations were completed in general accordance Coffey's design report<sup>1</sup> dated 16 June 2016 and the Tauranga City Council building consent number 55971.

The following items were checked or carried out on site:

- Verification of pre-drilled pile hole diameters depths and spacing's;
- Confirmation of soil conditions encountered within the boreholes;
- Verification of timber pole upright heights and diameters;
- Verification of timber lagging, dimensions and placement;
- Confirmation of safety fence installation.

As a result of our observations and site measurements, Coffey are satisfied that the subject retaining wall has been built in general accordance with the requirements of the design report and building consent.

A producer statement (PS4 – Construction Review) is attached to this letter.

---

<sup>1</sup> Coffey (2016) Retaining Wall Design Report for Stage 3G The Lakes, The Lakes Subdivision, Tauriko. Dated: 16 June 2016, Ref: GENZTAUC13086AB-AB



## Limitations

This report has been prepared solely for the use of our client, The Lakes (2012) Limited and their professional advisors and contractors in relation to the specific project described herein. No liability is accepted in respect of its use for any other purpose or by any other person or entity. All future owners of this property should seek professional geotechnical advice to satisfy themselves as to its ongoing suitability for their intended use.

This document should always be read in its entirety and is not to be split for further distribution.

For and on behalf of Coffey



**Rob Telford**  
Senior Engineering Geologist

Letter reviewed by:



**David Sullivan, BSc, MBA, CE (Calif.), MIPENZ, CPEng,**  
**TCC Category 1 Geotechnical Engineer**  
Principal Geotechnical Engineer  
CPEng No. 1025183

## Attachments

Site photographs


Producer Statement – PS4 – Construction Review

Photograph 1: Photo taken on the 10/11/16 of predrilled Pile holes 47 to 126.




Photograph 2: Photo taken on the 22/11/16 of the placement of piles.



CLIENT: The Lakes (2012) Ltd	PROJECT: 13086AB	DESIGNED: N.M	SITE PHOTOGRAPHS
	DWG #: A	DRAWN: N.M	
	REVISION:		
PROJECT TITLE: Stage 3G -Retaining Wall Observations and Certification	SCALE: NA	STATUS: FINAL	 <small>A TETRA TECH COMPANY</small>
	DATE: 23.01.17		

Photograph 3: Photo taken on the 22/11/16 of the final placement and alignment of retaining wall piles.



CLIENT: The Lakes (2012) Ltd	PROJECT: 13086AB	DESIGNED: N.M	SITE PHOTOGRAPHS
	DWG #: A	DRAWN: N.M	
	REVISION:		
PROJECT TITLE: Stage 3G -Retaining Wall Observations and Certification	SCALE: NA	STATUS: FINAL	 A TETRA TECH COMPANY
	DATE: 23.01.17		



# PRODUCER STATEMENT – PS4 – CONSTRUCTION REVIEW

(Guidance notes on the use of this form are printed on page 2)

ISSUED BY: COFFEY SERVICES (NZ) LIMITED.....  
(Construction Review Firm)

TO: THE LAKES (2012) LIMITED .....  
(Owner/Developer)

TO BE SUPPLIED TO: TAURANGA CITY COUNCIL.....  
(Building Consent Authority)

IN RESPECT OF: TIMBER POLE RETAINING WALL DESIGN.....  
(Description of Building Work)

AT: THE LAKES STAGE 3G.....  
(Address)  
..... LOT... 1001... DP 486181..... SO .....

COFFEY SERVICES (NZ) LTD has been engaged by THE LAKES (2012) LTD.....  
(Construction Review Firm)

To provide  CM1  CM2  CM3  CM4  CM5 (Engineering Categories) or  observation as per agreement with owner/developer

or  other PERIODIC INSPECTIONS DURING RETAINING WALL CONSTRUCTION..... services  
(Extent of Engagement)

in respect of clause(s) B1/VM4 & F4..... of the Building Code for the building work described in

documents relating to Building Consent No. 55971..... and those relating to

Building Consent Amendment(s) Nos. N/A..... issued during the

course of the works. We have sighted these Building Consents and the conditions of attached to them.

Authorised instructions / variations(s) No. N/A..... (copies attached)

or by the attached Schedule  have been issued during the course of the works.

On the basis of  this  these review(s) and information supplied by the contractor during the course of the works and on behalf of the firm undertaking this Construction Review, I believe on reasonable grounds that  All  Part only of the building works have been completed in accordance with the relevant requirements of the Building Consent and Building Consent Amendments identified above, with respect to Clause(s) B1/VM4 & F4..... of the Building Code.

I also believe on reasonable grounds that the persons who have undertaken this construction review have the necessary competency to do so.

I, ..... David Sullivan..... am:  CPEng No. ... 1025183.....  
(Name of Construction Review Professional)

Reg Arch No. ....

I am a Member of:  IPENZ  NZIA and hold the following qualifications: .....

The Construction Review Firm issuing this statement holds a current policy of Professional Indemnity Insurance no less than \$200,000\*.

The Construction Review Firm is a member of ACENZ:

SIGNED BY ... David Sullivan..... ON BEHALF OF COFFEY SERVICES (NZ) LTD.....

Date: 3-2-17 ..... Signature:

Note: This statement shall only be relied upon by the Building Consent Authority named above. Liability under this statement accrues to the Design Firm only. The total maximum amount of damages payable arising from this statement and all other statements provided to the Building Consent Authority in relation to this building work, whether in contract, tort or otherwise (including negligence), is limited to the sum of \$200,000\*.

This form is to accompany Forms 6 or 8 of the Building (Form) Regulations 2004 for the issue of a Code Compliance Certificate.

**FORM OF PRODUCER STATEMENT PS3 – CONSTRUCTION**

At project completion, this form shall be completed by the building contractor and supplied to the Engineer.

ISSUED BY: HIGGINS CONTRACTORS LTD  
(Building Contractor)

TO: THE LAKES 2012  
(Owner/Principal)

IN RESPECT OF: RETAINING WALL LAKES 3G  
(Description of Contract Works)

AT: 3110L PYES PA RD  
(Address)

T/A: TCC BUILDING CONSENT No: 55971  
(Territorial Authority / Building Consent Authority)

The above Building Contractor has contracted to the above Owner/Principal to carry out and complete certain building works in accordance with the contract, titled

RETAINING WALL LAKES 3G ("the contract")  
(Title of building contract)

STEVE PAPA a duly authorised representative of the  
(Builder's Authorised Agent)

above building contractor, believe on reasonable grounds that the above building contractor has carried out and completed

All  Part only as specified in the attached particulars

of the building works in accordance with the contract.

  
(Signature of Authorised Agent on behalf of the Building Contractor)

13/2/2017  
(Date)

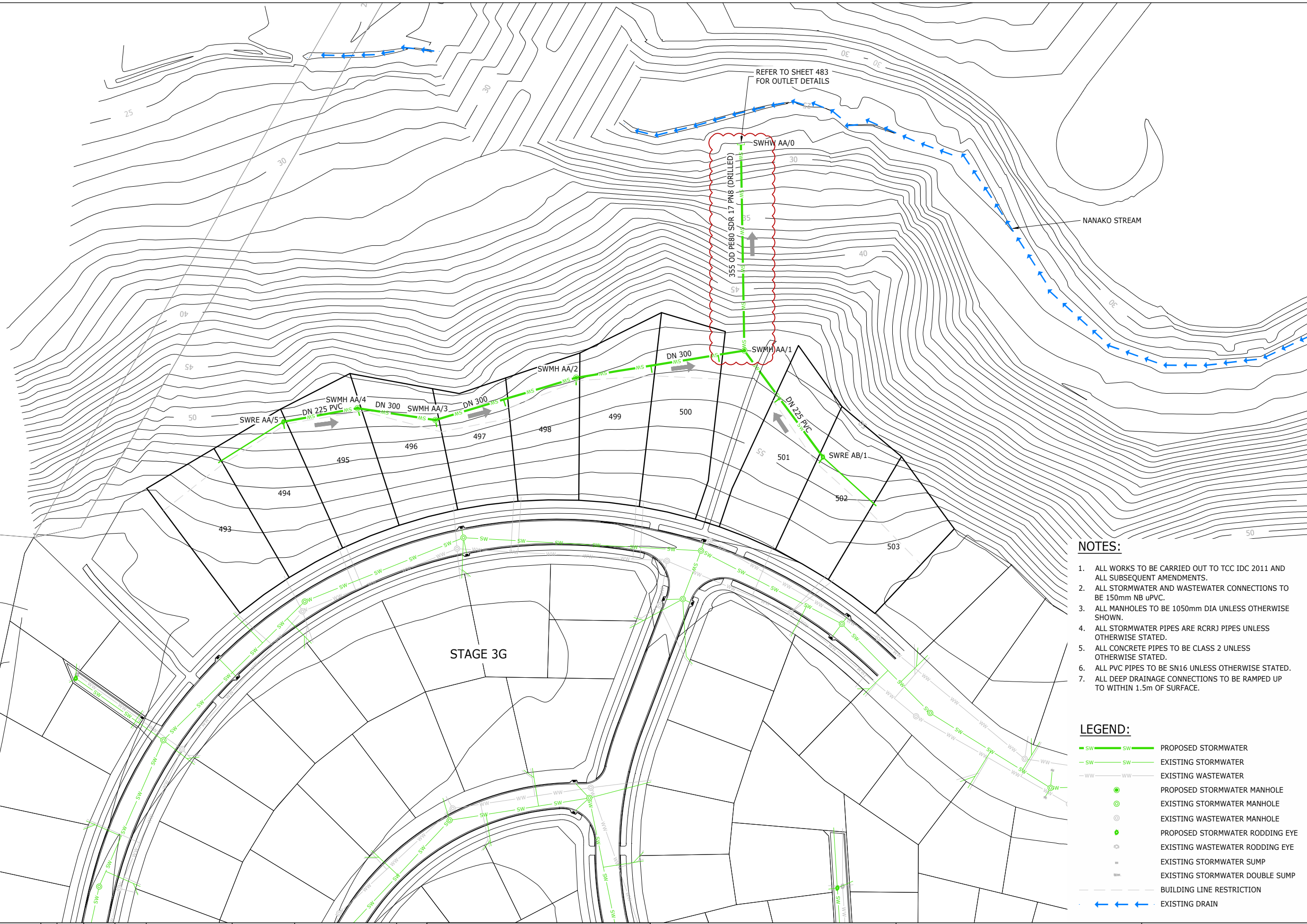
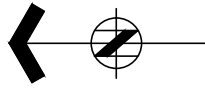
92 HEWLETTS RD  
MT MAUNGANUI  
(Address)

*This producer statement is confirmation by the builder(s) that they have carried out the building work in accordance with the drawings, specifications (and site amendments) that are part of the contract / building consent documents.*

*Work covered by this statement should have been supervised and checked by suitably qualified tradespersons.*

*The Engineer requires this producer statement and a copy of the T/A's building consent conditions, to confirm that items of the contract that he has not personally examined, have in fact been built according to the documents, so that the Engineer may issue appropriate documents to the T/A for it to release the Code Compliance Certificate.*

**Appendix H – Stage 3H Stormwater  
Pipeline Drawings**



1. ALL WORKS TO BE CARRIED OUT TO TCC IDC 2011 AND ALL SUBSEQUENT AMENDMENTS.
2. ALL STORMWATER AND WASTEWATER CONNECTIONS TO BE 150mm NB uPVC.
3. ALL MANHOLES TO BE 1050mm DIA UNLESS OTHERWISE SHOWN.
4. ALL STORMWATER PIPES ARE RCRRJ PIPES UNLESS OTHERWISE STATED.
5. ALL CONCRETE PIPES TO BE CLASS 2 UNLESS OTHERWISE STATED.
6. ALL PVC PIPES TO BE SN16 UNLESS OTHERWISE STATED.
7. ALL DEEP DRAINAGE CONNECTIONS TO BE RAMPED UP TO WITHIN 1.5m OF SURFACE.

**LEGEND:**

- SW — SW PROPOSED STORMWATER
- SW — SW EXISTING STORMWATER
- WW — WW EXISTING WASTEWATER
- S EXISTING STORMWATER MANHOLE
- S EXISTING WASTEWATER MANHOLE
- R PROPOSED STORMWATER RODDING EYE
- R EXISTING WASTEWATER RODDING EYE
- S EXISTING STORMWATER SUMP
- DS EXISTING STORMWATER DOUBLE SUMP
- - - BUILDING LINE RESTRICTION
- - - ← ← ← EXISTING DRAIN

ORIGINATOR: RJM	DATE: 16.06.16	SIGNED:	PLOT BY: RJM
DRAWN: TRS	DATE: 16.06.16	SIGNED:	PLOT DATE: 20.10.16
CHECKED: RJM	DATE: 20.10.16	SIGNED:	SURVEY BY:
APPROVED: GPR	DATE: 26.09.16	SIGNED:	SURVEY DATE:
BY	DATE	GPR	20.10.16

ASSOCIATION OF CONSULTING ENGINEERS  
NEW ZEALAND

ISO 9001  
QUALITY ASSURED

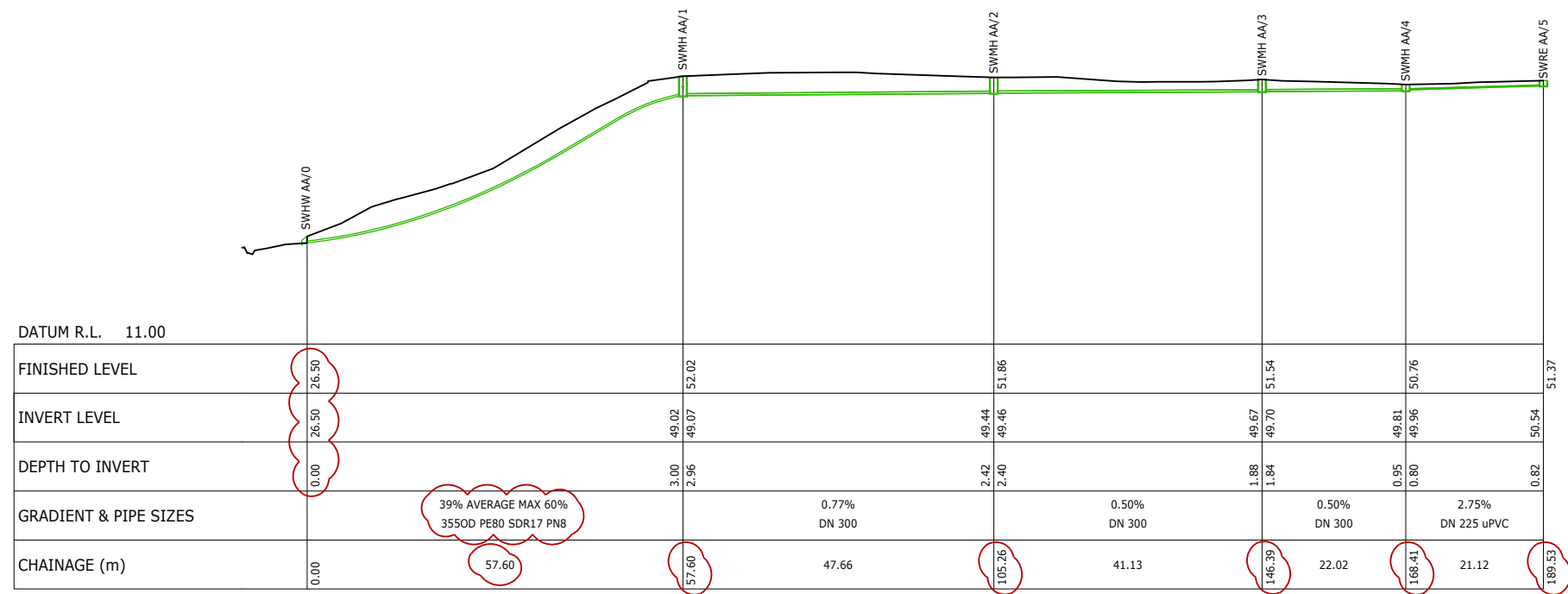
THIS DRAWING AND DESIGN REMAINS THE PROPERTY OF, AND MAY NOT BE REPRODUCED OR ALTERED, WITHOUT THE WRITTEN PERMISSION OF HARRISON GRIERSON CONSULTANTS LIMITED. NO LIABILITY SHALL BE ACCEPTED FOR UNAUTHORISED USE OF THIS DRAWING.

TAURANGA OFFICE  
LEVEL 1 HARRISON GRIERSON HOUSE  
141 CAMERON ROAD TAURANGA 3110  
T +64 7 578 0023  
W www.harrisongrierson.com

PROJECT:  
**Summit**  
THE LAKES (2012) LIMITED, TAURANGA

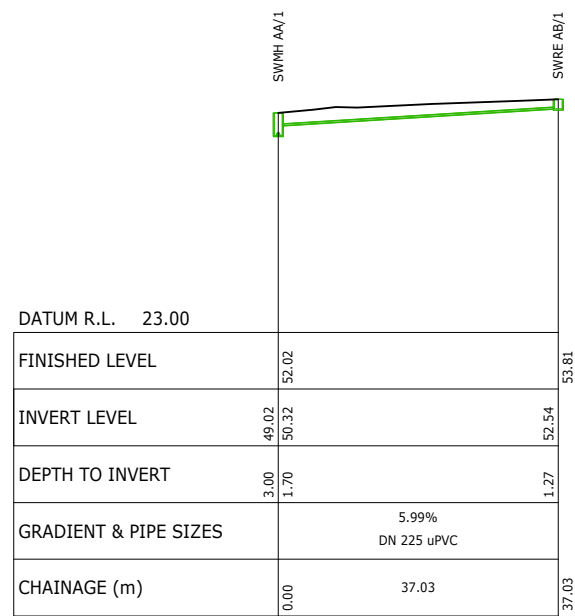
TITLE:  
**STAGE 3H  
STORMWATER LAYOUT PLAN**

ISSUE STATUS: <b>CONSTRUCTION</b>	
PROJECT No: 1500-138804-01	SCALES: 1:500 - A1 1:1000 - A3
DRAWING No: <b>138804-403</b>	REV <b>B</b>



**STORMWATER LINE AA LONGITUDINAL SECTION**

SCALE HOR 1:500 - A1, 1:1000 - A3  
VER 1:100 - A1, 1:200 - A3

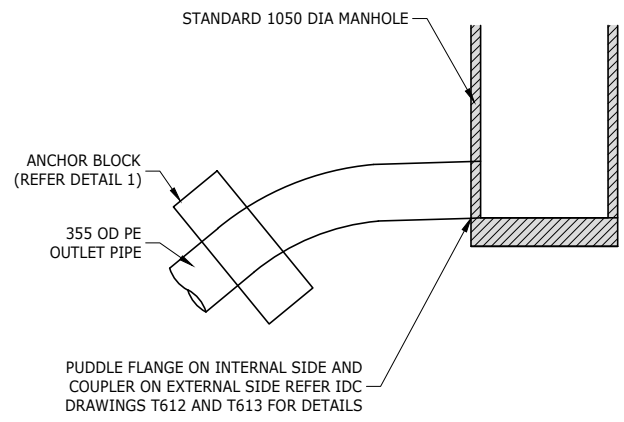


**STORMWATER LINE AB LONGITUDINAL SECTION**

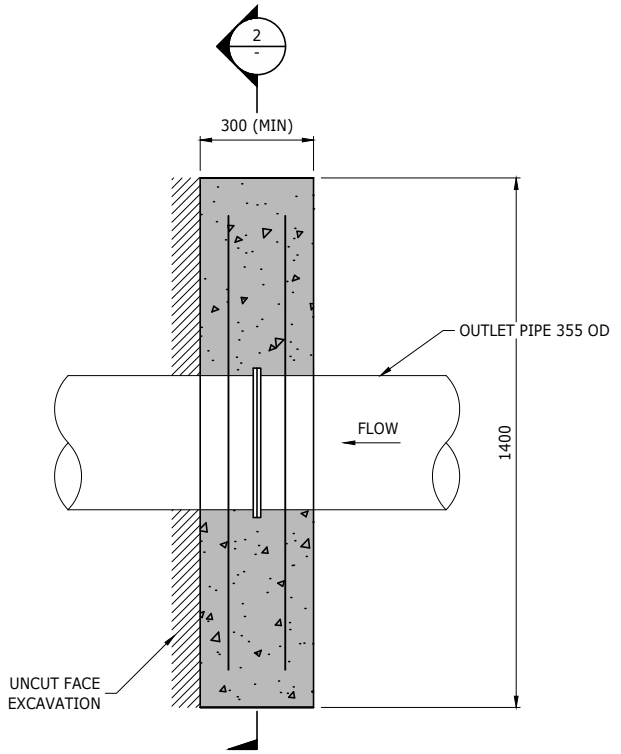
SCALE HOR 1:500 - A1, 1:1000 - A3  
VER 1:100 - A1, 1:200 - A3

ORIGINATOR: RJM	DATE: 16.06.16	SIGNED:	PLOT BY: RJM	ASSOCIATION OF CONSULTING ENGINEERS NEW ZEALAND	ISO 9001 QUALITY ASSURED	PROJECT: <b>Summit</b> THE LAKES (2012) LIMITED, TAURANGA	TITLE: STAGE 3H STORMWATER LONGITUDINAL SECTION	ISSUE STATUS: CONSTRUCTION
DRAWN: TRS	DATE: 16.06.16	SIGNED:	PLOT DATE: 20.10.16	THIS DRAWING AND DESIGN REMAINS THE PROPERTY OF, AND MAY NOT BE REPRODUCED OR ALTERED, WITHOUT THE WRITTEN PERMISSION OF HARRISON GRIERSON CONSULTANTS LIMITED. NO LIABILITY SHALL BE ACCEPTED FOR UNAUTHORISED USE OF THIS DRAWING.	TAURANGA OFFICE LEVEL 1 HARRISON GRIERSON HOUSE 141 CAMERON ROAD TAURANGA 3110 T +64 7 578 0023 W www.harrisongrierson.com	DRAWING No: 138804-435	SCALES: AS SHOWN	A1
CHECKED: RJM	DATE: 20.10.16	SIGNED:	SURVEY BY:	REV A ISSUED FOR CONSTRUCTION				REV B
APPROVED: GPR	DATE: 26.09.16	SIGNED:	SURVEY DATE:	REF				

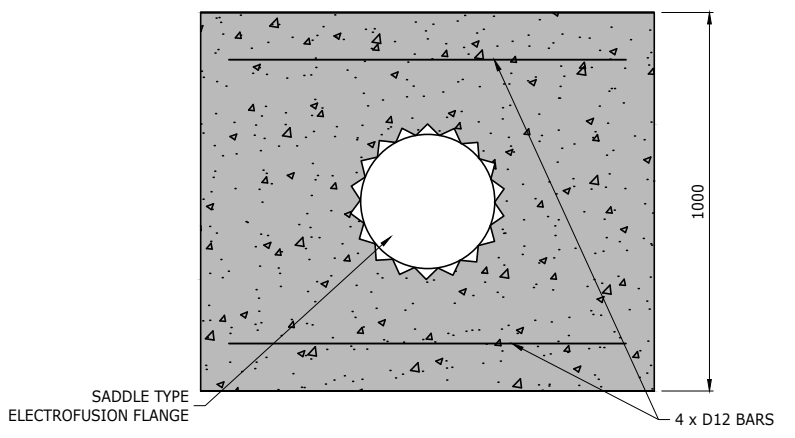




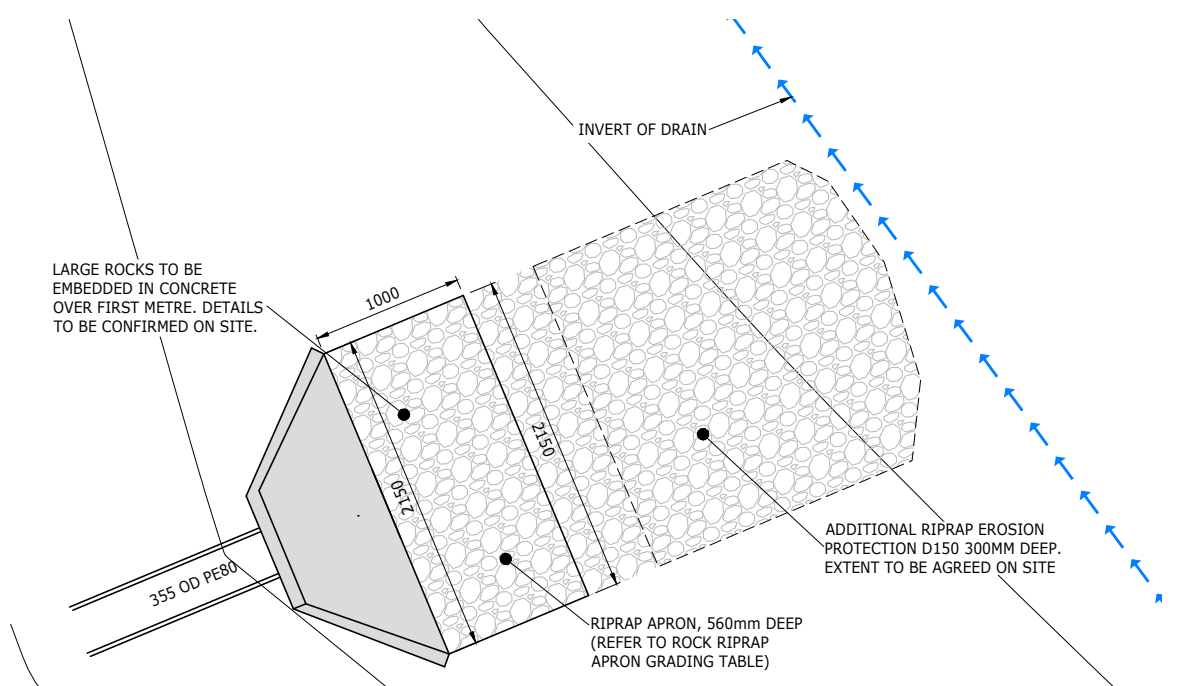
**A PE PIPE CONNECTION SWMH AA/1**  
SCALE NTS



**1 ANCHOR BLOCK DETAIL**  
SCALE 1:10 - A1  
1:20 - A3



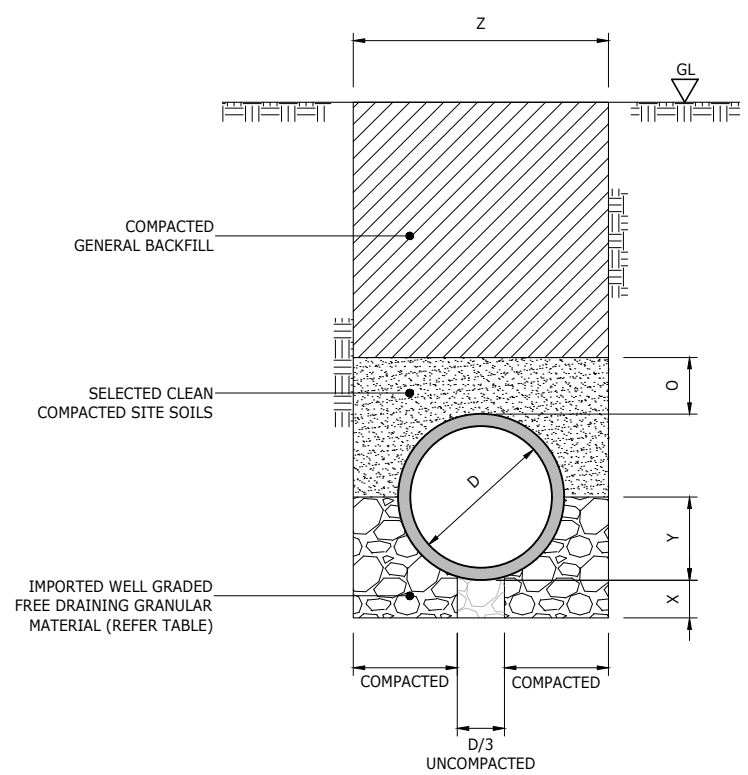
**2 ANCHOR BLOCK CROSS SECTION**  
SCALE 1:10 - A1  
1:20 - A3



**B SWHW AA/0 OUTLET DETAILS**  
SCALE 1:25 - A1  
1:50 - A3

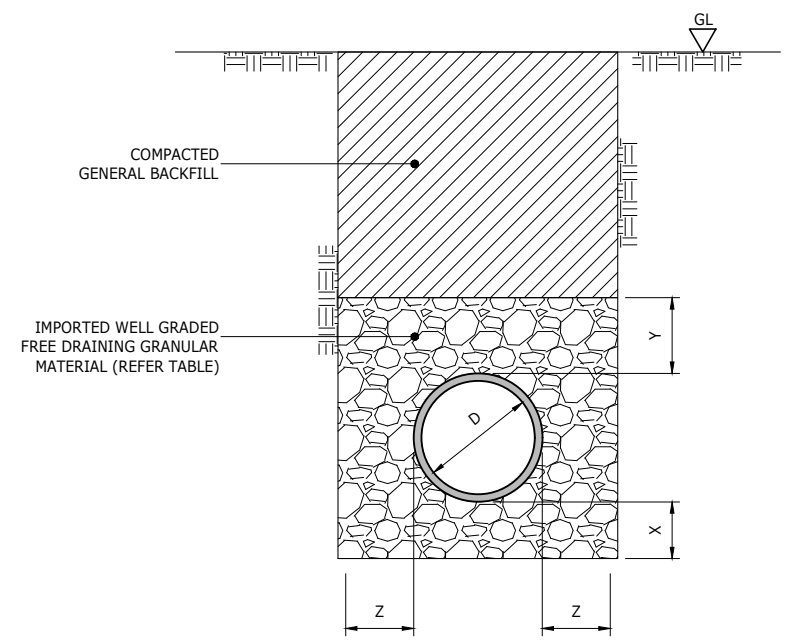
ROCK RIPRAP APRON GRADING TABLE	
SEIVE SIZE	% PASSING
345 - 391	100
276 - 322	85
230 - 322	50
92 - 138	15

GRADING FOR IMPORTED BEDDING	
SIEVE SIZE	% ALL PASSING
19.00	100
2.36	100 - 50
0.60	90 - 20
0.30	60 - 10
0.15	25 - 0
0.08	10 - 0



**CONCRETE PIPE BEDDING**  
SCALE NTS

BEDDING DETAILS CONCRETE PIPES				
PIPE SIZE (mm)	X	Y	Z	O
300	100	110	665	150



**PLASTIC PIPE BEDDING**  
SCALE NTS

BEDDING DETAILS uPVC PIPES			
PIPE SIZE (mm)	X	Y	Z
100	75	100	100
150	75	100	100

**NOTES:**

1. ALL CONCRETE PIPE BEDDING HAS BEEN DESIGNED TO H2 SUPPORT TYPE.
2. REFER TO THE SPECIFICATION FOR MINIMUM COMPACTION STANDARDS OF THE BEDDING MATERIAL.
3. CONTRACTOR TO PROVIDE GRADING CURVE OF PROPOSED BEDDING MATERIAL TO ENGINEER FOR APPROVAL.
4. ALL DIMENSIONS ARE MINIMUM, AND MAY BE INCREASED ON SITE.
5. ALL WORK WITH CONCRETE PIPES TO BE IN ACCORDANCE WITH AS/NZS 3725.
6. ALL WORK WITH PLASTIC PIPES TO BE IN ACCORDANCE WITH AS/NZS 2566.

ORIGINATOR: RJM	DATE: 16.06.16	SIGNED:	PLOT BY: TRS
DRAWN: TRS	DATE: 16.06.16	SIGNED:	PLOT DATE: 26.09.16
CHECKED: RJM	DATE: 26.09.16	SIGNED:	SURVEY BY:
APPROVED: GPR	DATE: 26.09.16	SIGNED:	SURVEY DATE:

ASSOCIATION OF CONSULTING ENGINEERS NEW ZEALAND

ISO 9001 QUALITY ASSURED

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PROJECT: **Summit**  
THE LAKES (2012) LTD, TAURANGA

TITLE: **STAGE 3H DRAINAGE DETAILS**

ISSUE STATUS: CONSTRUCTION	PROJECT No: 1500-138804-01	SCALES: AS SHOWN	A1
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