



Falcons Landing
Geotechnical Subdivision Report
GW Rolleston Limited

16 February 2017 Revision: 2 Reference: 254246



# Document control record

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# **Executive Summary**

#### Introduction

GW Rolleston Limited is proposing to develop an approximately 60 hectare block of rural land in Rolleston around Brathwaite Drive into the Falcons Landing residential subdivision. When completed it will contain approximately 600lots with associated subdivision infrastructure such as drainage and internal roads. GW Rolleston Limited has engaged Aurecon New Zealand Limited (Aurecon) to assess the suitability of the land for residential development from a geotechnical perspective and complete an assessment against Section 106 of the Resource Management Act.

#### **Geotechnical Investigations**

Aurecon has undertaken geotechnical testing across the site comprising a review of readily available published information, review nearby Environmental Canterbury (ECan) borehole logs, soakage pit tests from PDP as part of the stormwater design, and excavating 26 test pit excavations into the underlying gravel and 21 hand auger boreholes.

Based on the results of our geotechnical investigations the site is underlain by shallow gravel (0.2m to 1.5m depth) which ECan boreholes indicate extends to at least 200m depth.

Groundwater was not encountered in any of the test pit or hand auger investigation but information from nearby ECan boreholes suggest it is in the order of 10m depth at the development site

#### **Liquefaction Assessment**

Given the ground conditions comprising silt to sandy silt underlain by non-liquefiable gravel, a deep groundwater table (at least 10m depth) and the lack of evidence of liquefaction ground damage across the site following the 4 September 2010 Darfield Earthquake, liquefaction is not a credible hazard on this site. Hence a detailed liquefaction hazard assessment has not been carried out

#### **Technical Category Classification**

The site is considered consistent with a MBIE TC1 classification and therefore it is likely that standard NZ3604 type foundations outlined in NZS3604 'Timber Framed Buildings' and NZS4229 'Concrete Masonry Buildings not requiring Specific Engineering Design' type foundations will be suitable at the site provided sufficient shallow bearing capacity is achieved. Lot specific shallow geotechnical investigations will be required for detailed house design.

#### **RMA Section 106 Assessment**

The site is not susceptible to falling debris or slippage due to the gently sloping topography. No erosion was observed on the site and the risk of subsidence and inundation from liquefaction is low due to the relatively deep groundwater table and ground conditions encountered.

As such, the site will essentially be geotechnically stable land. Thus in our opinion, the proposed development will generally be free of "erosion," "falling debris," "subsidence," "slippage," and "inundation" and the proposed development satisfies the intent of RMA Section 106 1(a).

Provided that appropriate investigation and design inputs are made, as recommended in this report, subsequent use of the land following development is unlikely to accelerate, worsen, or result in material damage to the land, other land, or structures. In our opinion therefore, the development will comply with the requirements of Clause 106 1(b) RMA.



Our Limitations are attached as Section 7 of this report. This report shall be read as a whole.

This Revision 2 report incorporates the results from additional geotechnical testing on three additional life style properties that have been incorporated into the proposed development following the preparation and issuing of the Revision 1 report.



#### Introduction 1

GW Rolleston Limited is proposing to develop approximately 60 hectare block of rural land on the southeastern edge of Rolleston around Brathwaite Drive. This development will be known as Falcons Landing and when completed the residential subdivision will contain approximately 600 residential lots with associated subdivision infrastructure such as drainage and internal roads.

GW Rolleston Limited has engaged Aurecon New Zealand Limited (Aurecon) to assess the suitability of the land for residential development from a geotechnical perspective and complete an assessment against Section 106 of the Resource Management Act.

The scope of the work undertaken for this current assessment was as follows:

- A detailed desk study of readily available geological and geotechnical information for this site.
- A preliminary site walkover and reconnaissance.
- Excavate and log a nominal 32 test pit excavations.
- Drill and log 21 hand augers boreholes.
- Make recommendations for additional geotechnical testing, if required.
- Assess the site from a geotechnical perspective for residential development including assessing a likely residential land liquefaction hazard Technical Category (TC) classification in accordance with the principles of the MBIE Guidance.
- Undertake an assessment against the RMA Section 106 1a and 1b.
- Provide comments on development options and geotechnical constraints.
- Prepare this factual and interpretive geotechnical report outlining the above.

This report presents the results of our geotechnical investigation and recommendations for residential development. Our work was carried out under an IPENZ Short Form Agreement with GW Rolleston Ltd dated 7 November 2016. Approval to proceed was given by Hamish Wheelans on 7 November 2016.

This report does not address civil engineering aspects of the development such as drainage, storm water disposal, and pavement and bulk earthworks. We understand this is being addressed by others as part of the land development process.

Our Limitations are attached as Section 7 of this report. This report shall be read as a whole.

This Revision 2 report incorporates the results from additional geotechnical testing on three additional life style properties that have been incorporated into the proposed development following the preparation and issuing of the Revision 1 report.



#### Site Conditions 2

#### 2.1 Site Features

The site is located on the southeastern edge of Rolleston township, as shown on Figure 1 in Appendix A. The main site features are:

- The site currently comprises of 17 individual life style blocks of land with different ownership and legal titles. The total area proposed for residential development is approximately 60 hectares.
- The area comprises a number of residential houses along with fenced paddocks containing livestock, crops and horses.
- Drainage is inferred to be via direct soakage into the ground.
- The Branthwaite Drive site and the Rolleston area has the current MBIE Technical Category Classification of N/A - Rural & Unmapped.

#### 2.2 **Regional Geology and Seismicity**

The regional geology of the site is described by Forsyth and Barrel (2008) as 'Grey river alluvium beneath plains or low level terraces (Q1a). The underlying geology changes approximately 500m west of the site where it is described as "Brownish-grey river alluvium (Q2a)".

The site lies close to the epicentres of recent significant earthquakes as summarised in Table 1 below.

Table 1 **Recent Earthquake Activity** 

Earthquake	Distance to Epicentre	Moment Magnitude (M <sub>w</sub> )	Median PGA on Site <sup>(1)</sup>	Equivalent mean PGA for M <sub>w</sub> 7.5 Event <sup>(2)</sup>
Darfield Earthquake 4 September 2010	17km west to the eastern end of the Darfield fault trace	7.1	0.36g	0.32g
Christchurch Earthquake 22 February 2011	8km east	6.2	0.15g	0.11g

- (1) Peak Ground Accelerations (PGA) on site based on O'Rourke et. al. (2012) (as shown on the NZGD, 2016).
- (2) Calculated using the magnitude scaling factor based on the method of Idriss and Boulanger (2008).

#### 2.3 **Recorded Earthquake Damage**

Based on the GNS Science report "Review of liquefaction hazard information in eastern Canterbury, including Christchurch City and parts of Selwyn, Waimakariri and Hurunui" (GNS, 2012), there was no observed liquefaction induced damage after the 4 September 2010 or 22 February 2011 earthquakes.



#### **Geotechnical Investigation** 3

The geotechnical investigation comprised the following:

- A review of publically available geotechnical information from Environment Canterbury and the New Zealand Geotechnical Database.
- Review of soakage pit logs from PDP undertaken as part of the stormwater design for the Falcons Landing development.
- Test Pit excavations undertaken by Maugers and supervised by geotechnical engineers from Aurecon.
- Hand auger boreholes conducted by Aurecon geotechnical engineers.

This section of the report describes the results of our geotechnical review and additional testing.

#### 3.1 **New Zealand Geotechnical Database**

A review of the Canterbury Geotechnical Database did not identify any relevant geotechnical information near the site.

#### 3.2 **Environment Canterbury Database**

A review of the Environment Canterbury GIS Database (ECan, 2016) indicated two Environment Canterbury boreholes with logs on the site and a further 16 logs immediately adjacent to the site. These boreholes range from 25m to over 200m depth. The borehole logs typically indicate 1m to 2m of soil overlying predominately gravels to depth. The ECan borehole logs from the site are attached in Appendix B and locations shown on Figure 2 in Appendix A.

#### 3.3 PDP Investigation

As part of the stormwater assessment for the Falcons Landing development PDP have undertaken six groundwater soakage test across the site. These test were undertaken in test pit excavations 3.5m to 3.9m deep. Logs of these tests indicate the site is typically underlain by 0.8m to 1m of silty-sand and silt, overlying gravel and sandy-gravel to depth.

The PDP logs from the site are attached in Appendix C and locations shown on Figure 3 in Appendix Α.

#### 3.4 **Aurecon Investigations**

A geotechnical investigation was carried out across the Falcons Landing site to determine the upper ground conditions and the depth of the underlying gravel layer. The geotechnical investigation comprised the following:

- Twenty six test pit excavations;
- 21 hand auger boreholes.

These are described below.

#### 3.4.1 **Test Pits**

Twenty six test pit investigations were carried out across the Falcons Landing site in areas that were accessible with a 7 tonne, wheeled excavator. The test pits were undertaken by Maugers and supervised by Aurecon geotechnical engineers on the 22 and 23 November 2016. The test pits were extended into the gravel layer underlying the site to a maximum depth of 2.2m.



The test pit logs generally indicate a layer of topsoil (0.2m to 0.5m depth) underlain by light brown silt to sandy-silt extending 0.2 to 1.5m depth. The silt layer is underlain by gravel with minor to some sand. The test pit excavations were terminated in the gravel layer which geological maps indicate extends to several hundreds of meters depth with occasional sand and silt layers. The test locations are shown on Figure 3 in Appendix A and the test pit logs are presented in Appendix D.

#### 3.4.2 Hand Auger Boreholes

Aurecon conducted nine hand auger boreholes (HA1 to HA9) in locations where the excavator was unable to access on 25 November 2016. A further 12 hand auger boreholes (HA101 to 112) were drilled on 9 February 2017 in three additional life style blocks that have been incorporated into the wider development subsequent to November 2016. The hand augers were advanced to the surface of the underlying gravel layer at a maximum of 1.1m depth. The ground conditions encountered in the hand auger boreholes were similar those encountered in the test pit excavations with topsoil overlying silt to sandy-silt before terminating on the gravel layer. The hand auger borehole test locations are shown in Figure 3 and the logs are presented in Appendix D.

#### 3.5 Ground Water

Groundwater has been recorded from the following sources:

- Groundwater was not encountered in any of the Aurecon or PDP geotechnical investigation.
- ECan borehole log M36/0328 located immediately east of the site, indicates a recorded groundwater around 14mbgl.
- The ECan GIS Databases (ECan, 2016) indicates a likely depth to groundwater at the site in the order of 10mbgl.



# **Engineering Considerations**

#### 4.1 General

GW Rolleston Ltd is proposing to subdivide a 60 hectare block of land in Rolleston around Branthwaite Drive, resulting in approximately 600 residential lots to be known as Falcons Landing.

Based on the favourable ground conditions across the Rolleston area for residential development, lack of earthquake induced ground damage, and presence of non-liquefiable soils, following discussions with the geotechnical reviewer for the Selwyn District Council, Mr Ian McCahon, a reduced density of testing, relative to MBIE guidance, has been carried out. The deep ground conditions have been based on the ECan boreholes located on, or near, the site. Considering the favourable and consistent ground conditions the level of testing carried out is considered appropriate to geotechnically categorises the site form at resource consent stage of residential development.

This section of the report presents our interpretation of the ground conditions at the site, details our liquefaction assessment, and presents our geotechnical recommendations for site development.

#### 4.2 **Ground Model**

Based upon the results of the geotechnical site investigations we infer a ground profile presented in Table 2 below.

Table 2 Inferred Ground Model

Unit	Top of Layer	Thickness	Soil Description
1	Surface	0.2m to 0.5m	Topsoil comprising SILT with some sand with minor rootlets.
2*	0.2m to 0.5m	0.2m to 1.5m	SILT to sandy SILT; light brown. Dry to moist, low plasticity.
3	0.2m to 1.5m	*90m +	GRAVEL with minor to some sand; greyish brown. Dry to moist, subrounded to rounded.

Note: \* ECan borehole M36/4680 located on the site indicates that the underlying gravel layer extends to at least 90m depth.

For the purposes of this report we assumed that the ground water table is at least 10m below ground level across the site. It should be noted that water levels may change over time and will be subject to seasonal variation.

#### 4.3 Site Subsoil Classification

We have assessed the site flexibility based on the following:

- Logs indicate underlying ground conditions consist of predominately sands and gravels to a depth of 90m below ground level.
- Forsyth and Barrel (2008) indicate the depth to rock in the Rolleston Area is likely hundreds of metres.
- Table in Clause 3.1.3.2 of NZS 1170.5:2004.

We consider the site subsoil category in terms of NZS 1170.5:2004 Clause 3.1.3.2 is Class D (Deep Soil Site).



#### 4.4 **Liquefaction Assessment**

#### 4.4.1 Introduction

Under cyclic loading loose, non-plastic materials such as gravel, sand and silt tend to decrease in volume. If these soils are saturated and rapid loading occurs under un-drained conditions, the soil densification causes pore water pressure to increase. The increase in pore water pressure results in a loss of soil strength due to a decrease in effective stress, and eventually leads to liquefaction once effective stress drops to near zero. Liquefaction can lead to large displacements of foundations, flow failures of slopes, ground surface settlement, sand boils, and post-earthquake stability failures.

#### 4.4.2 **Liquefaction Assessment**

The three primary factors that contribute to liquefaction potential are:

- High groundwater table.
- Loose, non-plastic soils.
- Sufficiently high, earthquake induced ground acceleration and sustained shaking (i.e. sufficient load cycles).

Each of these is considered below together with conclusions on the site liquefaction potential.

#### Groundwater

Based on our site investigations and accounting for seasonal variation in ground water level, we assumed a groundwater level of 10mbgl. Therefore soils within the upper 10m of the soil profile are not considered liquefiable based on a saturation criterion.

#### **Soil Character and Density**

The geotechnical investigation across the site indicated silt and sandy-silty material in the upper 1.5m underlain by gravelly soils to over 90m depth. Liquefaction potential is assessed as being low based upon a soil grading and density criteria.

#### **Earthquake Intensity**

The level of ground shaking is one of the key factors in determining whether liquefaction will or will not occur. The design earthquakes for Residential developments in Canterbury have been provided in the MBIE Guidelines for Repairing and rebuilding houses affected by the Canterbury earthquake sequence (MBIE, 2012) as:

SLS-a  $M_w7.5 / 0.13g$ 

SLS-b  $M_w6.0 / 0.19g$ 

ULS  $M_w 7.5 / 0.35g$ 

#### 4.4.3 **Liquefaction Potential Assessment**

When comparing the estimated ground shaking at the site during the 4 September 2010 Darfield Earthquake (see Table 1 above) the site has likely gone through ground shaking levels similar to that of a ULS earthquake event with no observed ground damage.

Considering the composition of the underlying soils (non-liquefiable gravels to depths) and the lack of any observed ground damage during the 4 September 2010 Darfield Earthquake (which had levels of shaking similar to that of a ULS design earthquake) we infer that the site has minimal, if any, risk of seismically induced liquefaction. Hence no further liquefaction hazard assessment work is required or has been carried out.



#### 4.5 **Technical Categorisation**

The MBIE guidelines divide flat land into three technical categories that reflect both the liquefaction experience to date and future performance expectations. The categories and corresponding criteria are summarised as follows:

- Technical Category 1 (TC1) Future land damage from liquefaction is unlikely, and ground settlements are expected to be within normally accepted tolerances.
- Technical Category 2 (TC2) Minor to moderate land damage form liquefaction is possible in future large earthquakes.
- Technical Category 3 (TC3) Moderate to significant land damage from liquefaction is possible in future large earthquakes.

As the Bradley and Hughes (2012) ground shaking model does not extend into Rolleston, we have considered the O'Rourke et. al. (2012) PGA model. Based on the MBIE Guidelines (2012) the site has been 'sufficiently tested' as the median value for the PGA for the 4 September 2010 event exceeded 170% of the SLS PGA (i.e. 1.7 x 0.13g = 0.22g). No liquefaction damage was observed on the site after the 4 September 2010 earthquake event.

Based on the underlying ground condition, i.e. gravel from shallow depths and groundwater at depths in the order of 10mbgl, and our liquefaction hazard assessment detailed above we consider the site is consistent with a classification of Technical Category 1 (TC1).

#### 4.6 Recommendations

#### 4.6.1 House Foundations

This section provides generic foundation advice for the wider subdivision development. It does not constitute detailed design of foundations, and additional investigations will be required at the building consent stage for each house to determine the appropriate foundations and to support a building consent application.

The site is considered consistent with a MBIE TC1 classification and therefore it is likely that standard NZ3604 type foundations outlined in NZS3604 'Timber Framed Buildings' and NZS4229 'Concrete Masonry Buildings not requiring Specific Engineering Design' type foundations will be suitable at the site provided that the required shallow bearing capacities are sufficiently high to obtain 'Good Ground' on a lot by lot basis.

Due to the requirement for future earthworks as part of the subdivision development the upper soils are likely to be disturbed as part of the development process. Therefore, the bearing capacity of the upper silt and sandy silt layers will need to be confirmed with shallow, site specific geotechnical testing. This should be done following the completion of bulk earthworks on each lot, prior to or at the building consent stage to confirm the applicability of NZ3604 type foundations and to determine adequate founding depths on a lot by lot basis.

#### 4.6.2 **Civil Engineering Design**

Stormwater disposal, road pavement design, and earthworks associated this the development will need to be addressed by appropriate civil engineering design at the detailed design stage of the project.



#### Assessment Against RMA Section 106 5

Section 106 of the Resource Management Act (RMA) states inter alia

- ... "a consent authority may refuse to grant a subdivision consent, or may grant a subdivision consent subject to conditions, if it considers that:
  - a) the land in respect of which a consent is sought, or any structure on the land, is or is likely to be subject to material damage by erosion, falling debris, subsidence, slippage, or inundation from any source; or
  - b) any subsequent use that is likely to be made of the land is likely to accelerate, worsen, or result in material damage to the land, other land, or structure by erosion, falling debris, subsidence, slippage, or inundation from any source; or
  - c) sufficient provision has not been made for legal and physical access to each allotment to be created by the subdivision."

The site is not susceptible to falling debris or slippage due to the gently sloping topography. No erosion was observed on the site. However the silty soils that directly underlie the site are inferred to be potentially susceptible to erosion by run-off or wind if vegetation cover is removed for prolonged periods of time. The erosion of the silty soils can be minimised by using appropriate industry standard runoff control and dust mitigation measures during construction. The risk of subsidence and inundation from liquefaction is low due to the relatively deep groundwater table and ground conditions encountered. We understand the stormwater discharge is being dealt with in the detailed civil engineering design by others and any potential "inundation" susceptibility due to stormwater is being addressed as part of the detailed subdivision civil engineering design.

The proposed subdivision development therefore generally complies with the intent of Section 106 (a).

Subsequent use of the land following development is unlikely to accelerate, worsen, or result in material damage to the land, other land, or structures. In our opinion therefore, the development will comply with the intent of section 106 (b).

Section 106 (c) is not directly relevant to a geotechnical appraisal and therefore has not been considered in detail in this report.



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Bradley and Hughes, 2012. Conditional Peak Ground Accelerations in the Canterbury Earthquakes for Conventional Liquefaction Assessment. Technical Report for the Ministry of Business, Innovation and Employment, April 2012. 22p.

Forsyth and Barrel (compliers), 2008. Geology of the Christchurch area. Institute of Geological and Nuclear Sciences, 1:25,000 geological map 16. 1 sheet + 87p. Lower Hutt, New Zealand.

ECan, 2013. http://canterburymaps.govt.nz/Viewer/#webmap=0c3ca2ccfe1145c5849dc39864590d0b Accessed 8 November 2016.

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NZS 1170.5:2004: Structural Design Actions Part 5: Earthquake actions – New Zealand, Wellington, New Zealand: Standards New Zealand

NZS3604:2011, Timber framed buildings. Standards New Zealand; Release 2011 – New Zealand, Wellington, New Zealand: Standards New Zealand

NZS4229:2013, 'Concrete Masonry Buildings not requiring Specific Engineering Design' Standards New Zealand; Release 2013 - New Zealand, Wellington, New Zealand: Standards New Zealand

O'Rourke, T.D., Jeon, S.-S., Toprak, S., Cubrinovski, M. and Jung, J.K. (2012). Underground Lifeline System Performance during the Canterbury Earthquake Sequence, Proceedings of the 15th World Congress on Earthquake Engineering (15WCEE), Lisbon, Portugal, 24-28 Sep 2012



#### Limitations 7

We have prepared this report in accordance with the brief as provided. The contents of the report are for the sole use of the Client and no responsibility or liability will be accepted to any third party. Data or opinions contained within the report may not be used in other contexts or for any other purposes without our prior review and agreement.

The recommendations in this report are based on data collected at specific locations and by using appropriate investigation methods with limited site coverage. Only a finite amount of information has been collected to meet the specific financial and technical requirements of the Client's brief and this report does not purport to completely describe all the site characteristics and properties. The nature and continuity of the ground between test locations has been inferred using experience and judgment and it must be appreciated that actual conditions could vary from the assumed model.

Subsurface conditions relevant to construction works should be assessed by contractors who can make their own interpretation of the factual data provided. They should perform any additional tests as necessary for their own purposes.

Subsurface conditions, such as groundwater levels, can change over time. This should be borne in mind, particularly if the report is used after a protracted delay.

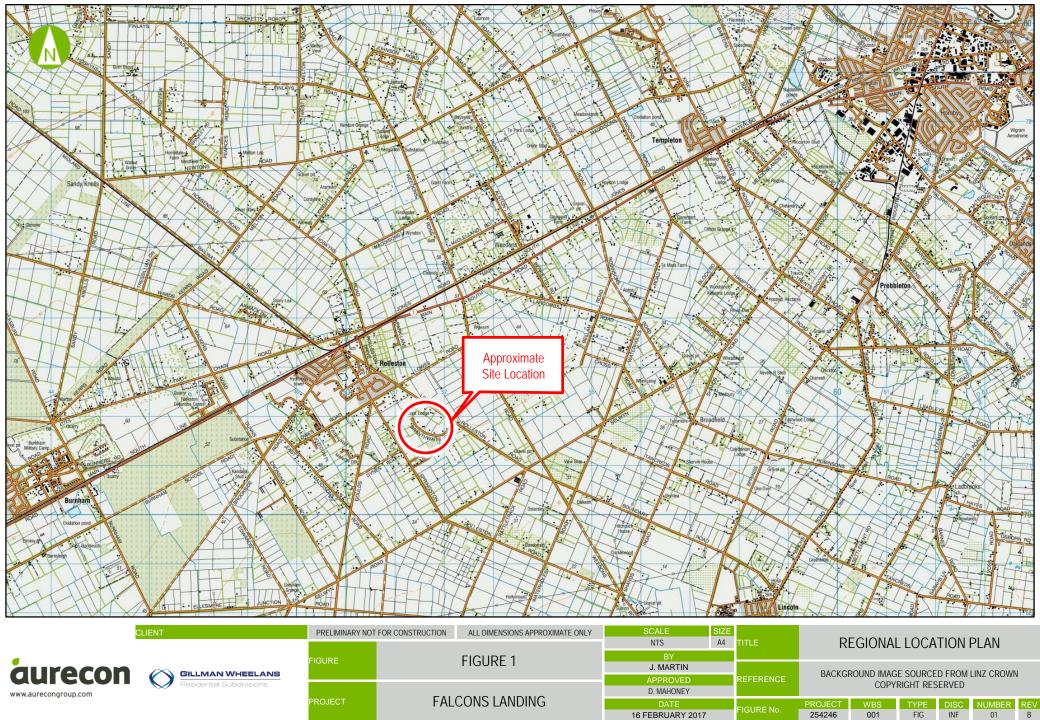
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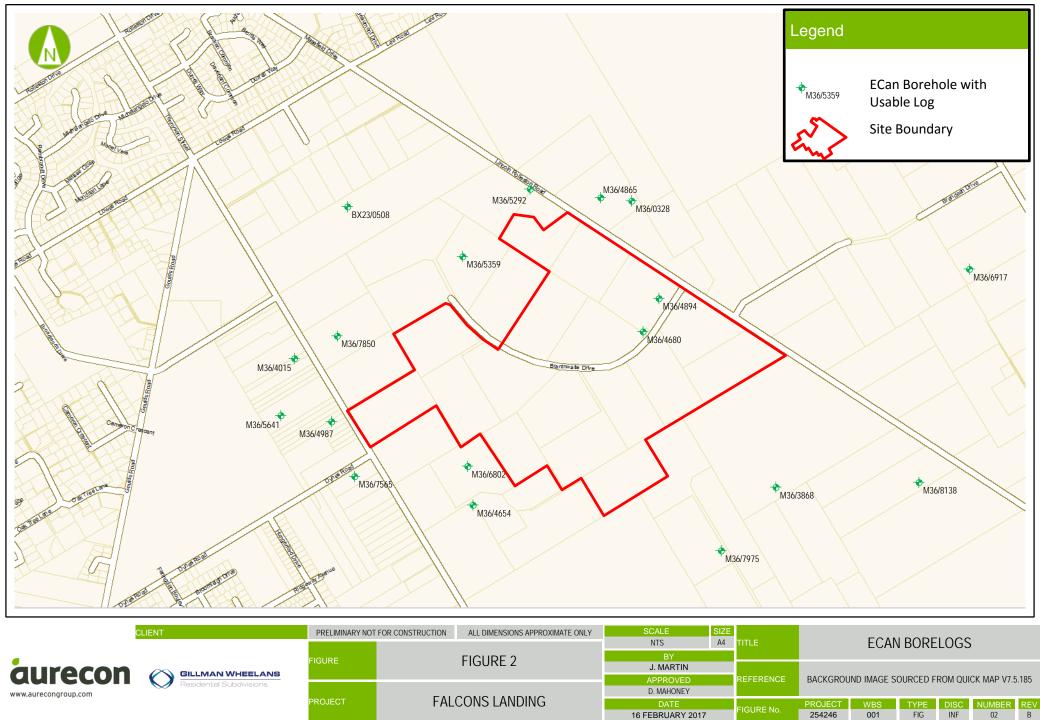


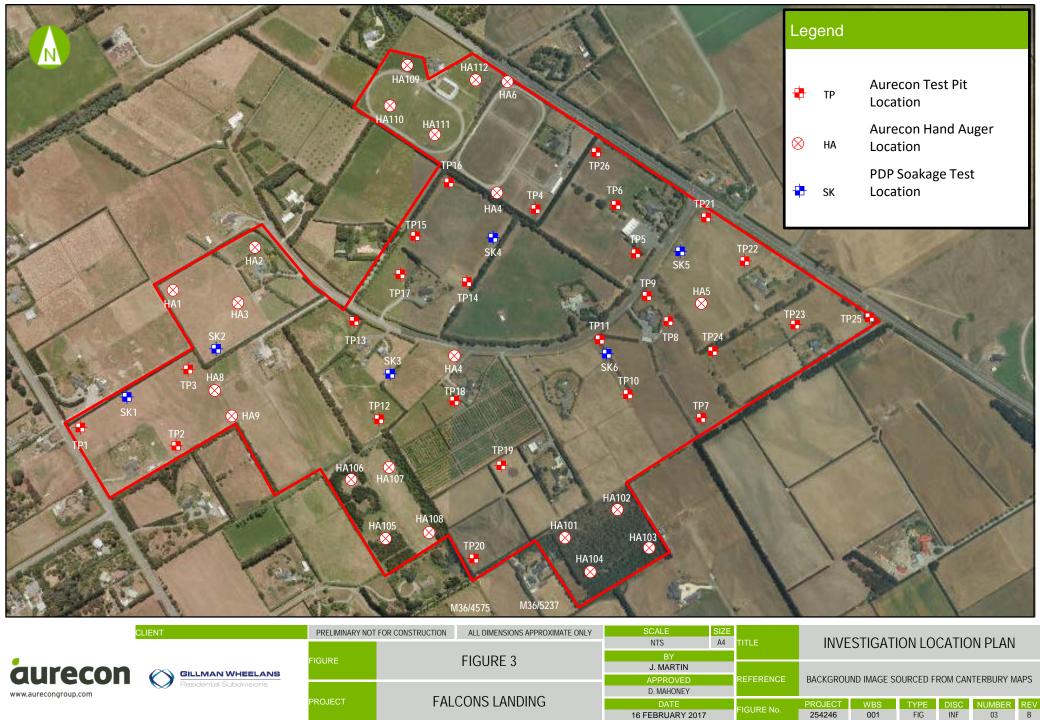
# Appendices



# Appendix A Figures







# Appendix B ECan Borehole Logs

## Borelog for well M36/5359

Grid Reference (NZTM): 1551437 mE, 5171990 mN Location Accuracy: 50 - 300m

Ground Level Altitude: 43.7 m +MSD Accuracy: < 2.5 m

Driller: East Coast Drilling Drill Method: Unknown

Borelog Depth: 34.0 m Drill Date: 19-Dec-1997



	Water				ometion
Scale(m)	Level	Depth(m)		Full Drillers Description	Code
			000000 000000 000000	Topsoil, olay, boulders	SP
5		4.00m _	0:0:0:0: :0:0:0:0:0:0:0:0:0:0:0:0:0:0:0	Sandy gravels, damp	RI
10		10.00m	0:-0::0:: 0:-0::0::0 0:-0:-0::	Sandy claybound gravels	RI
15		16.00m	.0:.0:.0 0:.0:.0:.0 0:.0:.0:.0		
20			0::0::0::0 0::0::0::0 0::0::0::0 0::0::0	Sandy claybound gravels	RI
Н		23.00m	0000000000	Free gravels between 23-24, 25-27	BR?
Н		24.00m	000	Sandy daybound gravels	BR?
25		25.00m _	000000000	Free gravels	BR?
		28.00m	0::0::0::	Sandy daybound gravels	BR?
		29.00m	000000000	Hard stained stones	LI-1
30			000000 000000 000000 000000 000000 00000	Large stained stones	LI-1
- ''		34,00011	,		'

### Borelog for well M36/5292

Grid Reference (NZTM): 1551672 mE, 5172222 mN

Location Accuracy: 2 - 15m

Ground Level Altitude: 44.4 m +MSD Accuracy: < 2.5 m

Driller: Smiths Welldrilling

Drill Method: Rotary Rig Borelog Depth: 52.0 m Drill Date: 15-Sep-1997



	Nater				Formation
Scale(m) L	evel	Depth(m	)	Full Drillers Description	Code
		0.25m	0::0::0::	Soil Sandy gravel	SP SP
Н			0::0::0	•	
			D::0::0::0		
Н		4.50m	100.:0:	Claybound gravel	RI
			000000	Gayodono giavei	n n
П			000000		
Ц			000000		
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- 1			000000		
- 1		14.00m	0.0.0	Claybound sandy gravel	RI
			00.	objective sality glaves	K.
- 4			.000		
			0::0::0::		
- 1			0::0::0		
21			<del></del>		
- T		22.00m	00		
Ц			0:0:0::	Sandy gravel	BR?
			:0::0::0		
Н		25.00m	3:25:65:6	Claybound gravel	LI
			200000		
П			000000		
Н			000000		
			000000		
31		32.00m	000000		
			0::0::0::	Sandy gravel	LI
П			:0::0::0		
		35.00m	B::2::3::1	Claybound sandy graval	LI
			<u> </u>		-
H			000		
			0::0::0::		
			0:0:0		
42			<u></u>		
П			<u> </u>		
Н			.0.00		
			0::0::0::		
Н			:0::0::0		
Ц		48.00m	0.00.		
П			0::0::0::	Free sandy gravel	LI
Н			1:0::0::0		
		50.00-	lb::0::0::d		
1.1		52.00m	III-U. V. V. I		I

#### Borelog for well M36/4885

Grid Reference (NZTM): 1540833 mE, 5159272 mN Location Accuracy: 10 - 50m Ground Level Altitude: 38.2 m +MSD Accuracy: < 2.5 m

Driller: Smiths Welldrilling Drill Method: Rotary/Percussion

Borelog Depth: 70.0 m Drill Date: 02-Dec-1996



	Water				Formation
Scale(m)	Level	Depth(m)		Full Drillers Description	Code
		0.30m 1.60m	2222	TOPSOIL. Yellow CLAY.	
Н		1.00	0::0::0	Blue sandy GRAVEL (2 - 50 MM).	
			0.00		
			5		
П					
			0.0.		
Н			0::0::0:		
			10:00:10		
Н			0.00		
		13.00m	4.9.9		
14			$\circ$ : $\circ$ : $\circ$	Brown sandy GRAVEL (2 - 60 MM).	
		16.00m	0::0::		
		10.0011	0.00	sandy GRAVEL (2 - 60 MM)	
			EO: :O:		
			bo.:o		
			$\cdot \circ \cdot \circ \cdot :$		
			···O···O·		
			20.00		
			00		
28			0::0::0		
			1:0::0:		
Ц			0.50		
		24.00-	.00.		
П		34.00m 35.00m	1	Grey CLAY.	
		36.00m	0=0=0	Brown clayey GRAVEL (2 - 60 MM).	
П			0::0::0::	clayey, sandy GRAVEL (2 - 60 MM).	
Н			.0.0.0		
			0.0.0.		
42					
			000		
			<u>~~~~~</u>		
			<u> </u>		
			000		
			0:0::0:		
			00.0		
			000		
			21-1121		
			000		
			0::0::0		
56					
		58.00m	0::0::0::		
Н			0::0::0	sandy GRAVEL (2 - 60 MM).	
			.0		
Ц			50.000		
			7.0.0		
		64.00m	10:0::		
П		64.50m	0::6::6	olayay GRAVEL (2 - 60 MM). Other colour sandy GRAVEL (2 - 60	
			· · · · · · · ·	MM).	
Н		- 1			
			$\mathbb{R}^{2} \cap \mathbb{R}^{2}$		
11		70.00m	11.4.).+C/		I

#### Borelog for well M36/0328

Grid Reference (NZTM): 1552007 mE, 5172190 mN Location Accuracy: 50 - 300m

Ground Level Altitude: 42.6 m +MSD Accuracy: < 0.5 m Driller: McMillan Drilling Ltd

Drill Method: Cable Tool Borelog Depth: 28.6 m Drill Date: 20-Aug-1980



Scale(m)	Water	Depth(m)		Full Drillers Description	Formation Code
			2223	Earth and clay	SP
Ш		1.20m			
П		1.20m	000000	Earth and clay	SP
Н				Claybound gravel	SP-RI
			000000		
Н			000000		
П			000000		
5			000000		
			000000		
			000000		
- 1					
			000000		
			000000		
			000000		
10			000000		
			000000		
П					
Ц			000000		
			000000		
Η ,	13.48				
	A	14.00m	000000		
П	$\nabla$	14.00m	0:0::0::	Claybound gravel	SP-RI
15 _ 1	14.34		0:0:0:	Rough sandy gravel	RI
			D::0::0::d		
- 1			0:0:0:		
			V. O O C		
			0.000		
- 4					
			A		
			0.0.0.0		
20			0.000		
П			p. 0 v. t		
Н			[:O::O:]		
			):.0::0::d		
Н			0::0::0::		
			:0::0::0		
П		23.50m	0::0::0::0		
Н		23.50m	0::0::0::	Rough sandy gravel Sandy claybound gravel	RI BR?
_		24.70m	.00.0		
25		24.70m	0::0::0::	Sandy daybound gravel Sandy daybound gravel less day.	BR? BR?
			.00.0	more sand	Dr.:
		06.75	3		
		26.79m 26.79m	8:8:8:	Sandy claybound gravel, less clay.	BR?
		Г	1.0.00	more sand	
		I	b. a. d. d	Free gravel and sand	BR?
		28.60m	D. 17. 10 1.10		1

#### Borelog for well M36/4894

Grid Reference (NZTM): 1552087 mE, 5171830 mN Location Accuracy: 50 - 300m Ground Level Altitude: 40.5 m +MSD Accuracy: < 2.5 m

Driller: Smiths Welldrilling

Drill Method: Rotary Rig Borelog Depth: 34.0 m Drill Date: 16-Mar-1995



	Water				Formation
Scale(m)	Level	Depth(m)		Full Drillers Description	Code
- 11		0.30m 0.60m		Sol	SP? SP?
Н		0.60m	0::0::0::	Glay Sandy gravel	SP?
- 11				sandy graver	arr
Н					
- 11			D::0::0::0		
Н			.000.		
- 11					
Н			p::0::0::q		
5		5.00m	100.:0::		
- H			000000	Claybound gravel	RI
			000000		
			000000		
			20000		
			000000		
			000000		
-					
			000000		
10					
			000000		
Н					
			000000		
Н			200000		
			000000		
Н			000000		
Ш			000000		
П			000000		
15			000000		
			000000		
			000000		
			000000		
- 4					
			000000		
			000000		
			2020		
20		20.00m	000000		
			0.0.0.	Claybound sandy gravel	RI-BR
Ш			<u> </u>		
П			00.0		
Ш			.0.0		
П			0.0000		
Ц					
			1.0.0.0		
Н					
			000		
25					
			00		
-			<u></u>		
			00.0.		
			· 0 · · 0		
			.0.0.0		
			0.0.0		
			<u> </u>		
			000		
30		30.00m			
П			0::0::0::	Free sandy gravel	LI-1
Ц			0.00		
Н			D::0::0::0		
			1.000.		
Н			[[		
		24.00-	lb:::O:::O:::a		
11		34.00m			I

#### Borelog for well M36/4680

Grid Reference (NZTM): 1552060 mE, 5171738 mN Location Accuracy: 1 - 2m Ground Level Altitude: 40.3 m +MSD Accuracy: < 2.5 m

Driller: McMillan Drilling Ltd Drill Method: Rotary/Percussion

Borelog Depth: 90.0 m Drill Date: 11-Mar-1994



Scale(m) Leve	er al Depth(m	0	Full Drillers Description	Formation Code
П	0.30m	000000000	Earth	SP?
- 11	1.50m	00.,0	- Grey gravels	SP?
Н		J	Sandy gravels	SP?
			•	
	6.50m	D O O d		
Н		0.0.0.	Sandy olaybound gravels	RI-BR
		<u> </u>		
		.00.0		
Н		.0.00		
		0.0.0.		
		00		
П		.00		
- 11		1.0.0.0		
18		0.00.		
		00		
		.00		
		1.0.0.0		
		0.0.0.		
		00.0.		
-				
		.0.0.0		
		0.0		
П		00.0.		
		.0.0.0		
	33.29m	87 - 1187		
		0:.0::0::	Very sandy free gravels	LI
36				
	00.00	.000		
П	38.20m	2: 2: 2:	One de conseile	
Н		0.0.0.	Sandy gravels	LI
- 11		0.00		
11				
Н		D:::O:::O:::0		
- 11		.000.		
- 11				
Н		000		
- 11		000		
Ш		.00		
П		P:: 0:::0:::0		
П		A:		
54		D::O::O::		
		0::0::0:		
	56.50m	. 0		
-	57.00m	000	Grey clay	LI
	57.20m	000000000	Brown sand	LI
	58.40m	000000000	Sandy gravels	LI
-		DOOOOOOOO	Free stain gravels	LI
	63.50m	000000000		
		000000	Claybound gravels	LI
		000000		
		200200		
		000000		
		000000		
	71.19m	000000		
72		000	Sandy free gravels	LI
- 11		······		
- 11		0.000		
Н		5		
1.1		h		
11		1.0.101101		
Ц	80.90m	D:::O:::O:::C		
H		DODDODDOD	Brown clay	BU
	\$1.50m	000000000	Free stein gravels	BU
	81.50m	0.0000000000		
	81.50m			
	81.50m			
		000000000	•	
	81.50m 87.50m	000000000	Sandy free gravels	BU

#### Borelog for well M36/6917

Grid Reference (NZTM): 1553217 mE, 5171820 mN Location Accuracy: 10 - 50m Ground Level Altitude: 38.1 m +MSD Accuracy: < 0.5 m

Driller: Smiths Welldrilling Drill Method: Rotary Rig

Borelog Depth: 45.0 m Drill Date: 18-May-2001



	Water				Formation
Scale(m)	Level	Depth(m)		Full Drillers Description	Code
Ш		0.20m	000000	Soil	SP
П		0.20m		Soil Claybound gravels	SP-RI
Н			000000	Claybound graves	SF-RI
Ш					
П			000000		
Н					
5			000000		
			20-50-		
			000000		
			200		
			000000		
			000000		
			000000		
10			000000		
П			000000		
Н			000000		
Н			00000		
ll ll			000000		
П					
Н			000000		
15					
			000000		
H					
			000000		
		18.00m	~~~~		
		18.00m	0.0.0.	Claybound gravels	SP-RI
			<u> </u>	Claybound sandy gravels	RI
20			000		
П			.0.0.0		
Н			000		
Ц			<u> </u>		
ll ll			.000		
Н			<del></del>		
Н			000		
25		25.00m			
		25.00m	0::0::0::	Claybound sandy gravels	RI
Н .				Sandy gravels	BR?
			D::0::0::0		
			.000.		
30			D::0::0::0		
□			00.:0::		
Н					
Ш		32.00m	7.0.0.0		
П		32.00m	0::0::0::	Sandy gravels	BR?
Н			.00.	Sandy gravels	LI-1
Н					
35			D:::O:::0		
			10:50:10:		
			J. O. O. O.		
			10::0::0::		
H			1		
40		40.00m	0::0::0::		
·· 🖪		40.00m	000000	_ Sandy gravels	LI-1
Н		41.00m -	200000	Claybound gravels	LI-1
Ш		41.00m	U	Claybound gravels	LI-1
П			:0::0::0:	Free stained sandy gravels	LI-1
Н			B		
Ц		П	F. O. O. O.		
		45.00m	1.00.:0.		
_					•

#### Borelog for well M36/8138

Grid Reference (NZTM): 1552947 mE, 5171201 mN Location Accuracy: 10 - 50m Ground Level Altitude: 35.3 m +MSD Accuracy: < 0.5 m

Driller: Daly Water Wells Ltd Drill Method: Rotary Rig

Borelog Depth: 36.0 m Drill Date: 16-Jan-2006



Scale(m)	Water Level	Depth(m)		Full Drillers Description	Formation Code
		0.30m	000000	brown topsoil	
Н		0.30m	000000	yellow daybound gravels	
Н			000000		
Н			000000		
Н			000000		
5			000000		
H			000000		
Н			000000		
н			000000		
- 1			000000		
10			000000		
Н			000000		
Н			000000		
Н			000000		
15			000000		
"			000000		
			000000		
			000000		
			000000		
20			000000		
Ц			000000		
Ц			000000		
Ц			500000		
Ц		24.00m	000000		
25		24.00m	000000	yellow daybound gravels brownish/yellow day some gravels	
			000000		
			000000		
			000000		
H			000000		
30		30.00m 30.00m		brownish/yellow day some gravels	
Н		30.00	000000000	brown free water-bearing gravels	
Н			000000000 000000000 000000000 00000000		
Н			0000000000		
Н		34.00m 34.00m	0000000000	brown free water-bearing gravels	
35			:0::0::0:	brown stained free sandy gravels	
		36.00m	REAL AND		

#### Borelog for well M36/3868

Grid Reference (NZTM): 1552494 mE, 5171203 mN Location Accuracy: 10 - 50m Ground Level Altitude: 38.4 m +MSD Accuracy: < 2.5 m

Driller: McMillan Drilling Ltd Drill Method: Rotary/Percussion

Borelog Depth: 36.8 m Drill Date: 18-Jan-1988



Scale(m)	Water Level	Depth(m)	Full Drillers Description	Formation Code
		0.30m 000000000	Earth	SP
Н		1.80m DD0000000	Grey gravels	SP
10			Sand and gravels with some day	SP-RI
20		0:0:0:0:0 :0:0:0:0 0:0:0:0:0 :0:0:0:0 :0:0:0:0 :0:0:0:0	Free gravels and sand	RILLI
25		0::0::0::0 0::0::0::0 0::0::0::0 0::0::0		
35		.0000 0000 0000 0000 0000		

#### Borelog for well M36/7975

Grid Reference (NZTM): 1552317 mE, 5171001 mN Location Accuracy: 50 - 300m Ground Level Altitude: 37.7 m +MSD Accuracy: < 2.5 m

Driller: Dynes Road Drilling Drill Method: Cable Tool

Borelog Depth: 37.5 m Drill Date: 05-Sep-2005



	Water				ormation
Scale(m)	Level	Depth(m)		Full Drillers Description	Code
		0.70m		brawn topsoil	
Н			0==0==0==	small-med gravel some slit	
Ш			==0==0==0		
П			000		
Н			000		
			F= 0 == 0		
П			0==0==0==		
5			20000		
			0==0==0==		
			00		
			=0=0=0		
			0==0==0==		
			== O == O == O		
			0.000		
40			000		
10			E 0 == 0 == 0		
Ц			0==0==0		
		12.00m	O == O == O		
Н		12.0011	000000000000	small rounded gravel	
Ц			0000000000000	•	
			2000000000000		
Н			20000000000000		
15			200000000000000		
			DODDODOGGDDD1		
			000000000000000000000000000000000000000		
			000000000000		
			000000000000000000000000000000000000000		
			000000000000000000000000000000000000000		
		19.00m	000000000000		
			000000000	small-med subrounded gravel	
20			000000000		
Ц			000000000		
			10000000000		
Н			1000000000		
Ш			000000000		
			000000000		
Н			000000000		
25		25.00m	000000000		
		26.00m		solid yellow sit water sealing	
		20.00111	000000000	small-med rounded gravel - some	
			000000000	steined	
		28.00m	000000000		
		28.50m	000	some sand with gravel	
- 4			00000000	small rounded stained gravel	
30		30.00m			
- T		-	000000000	loose rounded med gravel	
Н			000000000		
			0000000000		
П			000000000		
Н			100000000000		
		34.00m	1000000000		
П			000000000	34m hit a tree 0.2m thick	
35		35,00m	DO O O O O O O O O O O O O O O O O O O	conne crevel	
		I	000000000	orange gravel	
		36.80m	000000000		
-		37.50m	000000000	black stained gravel	
_		31.50m		-	'

## Borelog for well M36/6802

Grid Reference (NZTM): 1551451 mE, 5171282 mN

Location Accuracy: 2 - 15m Ground Level Altitude: 41.1 m +MSD Accuracy: < 2.5 m

Driller: Dynes Road Drilling Drill Method: Cable Tool

Borelog Depth: 37.7 m Drill Date: 01-Sep-1994



Scale(m)	Water Level	Depth(m)		Full Drillers Description	Formation Code
		4.00m	0:0:0:0: :0:0:0:0 0:0:0:0	Small medium gravel sandy	SP-RI
10				Very tight small silt bound sand	RI
		11.00m		Small clean gravel some water	RI
15		15.10m	8::8::8::	Small medium gravel silt bound. sealed off water	RI
20		21.20m	:0::0::0 :0::0::0 :0::0::0 :0::0::0 :0::0::0	Small medium gravel sandy, water returned	RI
		24.10m	0.0.0.0.0.0 0.0.0.0.0 0.0.0.0.0	Easy driving small gravel sandy water keeps up with sand pumps	RI
25		25.20m	0: 0: 0: :0: 0 : 0 0: 0: 0: 0 :0: 0: 0	Orange silt layer  Small medium gravel washed small amount sand	BR LI-1
30		31.40m	0:0:0:0:0 0:0:0:0:0 0:0:0:0	Small medium gravel sandy silt very tight pulled back to 36.5 set clean	LI-1
35		37.70m	.0:0:0 0:0:0 :0:0:0		

#### Borelog for well M36/4654

Grid Reference (NZTM): 1551472 mE, 5171149 mN Location Accuracy: 2 - 15m Ground Level Altitude: 40.3 m +MSD Accuracy: < 2.5 m

Driller: Dynes Road Drilling

Drill Method: Rotary/Percussion Borelog Depth: 46.2 m Drill Date: 01-Sep-1993



	Water	Donathini		5 # Billion Brandston	Formation
Scale(m)	Level	Depth(m)		Full Drillers Description Small medium gravel traces clay	Code SP-RI
5			000000 000000 000000		
10		8.00m _	0:0:0:0: :0:0:0:0:0:0:0:0:0:0:0:0:0:0:0	Small medium gravel, sands	RI
Н		14.00m	N:0::0:	Very tight send and day sealed off	RI
15		15.40m	0: 0::0:: :0::0::0::0	water Small medium gravel sandy water back	RI
20		25.00	0:0:0:0 0:0:0:0 0:0:0:0		
25		25.00m	2	Layer of orange sit	BR
		26.50m .	00000000	Small medium gravel Brown stain	BR
30			:0:0:0 :0:0:0:0 :0:0:0:0	Small medium gravel very sandy	LI
35					
45		41.00m 41.50m	0::0::0::0 0::0::0::0::0 ::0::0::0::0 ::0::0	Layer of small gravel daybound very tight Medium small gravel well washed amail amount sand	LI
		46.20m	PV V V.		

#### Borelog for well M36/7565

Grid Reference (NZTM): 1551067 mE, 5171240 mN Location Accuracy: 50 - 300m Ground Level Allitude: 42.2 m +MSD Accuracy: < 0.5 m

Driller: Dynes Road Drilling Drill Method: Cable Tool

Borelog Depth: 35.0 m Drill Date: 01-Jan-2004



Scale(m) Level Depth(m) Full Drillers Description  Small medium gravel, sandy	Code SP
0.0.0.0.0	185
2.00m 0 0 0 0	
2.00m Small medium gravel, sandy	SP SP
Small medium gravel, traces ye	ollow silt. RI?
0=0=0=0== ==0==0==0	
6.80m O O Small medium gravel, traces ye Small medium gravels sandy	ellow silt RI?
	F**
0::0::0::0 :0::0::0::0 :2:40m 0::0::0	
12.40m O Small medium gravels sandy	RI
Small medium gravel, sandy	RI
15	
21.20m O O Small medium gravel, sandy	RI
Small medium gravels. sandy. v	water RI-BR
0::0::0 0::0::0 0::0::0 0::0::0	
30 D. O. O. C O. O. O. O. 32.00m J. O. O.	
32.00m Small medium gravels, sandy, v Small gravels less sand 0.0.0.0.0.0 Small gravels less sand 0.0.0.0.0.0 35.00m 0.0.0.0	water RI-BR

#### Borelog for well M36/4987

Grid Reference (NZTM): 1550987 mE, 5171440 mN Location Accuracy: 50 - 300m Ground Level Altitude: 43.5 m +MSD Accuracy: < 2.5 m

Driller: Dynes Road Drilling Drill Method: Cable Tool

Borelog Depth: 26.0 m Drill Date: 01-Jun-1995



0	ale(m)	Water Level	Depth(m)		Full Drillers Description	Formation Code
500	alea(m)	Level	Depth(m)	000000	Med large gravel	ISP?
			2.00m	000000		
5			5.40m	000000000 000000000 000000000 00000000	Small medium gravel sit bound	RI
10				000000000 000000000 000000000 00000000	Small gravel sit bound very tight	RI
15			12.00m	000000000 000000000 000000000 00000000	Small gravel wet allt driving eased up	Ri
25			26.00m		Casing driving easy small gravel olean Brown stain	RI

#### Borelog for well M36/5641

Grid Reference (NZTM): 1550817 mE, 5171460 mN Location Accuracy: 10 - 50m Ground Level Altitude: 44.0 m +MSD Accuracy: < 0.5 m

Driller: East Coast Drilling

Drill Method: Rotary Rig Borelog Depth: 36.0 m Drill Date: 29-May-1998



Scale(m)	Water	Depth(m	a	Full Drillers Description	Formation Code
Scale(m)	Level	0.30m		Topsoil	ISP
Ш		0.30m	000000000	Topsol	SP
			000000000 000000000 000000000 00000000	Grey gravels	RI
5		6.00m 6.00m	000000	Grey gravels Claybound gravel	RI RI
10		12.00m	000000 000000 000000		
15		12.00m	000000	Claybound gravel Claybound gravel	RI RI
		18.00m 18.00m	000000	Claybound gravel Claybound gravel	RI RI
20			000000 000000 000000	oloyadana gravel	
25		24.00m 24.00m	000000 000000 000000	Claybound gravel Claybound gravel	RI RI
30		30.00m 30.00m	0000000	Claybound gravel Free round gravels	RI LI-1
35		36.00m	000000000 000000000000000000000000000		

# Click here for a printable BoreLog. Borelog for well N364916 Oid Subsection Accuracy 34 - 2000 p. 2015 1940 mill Liceton Accuracy 34 - 2000 p. 20 Long govern Medical controls . Medican repelled days 35658888 350000 Ballonyorck ю Mark traggered a local course 10.00m Small grand 11 3000 11.00m Bendi promised sky Medical participation (and stage 000000 0000000 000000 000000 Small to made in them are tree are altace or more going some same some a filter make 11000 Break powers and reach same and way, with the ### 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 10 Stand arrest room stan-Modern and and moral Ners, and a community and dismate solid blanch. Simply which are not at members are not only 2000.

#### Click here for a printable BoreLog

#### Borelog for well M36/7850

Grid Reference (NZTM): 1550977 mE, 5171720 mN

Location Accuracy: 50 - 300m

Ground Level Altitude: 44.7 m +MSD Accuracy; < 2.5 m.

Water

Driller: Smiths Welldrilling
Drill Method: Rotary Rig
Borelog Depth: 42.0 m | Drill Date: 22-Apr-2005



Formation

Scale(m)	Level	Depth(m)			Code
		0.50m .	500000	Soil	
Н			000000	daybound gravels	
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30			$[\cdot \circ \cdot \circ \cdot \circ \circ ]$		
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35			[.·Q::0::0]		
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40		_	λ:0::o::d		
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Ш		42,00m	Ne of total		

Borelog for well BX23/0508
Grid Reference (NZTM): 1551041 mE, 5172151 mN
Location Accuracy: 10 - 50m
Ground Level Athlude: m +NSD Accuracy:
Uniter: McMillian Drilling Ltd
Drill Dale: 02-May-2016

Stanking   Lawel   Destribe)	Code
5	
5	
2 0:0:0  5 0:0:0  6 0:0:0:0  7 0:0:0  8 0:0:0  7 0:0:0  8 0:0:0  9 0:0:0  10 0:0:0  10 0:0:0  11 0:0:0  11 0:0:0  12 0:0:0  14 0:0:0  15 0:0:0  16 0:0:0  17 0:0:0  18 0:0:0  18 0:0:0  19 0:0:0  10	
5 8.00m 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	
8 8.00m   Not Logged daywy GRAVEL (2-80 MM), Ped Recorded.	
8 8.00m	
Net Logged daywy GRAVEL (2 - 80   MV), Red. Reconstret.	
8 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	
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222151 0=0=0	
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43 Not Logged sondy GRAVEL 12 - 60	
64 (*O. O. O. O. MM) with minor clay. Not Recorded.	
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* 01,0701010	
6,0,0,0,0	
** ***********************************	
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50.00m   D. O. O. O. O.	
Not Logged sandy OffAVEL (2 - 60	
MM). Saturated (water-bearing).	
l ® B∵o∷o	
50 64 EDW (O. O	
[ Not Logged CHAVEL (2 - 50 km/).	
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<b>1</b> № 1000000d	
by San Clay He Bearing	
KO 50.50W	
Not Logged dayey @RAVEL (2 : 00	
50 E G E G E G E G E G E G E G E G E G E	
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6	54	04.000	000	Not Logged sandy GRAVEL (2 - 60
9	II		0.:0:	MM). Subrated (water-bearing).
	55		0::0::0	
	67		0:0::	
	50		): O: :O:	
	59		:O:-O::4	
9	8		1:0::0:	
	71		0::0::0	
	72		:0::0:	
	78	79.00m	8-8-9	Net Languard search RRAVEL D 60
	74		0.00	Not Logged sandy GPANEL, (2 - 93 MM), Saturated (Aster-bearing).
5	Н		33.00	
	76		0.10	
	77			
	78		0.00	
	79		10:00:01	
ŋ	4		0:00:0	
	81		00.00	
	82		b: 6: d	
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	88	88.00m	10:0:	
			000000	Not Logged CMAVEL (2 - 80 MM) Saturated (water-bearing).
0	1	80.00m	D00000	
	91		o:o:d	Not Logged sandy ORANEL (2 - 60 MM). Saturated (Aster-bearing).
	92		:·O::O::	
	93		$\mathbf{p}_{::O}$	
	94		[.00]	
5	[] <sup></sup>		D:::O:::O:	
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	89	100.00w	D. O. d	
00	1	100.000	0.0.0	Not Lagged eardy GRAVEL (2 - 60
	101		:0::0::	MM). Saturated (water-bearing).
	102		D: 0: 0	
	103		·O: O::	
	104		b::0::0:	
05	ii .	109.00m	6.5.5	Not Logged sandy GRAVEL (2 - 60
	106			MM). Seturated (water-bearing)
	107		0::0::0	
	100		0.0.	
	109		): :O: :O:	
10			0.0.0	
	111		1:0::0:	
	112		0:0:0	
	113		:0::0:	
	114		p:::o:::q	
15	H		0::0::	
	116		D:-0::0	
	117		0::0::0	
	118		:0::0::	
	118		P:∙O::O	
20	Ц		[o] : o::	
	121		::O::O·	
	122		[o:o::q]	
	123		o	
	124		0::0::d	
25			NO: 10:1	
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			50.0	
	131		0.0	
	182		K.OO.	
	133		N. O. 3	
	134		oo	
86	ii .		o: $o$ : $c$	
	135		1:0::0:	
	187		h::0::d	
	138	138.00m		Not Lagged Sity GRAVEL (2 - 60 MM)
	139		0==0==0	with some sand., Saturated
40	H .		0=0=0	(water-bearing).
	141			
	11		0=0=0=0	
	142			

		143.00m_ <u>i.e.</u>			
	148		0.0.0	Not Logged sandy GRAVEL (2 - 90	
	144	ő		MM) Saturated (water-bearing).	
146	ii .	1.3	0.000		
	145	15	0.0.0.0		
	147	ó.	0.00.000		
	140	100	0.00.00		
	149	130	0.0.0		
160		2:	0.0.0.0		
	151	Ď,	0.0.0.0		
	152	20	0.0.0.0		
		6.	0.0.0.0		
	153	ģ	0.0.0		
	154	53	0.00.00		
155	H	F. 6	2.0.0.0.0		
	199	P.	0.0.00		
	157	6	0.00		
	168	-70	0.0.0		
	159	2.7	0,70,0,0		
160		p)	0.0.00		
		139	0.0000		
	161	157	0.0.0		
	162	Ö	0.0.00		
	163	53	0.0.0.0		
	164	F. 0	0.0.0.		
165	H	P.	0.0.0.0		
	100	ģ	0.0.00		
	157	103	2,000,000		
	168	R.			
	150	P.	0.0.0.0		
170		170.00m O	0.0.0.0		
	Π	170 50m	***	Light brown CLAY Not Recorded	
	171	ļ-	2.0	Not Logged sandy ORAVEL (2 - 60 MW). Saturated (vater-bearing).	
	172	E	0::0:		
	173	15	:01:0		
	174	[7	J.: 0		
175	Ш	b:	3009		
	176	21	2:-0::4		
	177	177.00m D	<u>:0::01</u>		
	170	177.50m		Dark brown CLAY, Not Recorded Not Logged sandy CRAYCL (2 - 60	
	179	178 00m	A	MM). Not Recorded.	
100		10	7: O: 10	Not Logged sandy GRAVEL (2 - 60	
	П	lli a	o::o::	MM), Saturated (Aster-bearing).	
	181	16	: 0::0		
	192		0::0::		
	183	lb:	00		
	184	lli č	2:0::0		
185	н	5-	·01:01		
	106	اخ ال			
	187	197.00m			
	100	187.60m	0.:0	Orey CLAY, Not Recorded. Not Logged sandy CRAYCL (2 - 60	
	189		o : : : : : :	MM). Saturated (Autor-bearing).	
190		13	$\sim \sim \sim \sim 10$		
	Ī ,	K	5.55.51		
	191	t.	:A: Y:		
	192	1	2.0.0		
	193	F:			
	194	194.00m V		Yellow CLAY, Not Recorded.	
195	H	Ď.	0,0000	Not Lagged sandy GRAVEL (2 - 60	
	199	ő	0.0000	MM), Well sorted. Suturated (water-bearing).	
	197	3	0,0,0,0		
	198	198.00m P	0,0,0,0		
	122	15	2 2 2 2	Gray CLAY, Not Resorded.	
200	l ''''	200 00v			
	Π	10	0::0::	Not Logged sandy GRAVEL (2 - 90	
	201	202 00m	0::0::	MV), Unsaturated (dry or molat).	
1	202	202 001	-2-2-3	Brown CLAY, Not Recorded.	
		203 50m			
	203	204.00m	6::6	Not Logged sandy GRAVEL (2 - 60	
	203	100	2.9.9	MM). Not Recorded.	
206		C	A	Not Logged sandy GRAVEL (2 - 60	
206			0::0::	MV). Saturated (water-bearing).	
206	204	P.	00	MV). Saturated (water-bearing).	
206	204	0.50	0.:0 0.:0	net Logged landy celevist, pt - od MM). Balumbart (malar-baserry).	
206	204 205 207 208	000 000 PG	00	MM). Salurakari (wata-t-zaarreg).	
	204	200 0000	00	MM). Solumbed (mile-beamsg).  Net Looper CLAY Net Georgia:	
206	204 205 207 208 209	209 200 209 200 210 200 210 200 - 2		MM). Selected brain-bearing).  Not Logges CLAY. Not Recorded.  Not Logges CRAY. Set Seconded.  Not Logges CRAY. Set Seconded.	
	204 205 207 208	209 20m 209 20m 209 20m 210 20m	00	MW). Subuniad brain-bearing).  Not Logged CLAY. Not Recorder.  Not Logged CRAVE (2 * 65 MM).	

# Appendix C PDP Investigation Logs

PATTLE DELAMORE PARTNERS LTD	Log of Test Pit Branthwaite Drive Subdivision  PIT NO. TP1  JOB NO: C03533							
CLIENT: Gillman Wheelans		LOCAT	10N: 560 Sp	oringston	Rolleston Road	·		
DATE: 22/11/2016	DATE BACKFILLED: 22/11/2016	LOGGE	ED BY: Nick	van Voort	SHE	SHEET 1 OF 1		
	DESCRIPTION OF SOIL		GRAPHIC LOG	DEРТН (m)	SAMPLE DETAILS	TESTS	WATER OBSERVATIONS	
SILTY topsoil, dark brown, home	ogenous, soft, dry			0.0 - — 0.2			Groundwater Not Encountered	
Silty medium to coarse GRAVEL packed, soft, dry; silt, fine.	, light brown, homogeneous. Loosely			- 0.4 - 0.6 - 0.8				
	EL with some cobbles; dark grey, ked; moist; well graded; sub-angular to coarse; minor silt.		\$\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\	- 2.4 - 2.6 - 2.8 - 3.0 - 3.2				
End of Test Pit at 3.44 m bgl								
Notes:			Seepag Grab sa	water level ge inflow ample ading (ppm)	Method: CRS: Coordinat	Excavator EPSG:219 des: 1551157 5171713	3, NZTM	

Solutions for your environment  PATTLE DELAMORE PARTNERS LTD		Log of Test Pit prit No. TP2 Anthwaite Drive Subdivision PIT No. C0353330							
CLIENT: Gillman Wheelans			10N: 87 Bra		Orive	1			
DATE: 21/11/2016	DATE BACKFILLED: 21/11/2016 L	.OGGE	ED BY: Emily	Barton (F	PDP)	SHE	ET 1 0F 1		
	DESCRIPTION OF SOIL		GRAPHIC LOG	DЕРТН (m)	SAMPLE DETAILS	TESTS	WATER OBSERVATIONS		
SILTY topsoil, dark brown, home	ogenous, soft, dry			0.0			Groundwater Not		
SILT, light grey, homogenous. S	Soft, dry.		********** ******** ******** ********	— 0.2 - — 0.4 -			Encountered		
Silty SAND, light greyish-brown medium; minor silt.	mottled orange. Firm, moist; sand, fine	to	××××××× ··········· ×············ ········	— 0.6 -					
Silty medium to coarse GRAVEL with some cobbles, light greyish brow homogenous. Dry, well graded, greywacke gravel; silt; cobbles, subangular to sub-rounded.				0.8 - 1.0 					
				— 1.2 - — 1.4					
				- 1.6 -					
				1.8  2.0					
				- 2.2 -					
				2.4  2.6					
	EL with some cobbles; dark grey, ked; moist; well graded; sub-angular to coarse; minor silt.			- 2.8 -					
				— 3.0 - — 3.2					
				- — 3.4					
				- 3.6 - 3.8					
End of Test Pit at 3.84 m bgl				'	'		·		
Notes:			Seepag Grab sa	water level ge inflow imple ading (ppm)	Method: CRS: Coordinate	Excavator EPSG:2193 es: 1551322 5171789	3, NZTM		

solutions for your environment		of Test Pit te Drive Subdivision  PIT NO. TP3 JOB NO: C03533300						
PATTLE DELAMORE PARTNERS LTD	Branthwaite					JOB NO: (	003533300	
CLIENT: Gillman Wheelans	T	LOCATION: 69 Branthwite Drive						
DATE: 22/11/2016	DATE BACKFILLED: 22/11/2016	LOGGED BY: Nick van Voorthuysen (PD				SHEET 1 OF 1		
	DESCRIPTION OF SOIL		GRAPHIC LOG	DEPTH (m)	SAMPLE DETAILS	TESTS	WATER OBSERVATIONS	
SILTY topsoil, dark brown, home	ogenous; soft.			0.0			Groundwater Not Encountered	
SILT, dark brown, homogeneou			**************************************	0.2 0.4 0.6 			Encountered	
	e cobbles; dark brown, homogenous. to sub-rounded; silt, medium; minor			- 0.8 - 1.0 - 1.2 - 1.4 - 1.6				
	EL with some cobbles; dark grey, ked; moist; well graded; sub-angular t coarse; minor silt.	o	00000000000000000000000000000000000000	- 2.2 - 2.4 - 2.6 - 2.8 - 3.0 - 3.2				
Notes:			Seepag Grab sa	lwater level ge inflow ample	Method: CRS: Coordinate	Excavator EPSG:2193 es: 1551626 5171754	3, NZTM	

PATTLE DELAMORE PARTNERS LTD	Log of Branthwaite	PIT NO. <b>TP4</b> JOB NO: C03533300							
CLIENT: Gillman Wheelans	1	LOCATION: 70 Branthwite Drive							
DATE: 22/11/2016	DATE BACKFILLED: 22/11/2016	LOGGE	ED BY: Nick	van Voort	huysen (PDP)	SHE	ET 1 OF 1		
	DESCRIPTION OF SOIL		GRAPHIC LOG	DEРТН (m)	SAMPLE DETAILS	TESTS	WATER OBSERVATIONS		
SILTY topsoil, dark brown, hom	nogenous; soft.			0.0			Groundwater Not		
SILT, light greyish brown, homo	ogeneous. Soft to firm, dry.	 ıb-		- 0.2 - 0.4 - 0.6 - 0.8 - 1.0 - 1.2 - 1.4 - 1.6 - 1.8			Encountered		
	/EL with some cobbles; dark grey, cked; moist; well graded; sub-angular to coarse; minor silt.	to	\\ \text{\tex{\tex	- 2.0 - 2.2 - 2.4 - 2.6 - 2.8 - 3.0 - 3.2 - 3.4 - 3.6					
Notes:			Seepag Grab sa	water level ge inflow ample	Method: CRS: Coordinate	Excavator EPSG:2193 s: 1551817 5171987	3, NZTM		

PATTI E DELAMORE	solutions for your environment	Log o Branthwaite			PIT NO. <b>TP5</b> JOB NO: C03533300					
	an Wheelans		LOCATION: 215 Lincoln Rolleston Road							
DATE: 21/11/2	2016	DATE BACKFILLED: 21/11/2016	LOGGI	ED BY: Emily	Barton (F	PDP)	SHE	ET 1 OF 1		
		DESCRIPTION OF SOIL	•	GRAPHIC LOG	DEРТН (m)	SAMPLE DETAILS	TESTS	WATER OBSERVATIONS		
SILTY topsoil, da	ark brown, homo	ogenous. Soft, dry.			0.0			Groundwater Not Encountered		
,	coarse GRAVEL ry; well graded;	oft, dry.  with some cobbles, light greyish brown greywacke gravels; cobbles, sub-ang	,		- 0.2 - 0.4 - 0.6 - 0.8 - 1.0 - 1.2 - 1.4 - 1.6 2.0 - 2.2			Liteountered		
Silty SAND, light minor silt.	greyish-brown	mottled orange. Very firm, damp to n	noist;		- 2.4 -					
homogenous. S	emi-loosely pac	EL with some cobbles; dark grey, ked; moist; well graded; sub-angular coarse; minor silt.	to	00000000000000000000000000000000000000	- 2.6 - 2.8 - 3.0 - 3.2 - 3.4 - 3.6					
Notes:				Seepag Grab sa	water level ge inflow imple ading (ppm)	Method: CRS: Coordinate	Excavator EPSG:2193 es: 1552162 5171988	3, NZTM		

Dranthwaite	Log of Test Pit  Branthwaite Drive Subdivision  PIT NO. TP6  JOB NO: C035333							
CLIENT: Gillman Wheelans		(ION: 17 Bra		Orive	1300 110.	00333300		
DATE: 21/11/2016 DATE BACKFILLED: 21/11/2016	LOGGI	ED BY: Emily	SHE	SHEET 1 OF 1				
DESCRIPTION OF SOIL		GRAPHIC LOG	DEPTH (m)	SAMPLE DETAILS	TESTS	WATER OBSERVATIONS		
Silty TOPSOIL, dark brown. Soft to firm, dry.  SILT, light greyish brown, homogenous. Very firm, dry.  Silty medium to coarse GRAVEL with some cobbles, light greyish brohomogenous. Dry, well graded greywacke gravels; cobbles, sub-ang sub-rounded. Minor silt.  Sandy medium to coarse GRAVEL to gravelly SAND with some cobb dark grey, homogenous. Semi-loosely packed; moist; well graded; sangular to sub-rounded; sand, medium to coarse; minor silt.	gular to	00000000000000000000000000000000000000	- 0.0 - 0.2 - 0.4 - 0.6 - 0.8 - 1.0 - 1.2 - 1.4 - 1.6 - 1.8 - 2.0 - 2.2			Groundwater Not Encountered		
End of Test Pit at 3.58 m bgl  Notes:			- 2.4 - 2.6 - 2.8 - 3.0 - 3.2 - 3.4 - 3.4	Method: CRS: Coordina	Excavator EPSG:219 tes: 1552012 5171804			

# Appendix D Aurecon 2016 Investigation Logs

# NZ GEOTECHNICAL SOCIETY INC



# SOIL

# > field guide sheet

**SEQUENCE OF TERMS** – fraction – colour – structure – strength – moisture – bedding – plasticity – sensitivity – additional

#### **GRAIN SIZE CRITERIA**

	COARSE							FI	NE	ORGANIC	
				Gravel			Sand				
TYPE	Boulders	Cobbles	coarse	medium	fine	coarse	medium	fine	Silt	Clay	Organic Soil
Size Range (mm)	2	00 6	0 2	0 6	5 2	2 0	.6 0.	2 0.	06 0.0	002	
Graphic Symbol				300	380				× × × × × × × × ×		

#### PROPORTIONAL TERMS DEFINITION (COARSE SOILS)

Fraction	Term	Example										
Major	() [UPPER CASE]	≥ 50 [major constituent]	GRAVEL									
Subordinate	() y [lower case]	20 – 50	Sandy									
Minor	with some with minor	12 – 20 5 – 12	with some sand with minor sand									
	with trace of (or slightly)	< 5	with trace of sand (slightly sandy)									

# Fraction finer >35% — than 0.06mm — <35% Fine Soil Plastic Quick/dilatant behaviour behaviour behaviour composition CLAY SILT SAND GRAVEL COBBLES BOULDERS

#### **DENSITY INDEX (RELATIVE DENSITY) TERMS**

Descriptive Term	Density Index (R <sub>D</sub> )	SPT "N" value (blows / 300 mm)	Dynamic Cone (blows / 100 mm)
Very dense	> 85	> 50	> 17
Dense	65 – 85	30 – 50	7 – 17
Medium dense	35 – 65	10 – 30	3 – 7
Loose	15 – 35	4 – 10	1 – 3
Very loose	< 15	< 4	0 – 2
Note: • No correlation	is implied between Standard E	Opportunition Toet (CDT) and Dv	namic Cono Toet values

Note: 
No correlation is implied between Standard Penetration Test (SPT) and Dynamic Cone Test values.

SPT "N" values are uncorrected.

Dynamic Cone Penetrometer (Scala)

#### CONSISTENCY TERMS FOR COHESIVE SOILS

Descriptive Term	Undrained Shear Strength (kPa)	Diagnostic Features			
Very soft	< 12	Easily exudes between fingers when squeezed			
Soft	12 – 25	Easily indented by fingers			
Firm	25 - 50	Indented by strong finger pressure and can be indented by thumb pressure			
Stiff	50 - 100	Cannot be indented by thumb pressure			
Very stiff	100 - 200	Can be indented by thumb nail			
Hard	200 - 500	Difficult to indent by thumb nail			

#### **ORGANIC SOILS/ DESCRIPTORS**

Term	Description
Topsoil	Surficial organic soil layer that may contain living matter. However topsoil may occur at greater depth, having been buried by geological processes or manmade fill, and should then be termed a buried topsoil.
Organic clay, silt or sand	Contains finely divided organic matter; may have distinctive smell; may stain; may oxidise rapidly. Describe as for inorganic soils.
Peat	Consists predominantly of plant remains.  Firm: Fibres already compressed together Spongy: Very compressible and open stucture Plastic: Can be moulded in hand and smears in fingers  Fibrous: Plant remains recognisable and retain some strength Amorphous: No recognisable plant remains
Roolets	Fine, partly decomposed roots, normally found in the upper part of a soil profile or in a redeposited soil (e.g. colluvium or fill)
Carbonaceous	Discrete particles of hardened (carbonised) plant material.

#### **PLASTICITY (CLAYS & SILTS)**

Term	Description
High plasticity	Can be moulded or deformed over a wide range of moisture contents without cracking or showing any tendency to volume change
Low plasticity	When moulded can be crumbled in the fingers; may show quick or dilatant behaviour

#### MOISTURE CONDITION

Condition	Description	Granular Soils	Cohesive Soils
Dry	Looks and feels dry	Run freely through hands	Hard, powdery or friable
Moist	Feels cool, darkened in colour	Tend to cohere	Weakened by moisture, but no free water on hands when remoulding
Wet			Weakened by moisture, free water forms on hands when handling
Saturated	Feels cool, darkened in	n colour and free wat	ter is present on the sample

#### **GRADING (GRAVELS & SANDS)**

Term	Description						
Well graded	Good representation of all particle sizes from largest to smallest						
Poorly graded	Limited representation of grain sizes - further divided into:						
	Uniformly graded	Most particles about the same size					
	Gap graded	Absence of one or more intermediate sizes					

#### **NZ GEOTECHNICAL SOCIETY INC**

This field sheet has been taken from and should be used and read with reference to the document FIELD DESCRIPTION OF SOIL AND ROCK. Guideline For the Field Classification and Description of Soil and Rock for Engineering Purposes. NZ Geotechnical Society Inc, December 2005. www.nzgeotechsoc.org.nz



HOLE NO. HA1

**RECORD** www.aurecongroup.com 254246 PROJECT NO. PROJECT Branthwaite Drive CLIENT GW Rolleston Ltd. CO-ORDINATES (NZTM) SHEET of 1 E 1551235 METHOD HA DATE from **25/11/2016** to 25/11/2016 N 5171723 MACHINE & NO. N/A ORIENTATION VERTICAL GROUND-LEVEL **+47.00** m RL

			ס					STRATA DESCRIPTION
Water level	Tests	Samples	Reduced	0.0 Depth 00 (m)	Legend		SUBORDINATE F STF (NZ GEOTECHI	RACTION, MAJOR FRACTION, MINOR FRACTION, COLOUR, RUCTURE, STRENGTH, MOISTURE CONDITION GRADING, BEDDING, PLASTICITY, ETC VICAL SOCIETY - FIELD DESCRIPTION OF SOIL AND ROCK)
-		Type Ref Depth 0.00 HA	+46.70	0.30	1/ · 1/ · 1	SILT with mir (TOPSOIL)	nor sand and trace o	of rootlets; dark brown. Moist, low plasticity; sand, fine.
-				- - -		Te	End of H ermination Reason:	and Auger at 0.30m, on 25/11/2016 Too difficult to auger, unable to penetrate gravel.
- - -				- - - -				
- - - -				- - - -				
- - - 5 - 5 -				- - - -				
				- - - -				
				- - - -				
- - - - - - - -				- - -				
				- - - -				
• Sma				- - - -				
• Sma	all Disturbed S	Sample ¥	- Water L	- - -evel				REMARKS
Larg	ge Disturbed S			sion Pack		LOGGED	T. MITCHELL	Groundwater not encountered.
SPT	Liner Sample 1 Wall Undistu	rbed Sample		rd Penetra bility Tes	ation Test st	DATE	25/11/2016	Coordinates found using handheld GPS, likely accurate to +/- 5 m.
U100	0 Undisturbed	d Sample 🛔 🛔	Piezom	eter / Sta	ndpipe Tip	CHECKE	A. HILLS	Ground level found using handheld GPS, likely accurate to +/- 10 m.
:I	ket Penetrom on Sample	eter Test ~	Packer In-situ	Test Vane She	ar Test	DATE	02/12/2016	17- IV III.



GW Rolleston Ltd.

# HAND AUGER RECORD

HOLE NO. HA2

PROJECT NO. **254246** 

PROJECT Branthwaite Drive

SHEET 1

of **1** 

METHOD HA

CLIENT

E 1551391 N 5171799

CO-ORDINATES (NZTM)

DATE from **25/11/2016** to

25/11/2016

MACHINE & NO. N/A

ORIENTATION VERTICAL

GROUND-LEVEL +47.00 m RL

Water level	Tests	Samples	Reduced	0.0 Depth	Legend	SUBORDINATE I ST (NZ GEOTECH	STRATA DESCRIPTION  FRACTION, MAJOR FRACTION, MINOR FRACTION, COLOUR, RUCTURE, STRENGTH, MOISTURE CONDITION GRADING, BEDDING, PLASTICITY, ETC GRADING, BEDDING, PLASTICITY, ETC INICAL SOCIETY - FIELD DESCRIPTION OF SOIL AND ROCK)
		Type Ref Depth  0.00	+46.70	- 0.30	1/2 1/1/2 1/2 1/2 1/2 1/2 1/2 1/2 1/2 1/	SILT with minor sand and trace (TOPSOIL)  SILT with minor sand; light brow	of rootlets; dark brown. Moist, low plasticity; sand, fine.
		HA		-	× × × × × × × × × ×		
			+46.10	0.90	× × ×	0.70m Becomes with some sand	
		<b>—</b>	+46.00	1.00	× ·×	Sandy SILT; greyish brown. Moi	st, low plasticity; sand, fine to medium. Hand Auger at 1.00m, on 25/11/2016
						Termination Reason:	Too difficult to auger, unable to penetrate gravel.
				- - -			
•							
	mall Disturbed S	Sample $\Psi$	Water I	_evel			REMARKS
	arge Disturbed S			sion Pack		LOGGED T. MITCHELL	Groundwater not encountered.
	PT Liner Sample	÷			ation Test	DATE <b>25/11/2016</b>	Coordinates found using handheld GPS, likely accurate to
	hin Wall Undistu 100 Undisturbed	ırbed Sample <u> </u> d Sample	-	ability Tes neter / Sta	st ndpipe Tip		+/- 5 m.
	ocket Penetrom		Packer		napipe rip	CHECKED A. HILLS	Ground level found using handheld GPS, likely accurate to +/- 10 m.
PC							



# HAND AUGER

HOLE NO. HA3

**RECORD** www.aurecongroup.com 254246 PROJECT NO. PROJECT Branthwaite Drive CLIENT GW Rolleston Ltd. CO-ORDINATES (NZTM) SHEET of 1 E 1551358 METHOD HA DATE from **25/11/2016** to 25/11/2016 N 5171707 MACHINE & NO. N/A ORIENTATION VERTICAL GROUND-LEVEL **+46.00** m RL

Type Ref Depth 0.00 SILT with minor sand and trace of rootlets; dark brown. Moist, low plasticity; sand, fine (TOPSOIL)  HA  HA  HA  HA  HA  HA  HA  HA  HA  H		STRATA DESCRIPTION  FRACTION, MAJOR FRACTION, MINOR FRACTION, COLOUR, TRUCTURE, STRENGTH, MOISTURE CONDITION GRADING, BEDDING, PLASTICITY, ETC HHIICAL SOCIETY - FIELD DESCRIPTION OF SOIL AND ROCK)	SUBORDINATE F STR (NZ GEOTECHI	Legend	0.0 Depth 0.0 (m)	Reduced	Samples	Tests	Water level
+45.40 0.60 × × × End of Hand Auger at 0.60m, on 25/11/2016	iticity; sand, fine.		(TOPSOIL) SILT with minor sand; brown. Dr	× × × × × × × × × × × × × × × × × × ×	-	+45.70			-
	rate gravel.	Hand Auger at 0.60m, on 25/11/2016 : Too difficult to auger, unable to penetrate gravel.	End of H	×	- 0.60 - -	+45.40	<b>↓</b>		- - - -
					- - - -				- - - -
					- - - -				- - - -
December 2016					- - -				-  -  -  -
TTE DRIVE LOGS GPU    Library: AGS 4, 0.GLB    Date: 5 December 2016					- - -				-   -   -   -
PJ   Library: AGS					- - -				-   -   -   -
E DRIVE LOGS.0					- - -				-  -  -  -
					- - -				
Small Disturbed Sample Large Disturbed Sample SPT Liner Sample Thin Wall Undisturbed Sample Thin Wall U					-  -  -  -				- - - - - -
Small Disturbed Sample  Large Disturbed Sample  SpT Liner Sample  Water Level  Impression Packer Test  Standard Penetration Test  DATE  OF 144 1994 C.  REMARKS  Groundwater not encountered.  Coordinates found using handhold GPS, likely accurate	0.111.1	Groundwater not encountered.			sion Pack	Impres	Sample	rge Disturbed	• Sm
Thin Wall Undisturbed Sample    DATE   25/11/2016   Coordinates found using handheld GPS, likely accurate +/- 5 m.		+/- 5 m.  Ground level found using handheld GPS, likely accura	CHECKED A. HILLS	Thin Wall Undisturbed Sample Permeability Test U100 Undisturbed Sample † Piezometer / Standpipe Tip Pocket Penetrometer Test Packer Test					



HA4 HOLE NO.

www.aurecongroup.com 254246 PROJECT NO. PROJECT Branthwaite Drive CLIENT GW Rolleston Ltd. CO-ORDINATES (NZTM) SHEET of 1 E 1551746 METHOD HA DATE from **25/11/2016** to 25/11/2016 N 5171599 MACHINE & NO. N/A ORIENTATION VERTICAL **GROUND-LEVEL** +43.00 m RL

				-					STRATA DESCRIPTION
		Tests	Samples	ĕ	_	7		SUBORDINATE FI	RACTION, MAJOR FRACTION, MINOR FRACTION, COLOUR,
Ę	<u>,                                    </u>	resis	Samples	Reduced Level	Depth (m)	len		SIR	RACTION, MAJOR FRACTION, MINOR FRACTION, COLOUR, UCTURE, STRENGTH, MOISTURE CONDITION GRADING, BEDDING, PLASTICITY, ETC IICAL SOCIETY - FIELD DESCRIPTION OF SOIL AND ROCK)
×	level			2 3	ے تے	Legend		(NZ GEOTECHN	IICAL SOCIETY - FIELD DESCRIPTION OF SOIL AND ROCK)
	_		Type Ref Depth 0.00		0.00				
L			1 0.00		_	711/	SILI with mir	or sand and trace o	f rootlets; dark brown. Moist, low plasticity; sand, fine.
L						1.11.	(TOPSOIL)		
L			   HA		L	11/2 11/2			
Γ			I TA	+42.60	0.40	1 × × ×			
Г						××	SILT with mir	or sand; brown. Dry	y, low plasticity; sand, fine.
ı				+42.40	0.60	× ^ ×		nes light brown.	
			<b>-</b>	<del>+42.40</del>	0.00			Fnd of H	and Auger at 0.60m, on 25/11/2016
F					-		Te	ermination Reason:	Foo difficult to auger, unable to penetrate gravel.
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• (G	Sma	all Disturbed S	Sample 🔻	Water I	Level				REMARKS
HAND A	Larg	ge Disturbed S	Sample	Impres	sion Pack	er Test	LOGGED	T. MITCHELL	Groundwater not encountered.
₹ 'n		Liner Sample		•		ation Test			
S4 H			rbed Sample		ability Tes		DATE	25/11/2016	Coordinates found using handheld GPS, likely accurate to
GS					-		.		+/- 5 m.
		0 Undisturbed		_		ndpipe Tip	CHECKED	A. HILLS	Ground level found using handheld GPS, likely accurate to
	Poc	ket Penetrom	eter Test	Packer	Test				+/- 10 m.
Report ID: AGS4 HAND AUGER RECORD    Project: BRANTHWAITE DRIVE LOGS.GPJ    Library: AGS 4_0.GLB    Date: 5 December 2016	Pist	ton Sample	~	In-situ	Vane She	ar Test	DATE	02/12/2016	
	econ N	ew Zealand I in	nited, , . Tel: Fax:						
, with		, _calaira Lili		-					



HA5 HOLE NO.

www.aurecongroup.com 254246 PROJECT NO. PROJECT Branthwaite Drive CLIENT GW Rolleston Ltd. CO-ORDINATES (NZTM) SHEET of 1 E 1552172 METHOD HA DATE from **25/11/2016** to 25/11/2016 N 5171677 MACHINE & NO. N/A ORIENTATION VERTICAL **GROUND-LEVEL** +44.00 m RL

							STRATA DESCRIPTION
			Reduced Level		7	SUBORDINATE F	
<u>, , </u>	Tests	Samples	vel vel	bth (	Jeno	STF	RACTION, MAJOR FRACTION, MINOR FRACTION, COLOUR, RUTURE, STRENGTH, MOISTINE CONDITION GRADING, BEDDING, PLASTICITY, ETC
water			盎ግ	0.0 Depth 00 (m)	Legend	(NZ GEOTECHI	NICAL SOCIETY - FIELD DESCRIPTION OF SOIL AND ROCK)
		Type Ref Depth 0.00		0.00	711/2 1/1/	SILT with minor sand and trace of	of rootlets; dark brown. Moist, low plasticity; sand, fine.
			. 40.00		1/.31/.	(TOPSOIL)	or rooticts, dark brown. Moist, low plasticity, saird, line.
		HA	+43.80	0.20	××	SILT with minor sand; light brown	n Dry low plasticity sand fine
		"		-	× ×	OLET WATTIME GATA, IIGHT STOWN	Bry, for placetoky, carra, fine.
			+43.50	0.50	× ×		
		_	+43.50	0.50	^ ^	End of H	land Auger at 0.50m, on 25/11/2016
				-		Termination Reason:	land Auger at 0.50m, on 25/11/2016 Too difficult to auger, unable to penetrate gravel.
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	all Distant	Pample	Water L				REMARKS
	all Disturbed				Ta-4	LOGGED T. MITCHELL	
	ge Disturbed			sion Pack		1. WIITOTILLE	Groundwater not encountered.
	T Liner Sampl	•			ation Test	DATE <b>25/11/2016</b>	Coordinates found using handheld GPS, likely accurate to
		urbed Sample	:	ability Tes			+/- 5 m.
	00 Undisturbe		_		ndpipe Tip	CHECKED A. HILLS	Ground level found using handheld GPS, likely accurate to
FUL	Pocket Penetrometer Test Packer Test  Piston Sample   Piston Sample   In-situ Vane Shear Test				_	DATE <b>02/12/2016</b>	+/- 10 m.
Pist	ton Sample					DATE <b>02/12/2016</b>	



HOLE NO. HA6

**RECORD** www.aurecongroup.com 254246 PROJECT NO. PROJECT Branthwaite Drive CLIENT GW Rolleston Ltd. CO-ORDINATES (NZTM) SHEET of 1 E 1551841 METHOD HA DATE from **25/11/2016** to 25/11/2016 N 5172093 MACHINE & NO. N/A ORIENTATION VERTICAL GROUND-LEVEL +48.00 m RL

									·
									OTDATA DECODIDATION
				D					STRATA DESCRIPTION
		Tests	Samples	Reduced Level	£	Legend		SUBORDINATE F STF	RACTION, MAJOR FRACTION, MINOR FRACTION, COLOUR, RUCTURE, STRENGTH, MOISTURE CONDITION
/ate	level		·	Sed eve	Depth (m)	ege		(NZ GEOTECHI	GRADING, BEDDING, PLASTICITY, ETC VICAL SOCIETY - FIELD DESCRIPTION OF SOIL AND ROCK)
>	<u>o</u>		Type Ref Depth 0.00	ш	0.00				
			0.00			71/2 7/1/		or sand and trace o	of rootlets; dark brown. Moist, low plasticity; sand, fine.
Γ						11.71.7	(TOPSOIL)		
[						16.16			
			HA	+47.60	0.40				
L					L	××	SILT; light bro	own. Dry, low plastic	city; sand, fine.
L				+47.40	0.60	× ×			
L						×	Silty fine SAN	ID; light brown. Dry	
			<b>*</b>	+47.20	0.80	× .			
L					_		7.	End of H	and Auger at 0.80m, on 25/11/2016
L					_		16	ermination Reason:	Too difficult to auger, unable to penetrate gravel.
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Report ID: AGS4 HAND AUGER RECORD    Project: BRANTHWAITE DRIVE LOGS.GPJ    Library: AGS 4_0.GLB    Date: 5 December 2016									
• UGE	Sm	all Disturbed S	Sample <b>Y</b>	Water L	evel				REMARKS
D A	Lar	ge Disturbed S			sion Pack	er Test	LOGGED	T. MITCHELL	Groundwater not encountered.
HAND A	SPT Liner Sample			Standa	rd Penetra	ation Test		05/44/00/15	
S4 F			ırbed Sample 🕇		bility Tes		DATE	25/11/2016	Coordinates found using handheld GPS, likely accurate to +/- 5 m.
P AG		00 Undisturbed			-	ndpipe Tip	CHECKE	, <b>у п</b> ите	Ground level found using handheld GPS, likely accurate to
		cket Penetrom		Packer			CHECKEL	A. HILLS	+/- 10 m.
por port						ar Test	DATE	02/12/2016	
تارق	Piston Sample ~			In-situ Vane Shear Test			5,,,,		



HA7 HOLE NO.

www.aurecongroup.com 254246 PROJECT NO. PROJECT Branthwaite Drive CLIENT GW Rolleston Ltd. CO-ORDINATES (NZTM) SHEET of 1 E 1551813 METHOD HA DATE from **25/11/2016** to 25/11/2016 N 5171901 MACHINE & NO. N/A ORIENTATION VERTICAL **GROUND-LEVEL** +50.00 m RL

							STRATA DESCRIPTION
			pa			011005-1111-	STRATA DESCRIPTION
_	Tests	Samples	Jack	듔	pué	SUBORDINATE ST	FRACTION, MAJOR FRACTION, MINOR FRACTION, COLOUR, RUCTURE, STRENGTH, MOISTURE CONDITION GRADING, BEDDING, PLASTICITY, ETC
level			Reduced Level	Depth (m)	Legend	(NZ GEOTECH	GRADING, BEDDING, PLASTICITY, ETC INICAL SOCIETY - FIELD DESCRIPTION OF SOIL AND ROCK)
> =		Type Ref Depth		0.00			
		0.00		Ļ	<u> </u>	SILT with minor sand and trace	of rootlets; dark brown. Moist, low plasticity; sand, fine.
				_	1/ - 2/ 1/	(TOPSOIL)	
			+49.70	0.30	X	011 7 111 1 1 1 1 1 1 1 1 1	
		HA		-	×	SILT with minor sand; light brow	n. Dry, low plasticity; sand, fine.
				_	×××		
				-	×××		
				-	×××		
		<b>*</b>	+49.20	0.80	× ^ ×	End of L	Hand Auger at 0.80m, on 25/11/2016
				-		Termination Reason	and Auger at 0.80m, on 25/11/2016  Decen: Too difficult to auger, stiff soil encountered.
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				L			DEMARKS
	all Disturbed		Water I		_	LOCCED T MITCHELL	REMARKS
	ge Disturbed			sion Pack		LOGGED T. MITCHELL	Groundwater not encountered.
	Liner Sampl	•			ation Test	DATE <b>25/11/2016</b>	Coordinates found using handheld GPS, likely accurate to
		urbed Sample		ability Tes			+/- 5 m.
	0 Undisturbe				ndpipe Tip	CHECKED A. HILLS	Ground level found using handheld GPS, likely accurate to
> Poc	ket Penetrom	eter Test	Packer	Test		DATE <u>05/12/2016</u>	+/- 10 m.
Piste		~		Vane She		DATE <b>05/12/2016</b>	



MACHINE & NO. N/A

# HAND AUGER RECORD

HOLE NO. HA8

**+44.00** m RL

PROJECT NO.

GROUND-LEVEL

254246

 
 PROJECT
 Branthwaite Drive

 CLIENT
 GW Rolleston Ltd.
 CO-ORDINATES (NZTM)
 SHEET
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 of
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 METHOD
 HA
 E 1551308 N 5171552
 DATE from 25/11/2016
 to 25/11/2016

ORIENTATION VERTICAL

le ter	Tests	Samples	Reduced	pth )	Legend		SUBORDINA*	STRATA DESCRIPTION  TE FRACTION, MAJOR FRACTION, MINOR FRACTION, COLOUR, STRUCTURE, STREMSTH, MOISTURE CONDITION GRADING, BEDDING, PLASTICITY, ETC
Water		Type Ref Depth 0.00	Le Re	0.0 Depth 00(m)	1 1		(NZ GEOTE	ECHNICAL SOCIETY - FIELD DESCRIPTION OF SOIL AND ROCK)
-		0.00 HA	+43 80	_	7.77	(TOPSOIL)		e of rootlets; dark brown. Moist, low plasticity; sand, fine.
		↓			× ×	SILT with mi	nor sand; light bro	own. Dry, low plasticity; sand, fine.
AGS4 HAND AUGER RECORD    Project: BRANTHWAITE DRIVE LOGS.GPU    Library: AGS 4 0.GLB    Date: 5 December 2016  ■ □ □ □ □ □ □ □ □ □ □ □ □ □ □ □ □ □ □		HA •	+43.80	0.20 0.30		SILT with mi	End of	own. Dry, low plasticity; sand, fine.  f Hand Auger at 0.30m, on 25/11/2016  n: Too difficult to auger, unable to penetrate gravel.
ORD    Pr				<u>-</u>				
R REC				-				
⊕ Sma	III Disturbed S	Sample ¥	Water L	_evel	1			REMARKS
A Carm	je Disturbed S			sion Pack	er Test	LOGGED	T. MITCHELL	
N¥ SPT	Liner Sample				ation Test			Groundwater not encountered.
Thin	-	ırbed Sample		bility Tes		DATE	25/11/2016	Coordinates found using handheld GPS, likely accurate to +/- 5 m.
	0 Undisturbed ket Penetrom	d Sample 🛔		eter / Sta	ndpipe Tip	CHECKE	D_ <b>A. HILLS</b>	Ground level found using handheld GPS, likely accurate to +/- 10 m.
<u> اج</u>	on Sample	×		Vane She	ar Test	DATE	02/12/2016	_



HA9 HOLE NO.

254246 PROJECT NO. PROJECT Branthwaite Drive CLIENT GW Rolleston Ltd. CO-ORDINATES (NZTM) SHEET of 1 E 1551345 METHOD HA DATE from **25/11/2016** to 25/11/2016 N 5171493 MACHINE & NO. N/A ORIENTATION VERTICAL GROUND-LEVEL **+46.00** m RL

				_			STRATA DESCRIPTION	
				Reduced Level		_	SUBORDINATE FRACTION, MAJOR FRACTION, MINOR FRACTION, COLOUR.	
	.	Tests	Samples	e ğ	Depth (m)	Legend	SUBORDINATE FRACTION, MAJOR FRACTION, MINOR FRACTION, COLOUR, STRUCTURE, STRENGTH, MOISTURE CONDITION	
ate	level			e G	m je	ğ	GRADING, BEDDING, PLASTICITY, ETC (NZ GEOTECHNICAL SOCIETY - FIELD DESCRIPTION OF SOIL AND ROCK)	
>	<u>•</u>		Type Ref Donth	ш	0.00	ت	· · · · · · · · · · · · · · · · · · ·	
$\vdash$			Type Ref Depth 0.00		0.00	717. 717	SILT with minor sand and trace of rootlets; dark brown. Moist, low plasticity; sand, fin	e
⊦					-	1	(TOPSOIL)	С.
ŀ				+45.80	0.20	17.31/		
L			HA		L	× ·×	Sandy SILT; light brown. Dry, low plasticity; sand, fine.	
			"	+45.60	0.40	××		
Ī						×	Silty fine SAND; light brown. Moist.	
ŀ				. 45 40		' . ' .× .		
-			_ Y	+45.40	0.60		End of Hand Auger at 0.60m, on 25/11/2016	
ŀ					-		Tarmination December To difficult to quart unable to penetrate gravel	
L					_		Termination Reason: Too difficult to auger, unable to penetrate gravel.	
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rary: AGS 4_0.GLB					- - - -			
Library: AGS 4_0.GLB					- - - - -			
J    Library: AGS 4_0.GLB					- - - - -			
GPJ    Library: AGS 4_0.GLB					- - - - -			
SS.GPJ    Library: AGS 4_0.GLB					- - - - -			
OGS.GPJ    Library: AGS 4_0.GLB					- - - - - -			
E LOGS.GPJ    Library: AGS 4_0.GLB					- - - - - - -			
RIVE LOGS.GPJ    Library: AGS 4_0.GLB					- - - - - - - -			
DRIVE LOGS.GPJ    Library: AGS 4_0.GLB					- - - - - - - -			
ITE DRIVE LOGS.GPJ    Library: AGS 4_0.GLB					- - - - - - - - -			
WAITE DRIVE LOGS.GPJ    Library: AGS 4_0.GLB					- - - - - - - - - -			
THWAITE DRIVE LOGS.GPJ    Library: AGS 4_0.GLB					- - - - - - - - - - -			
ANTHWAITE DRIVE LOGS.GPJ    Library: AGS 4_0.GLB					- - - - - - - - - - - -			
SRANTHWAITE DRIVE LOGS.GPJ    Library: AGS 4_0.GLB					- - - - - - - - - - - - - - - - - - -			
2t: BRANTHWAITE DRIVE LOGS.GPJ    Library: AGS 4_0.GLB					- - - - - - - - - - - - - - - - - - -			
ject: BRANTHWAITE DRIVE LOGS.GPJ    Library: AGS 4_0.GLB					- - - - - - - - - - - - -			
Project: BRANTHWAITE DRIVE LOGS.GPJ    Library: AGS 4_0.GLB					- - - - - - - - - - - - - - - - - - -			
)    Project: BRANTHWAITE DRIVE LOGS.GPJ    Library: AGS 4_0.GLB					- - - - - - - - - - - - - - - - - - -			
ORD    Project: BRANTHWAITE DRIVE LOGS.GPJ    Library: AGS 4_0.GLB					- - - - - - - - - - - - - - - - - - -			
CORD    Project: BRANTHWAITE DRIVE LOGS.GPJ   Library: AGS 4_0.GLB					- - - - - - - - - - - - - - - - - - -			
RECORD    Project: BRANTHWAITE DRIVE LOGS.GPJ    Library: AGS 4_0.GLB					- - - - - - - - - - - - - - - - - - -			
ER RECORD    Project: BRANTHWAITE DRIVE LOGS.GPJ    Library: AGS 4_0.GLB					- - - - - - - - - - - - - - - - - - -			
UGER RECORD    Project: BRANTHWAITE DRIVE LOGS.GPJ    Library: AGS 4_0.GLB     •	Sm	all Disturbed S	Sample ▼	Water L	- - - - - - - - - - - - - - - - - - -		REMARKS	
AUGER RECORD    Project: BRANTHWAITE DRIVE LOGS.GPJ    Library: AGS 4_0.GLB				Water L		or Tost	LOGGED T MITCHELL	
NND AUGER RECORD    Project: BRANTHWAITE DRIVE LOGS.GPJ    Library: AGS 4_0.GLB    コンパ・・	Lar	ge Disturbed S	Sample	Impres	sion Pack		LOGGED T. MITCHELL Groundwater not encountered.	
HAND AUGER RECORD    Project. BRANTHWAITE DRIVE LOGS.GPJ    Library: AGS 4_0.GLB	Lar SP1	ge Disturbed S T Liner Sample	Sample	Impres			LOGGED T. MITCHELL Groundwater not encountered.	e to
SS4 HAND AUGER RECORD    Project: BRANTHWAITE DRIVE LOGS.GPJ    Library: AGS 4_0.GLB	Lar SP1	ge Disturbed S T Liner Sample	Sample	Impres Standa	sion Pack	ation Test	LOGGED T. MITCHELL Groundwater not encountered.	e to
AGS4 HAND AUGER RECORD    Project: BRANTHWAITE DRIVE LOGS.GPJ    Library: AGS 4_0.GLB	Lar SP1 Thi	ge Disturbed S T Liner Sample in Wall Undistu	Sample  irbed Sample	Impress Standa Permea	sion Pack rd Penetra ability Tes	ation Test t	t DATE 25/11/2016 Groundwater not encountered.  Coordinates found using handheld GPS, likely accurate +/- 5 m.	
D: AGS4 HAND AUGER RECORD    Project: BRANTHWAITE DRIVE LOGS.GPJ    Library: AGS 4_0.GLB    	Lar SP1 Thi U10	rge Disturbed S T Liner Sample in Wall Undistu 00 Undisturbed	Sample  Prince Sample   I Sample   A Sample	Impress Standa Permea	sion Pack rd Penetra ability Tes neter / Star	ation Test t	t DATE 25/11/2016 Groundwater not encountered.  COORDINATE 25/11/2016 Groundwater not encountered.  COORDINATE 25/11/2016 HILLS Groundwater not encountered.  COORDINATE COORDINATE OF THE PROPERTY OF THE PRO	
ort ID: AGS4 HAND AUGER RECORD    Project: BRANTHWAITE DRIVE LOGS.GPJ    Library: AGS 4_0.GLB	Lar SP1 Thi U10	rge Disturbed S T Liner Sample in Wall Undistu 00 Undisturbed cket Penetrom	Sample  irbed Sample  i Sample	Impress Standa Permea Piezom Packer	sion Pack rd Penetra ability Tes neter / Star Test	ation Test t ndpipe Tip	t DATE 25/11/2016 Groundwater not encountered.  CHECKED A. HILLS  CHECKED A. HILLS  COordinates found using handheld GPS, likely accurate +/- 10 m.  Ground level found using handheld GPS, likely accurate +/- 10 m.	
AGS4 HAND AI	Lar SP1 Thi U10	rge Disturbed S T Liner Sample in Wall Undistu 00 Undisturbed	Sample  Prince Sample   I Sample   A Sample	Impress Standa Permea Piezom Packer	sion Pack rd Penetra ability Tes neter / Star	ation Test t ndpipe Tip	t DATE 25/11/2016 Groundwater not encountered.  COORDINATE 25/11/2016 Groundwater not encountered.  COORDINATE 25/11/2016 HILLS Groundwater not encountered.  COORDINATE COORDINATE OF THE PROPERTY OF THE PRO	



**HA101** HOLE NO.

PROJECT NO.

PROJECT	Falcons Landing Rolleston						
CLIENT	GW Rolleston Ltd.	CO-ORDINATES (NZTM)	SHEET	1	of	1	
METHOD	НА	E 1551945 N 5171270	DATE from	09/02/2017	to	09/02/2017	
MACHINE	& NO NA	ORIENTATION VERTICAL	GROUND-I	E\/EI ±2	9 00	m Pl	

			p				STRATA DESCRIPTION
<u> </u>	Tests	Samples	Reduced Level	bth	Legend	SUBORDINATE FF STRU	VACTION, MAJOR FRACTION, MINOR FRACTION, COLOUR, JCTURE, STRENGTH, MOISTURE CONDITION GRADING, BEDDING, PLASTICITY, ETC ICAL SOCIETY - FIELD DESCRIPTION OF SOIL AND ROCK)
level		Time Def Death	Re	0.0 Depth	Leg	(NZ GEOTECHNI	(CAL SOCIETY - FIELD DESCRIPTION OF SOIL AND ROCK)
		Type Ref Depth 0.00		0.00	711/2	SILT with minor sand and trace o medium. (TOPSOIL)	f rootlets; dark brown. Dry, low plasticity; sand, fine to
					1/ - 7/1/ - 7	medium. (TOPSOIL)	
				_	71/2 /11/		
					<u> </u>		
					71/ /1/		
				_	<u>/</u> . <u>\ \ /</u> . \ \		
					<u> </u>		
			+38.70	0.30	<u>½ .∀ ½</u> . ∨	SILT with minor eand: light brown	with orange mottles. Dry, low plasticity; sand, fine to
		HA I			× ×	medium.	with drange motiles. Dry, low plasticity, sand, line to
					× ×		
					× ^×		
					× ×		
				F	× × × ×		
					x x x		
					× ×		
			+38.35	0.65	× × ×		
			130.33	0.00		End of Ha	and Auger at 0.65m, on 09/02/2017 <i>n:</i> Too difficult to auger, gravel encountered.
				-			
				_			
				_			
				-			
				-			
				_			
Sma	III Disturbed	Sample $\Psi$	Water I	Level			REMARKS
_	je Disturbed		•	sion Pack		LOGGED J. MARTIN	Co-ordinates were obtained from Google Earth and are
	Liner Sample	e urbed Sample		rd Penetr ability Tes	ation Test	DATE <u>09/02/2017</u>	approximate only.
	0 Undisturbe	• —		-	ndpipe Tip	CHECKED <b>D. MAHONEY</b>	
	ket Penetrom		Packer		•	511251125 <u>51 1111 4151121</u>	
	on Sample	~	L14	Vane She	<b>T</b> 4	DATE 10/02/2017	



**HA102** HOLE NO.

PROJECT NO.

254246

Falcons Landing **PROJECT** Rolleston CLIENT GW Rolleston Ltd. CO-ORDINATES (NZTM) SHEET 1 of 1 E 1552035 METHOD DATE from 09/02/2017 to 09/02/2017 N 5171315 MACHINE & NO. ORIENTATION VERTICAL GROUND-LEVEL **+40.00** m RL NA

level	Tests	Samples	Reduced Level	Depth (m)	Legend		STRATA DESCRIPTION  RDINATE FRACTION, MAJOR FRACTION, MINOR FRACTION, COLOUR, STRUCTURE, STRENGTH, MOISTURE CONDITION GRADING, BEDDING, PLASTICITY, ETC  GEOTECHNICAL SOCIETY - FIELD DESCRIPTION OF SOIL AND ROCK)
		Type Ref Depth 0.00		0.00	<u> </u>	SILT with minor sand and medium. (TOPSOIL)	trace of rootlets; dark brown. Dry, low plasticity; sand, fine to
					<u>'' ''' '</u>	medium. (TOPSOIL)	
				-	<u> </u>		
					11/ 11/		
				-	<u>1</u> 2. <u>1.12.</u> 1		
			+39.70	0.30	5 3 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5		
		HA I			× × × ×	SILT with minor sand; ligh	t brown. Dry, low plasticity; sand, fine to medium.
					× × ×		
					× × × ×		
				_	× × ×		
					× × × ×		
				_	× × ×		
		<b>—</b>	+39.35	0.65	××	Er	nd of Hand Auger at 0.65m. on 09/02/2017
				-		Termination	nd of Hand Auger at 0.65m, on 09/02/2017 • <i>Reason:</i> Too difficult to auger, gravel encountered.
				_			
				-			
				_			
				-			
Sma	all Disturbed \$	Sample ¥	Water L	evel			REMARKS
Lar	ge Disturbed	Sample	Impres	sion Pack		LOGGED J. MARTIN	Co-ordinates were obtained from Google Earth and are
	「Liner Sample n Wall Undistu	e urbed Sample		rd Penetra ability Tes	ation Test t	DATE <u>09/02/2017</u>	approximate only.
	0 Undisturbed	_	Piezom Packer		ndpipe Tip	CHECKED D. MAHONI	EY
	ton Sample			Vane She	ar Toet	DATE 10/02/2017	



**HA103** HOLE NO.

PROJECT NO.

PROJECT	Falcons Landing Rolleston					
CLIENT	GW Rolleston Ltd.	CO-ORDINATES (NZTM)	SHEET	1	of	1
METHOD	НА	E 1552100 N 5171255	DATE from	09/02/2017	to	09/02/2017
MACHINE 8	§NO NΔ	ORIENTATION VERTICAL	GROUND-I	FVFI +30	9 00	m RI

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									STRATA DESCRIPTION
				- G				SUBORDINATE E	
	- e	Tests	Samples	Reduced	돭	pue		STR	RACTION, MAJOR FRACTION, MINOR FRACTION, COLOUR, UCTURE, STRENGTH, MOISTURE CONDITION GRADING, BEDDING, PLASTICITY, ETC
	Water	) S		Reduc	Depth (m)	Legend		(NZ GEOTECHN	GRADING, BEDDING, PLASTICITT, ETC IICAL SOCIETY - FIELD DESCRIPTION OF SOIL AND ROCK)
L	<u> </u>	<u> </u>	Type Ref Depth 0.00		0.00				
			0.00			711/	SILT with mir	or sand and trace o	of rootlets; dark brown. Dry, low plasticity; sand, fine to
						1/ - 21 1/	medium. (TO	PSOIL)	
上					-	\ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \			
						7. 77. 7			
						11/ 11/			
L				+38.80	0.20				
						×××	SILT with mir	or sand; light browr	n. Dry, low plasticity; sand, fine to medium.
			HA			×××			
						× ×			
ı					-	× ×			
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ŀ					-	×			
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			↓	+38.50	0.50	× ^ ×			
								End of H	and Auger at 0.50m, on 09/02/2017
								Termination Reason	on: Too difficult to auger, gravel encountered.
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ANDING LOGS.GPJ    Library: AGS 4_0.GLB    Date: 10 February 2017									
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Report ID: AGS4 HAND AUGER RECORD    Project: FALCON'S L				ļ	L	L		T	DEMARKS
ĬΙ.		Small Disturbed		Water L				LMADTIN	REMARKS
9		Large Disturbed			sion Pack		1	J. MARTIN	Co-ordinates were obtained from Google Earth and are
Ψ	1	SPT Liner Sample	le	Standa	rd Penetr	ation Test	DATE	00/02/2047	approximate only.
SY		Thin Wall Undist	urbed Sample	Permea	ability Tes	st	DATE	09/02/2017	
AG		U100 Undisturbe	d Sample 🛕 🕆	Piezom	neter / Sta	ndpipe Tip	CHECKER	D. MAHONEY	
Ϊ		Pocket Penetron		Packer		•	CHECKEL	D. MAIDINE!	
port.	P/S	Piston Sample	~		Vane She	ar Test	DATE	10/02/2017	
				0	0110		2.112		
Α	urec	on New Zealand Li	mited, , . Tel: Fax	:					



**HA104** HOLE NO.

PROJECT NO.

PROJECT	Falcons Landing Rolleston						
CLIENT	GW Rolleston Ltd.	CO-ORDINATES (NZTM)	SHEET	1	of	1	
METHOD	НА	E 1551995 N 5171210	DATE from	09/02/2017	to	09/02/2017	
MACHINE	R NO NA	ORIENTATION VERTICAL	GROUND	E//EI ±2	۵ ۸۸	m PI	

Tests Samples  Tests	_					1	1			
Tests Surroles & Common terms of the control of the										STRATA DESCRIPTION
See					eq				SUBORDINATE E	
Send Disturbed Sample		ъ.	Tests	Samples	g le	돭	pue		STR	CRADING REDDING BLASTICITY ETC
Small Districted Sample  Small Districted Samp		Vat	% e		Le Re	(E)	ege		(NZ GEOTECHN	GRADING, BEDDING, PLASTICITT, ETC IICAL SOCIETY - FIELD DESCRIPTION OF SOIL AND ROCK)
* Small Disturbed Sample ** Small Disturbed	L	<u> </u>	<u> </u>	Type Ref Depth		0.00				
198.0 0.20 X X SILT with minor sand; light brown with orange mottles. Dry, low plasticity; sand, fine to middlum.				0.00			71/2	SILT with mir	or sand and trace o	of rootlets; dark brown. Dry, low plasticity; sand, fine to
138.80 0.20								medium. (10	PSOIL)	
Sanati Daturbed Sample Large Disturbed Sample										
Sample   S	ŀ	-				-	<u> </u>			
Sample   S							7. 77. 7			
September   1900   19							11/ 11/			
This Sample   This Sample   The Sample   T	L				+38.80	0.20				
# Small Disturbed Sample Large Disturbed Sample Disturbed Sample Large Disturbed Sample Disturbe									ıor sand; light browr	n with orange mottles. Dry, low plasticity; sand, fine to
## Small Disturbed Sample   ST Lines Sample   Large Disturbed Sample				HA				medium.		
Small Disturbed Sample   Small Disturbed Sample   Lurgo Disturbed Sample   Lurgo Disturbed Sample   Lurgo Disturbed Sample   Empression Packer Test   Smith Charles   Employed Disturbed Sample   Smith Charles   Employed Disturbed Sample   Empression Packer Test   Empression Packer Test   Empression Packer Test   Employed Disturbed Sample   Empression Packer Test   Empression Packer Test   Empression Packer Test   Empression Packer Test   Employed Disturbed Sample   Empression Packer Test   Empression Packer Test   Empression Packer Test   Empression Packer Test   Employed Disturbed Sample   Empression Packer Test   Empression Packer Test   Empression Packer Test   Empression Packer Test   Employed Disturbed Sample   Empression Packer Test   Empression Packer Test   Empression Packer Test   Empression Packer Test   Employed Disturbed Sample   Empression Packer Test   Empression Packer Test   Empression Packer Test   Empression Packer Test   Employed Disturbed Sample   Empression Packer Test   Empression Packer Test   Empression Packer Test   Empression Packer Test   Employed Disturbed Sample   Empression Packer Test   Empression Packer Test   Empression Packer Test   Empression Packer Test   Employed Disturbed Sample   Empression Packer Test   Empression Packer Test   Empression Packer Test   Empression Packer Test   Employed Disturbed Sample   Empression Packer Test   Empression Packer Test   Empression Packer Test   Empression Packer Test   Employed Disturbed Sample   Empression Packer Test   Empression Packer Test   Empression Packer Test   Empression Packer Test   Employed Disturbed Sample   Empression Packer Test   Empression Packer Test   Empression Packer Test   Empression Packer Test   Employed Disturbed Sample   Empression Packer Test   Empression Packer Test   Empression Packer Test   Empression Packer Test   Employed Disturbed Sample   Empression Packer Test   Empression Packer Test   Empression Packer Test   Empression Packer Test   Employed Disturbed Sample   Empression Packer Test   Empression Pac							× ×			
* Small Disturbed Sample   Small Disturbed Sam	ı					-				
## Small Disturbed Sample   Water Level   Small Disturbed Sample   Lurge Disturbed Sample   Lurge Disturbed Sample   Lurge Disturbed Sample   Lurge Disturbed Sample   Structure Sample   Lurge Disturbed Sample   Department Feat   Percentage   Percentage   Texture Disturbed Sample   Department   Departmen										
*** *** *** *** *** *** *** *** **							×			
Small Disturbed Sample Large Disturbed Sample	-  -	-				_				
* Small Disturbed Sample  * Disturbed							× ×			
Small Disturbed Sample  Small Disturbed Sample  Small Disturbed Sample  Large Disturbed Sample  Large Disturbed Sample  Large Disturbed Sample  LogGED  J. MARTIN  DATE  O9/02/2017  CHECKED D. MAHONEY  DATE  Disturbed Sample  Procker Periormeter Test  Usou Undolsturbed Sample  Log D. MAHONEY  DATE  O9/02/2017  CHECKED D. MAHONEY  DATE  DATE  O9/02/2017  CHECKED D. MAHONEY  DATE  DATE  O9/02/2017  CHECKED D. MAHONEY  DATE  DATE  O9/02/2017  CHECKED D. MAHONEY  DATE  O9/02/2017							× ×			
End of Hand Auger at 0.50m, on 09/02/2017 Termination Reason: Too difficult to auger, gravel encountered.  * Small Disturbed Sample * Small Disturbed Sample * Large Disturbed Sample * Small Disturbed Sample * Decker Downson Standard Persteration Test Permeability Test * Disturbed Sample * Decker Downson Standard Persteration Test * Disturbed Sample * Decker Downson Standard Persteration Test * Disturbed Sample * Decker Downson Standard Persteration Test * Disturbed Sample * Decker Downson Standard Persteration Test * Disturbed Sample * Decker Downson Standard Persteration Test * Disturbed Sample * Decker Downson Standard Persteration Test * Disturbed Sample * Decker Downson Standard Persteration Test * Disturbed Sample * Disturbed Samp				↓	+38 50	0.50				
* Small Disturbed Sample Large Disturbed Sample Spell Liner Sample Depletor Sample Water Level Impression Packer Test Standard Powertration Test Standard Po	l				30.00	3.50			End of H	and Auger at 0.50m, on 09/02/2017
Small Disturbed Sample Large Disturbed Sample SPT Liner Sample Thin Wall Undisturbed Sample U100 Undisturbed Sample U100 Undisturbed Sample Pocket Penetrometer Test Piston Sample Pist									Termination Reason	on: Too difficult to auger, gravel encountered.
Small Disturbed Sample Large Disturbed Sample SPT Liner Sample Thin Wall Undisturbed Sample U100 Undisturbed Sample U100 Undisturbed Sample Pocket Penetrometer Test Piston Sample Pist										• •
Small Disturbed Sample Large Disturbed Sample SPT Liner Sample Thin Wall Undisturbed Sample Thin Wall Undisturbed Sample U100 Undisturbed Sample Pocket Penetrometer Test Piston Sample	-	-				_				
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Small Disturbed Sample Large Disturbed Sample SPT Liner Sample Thin Wall Undisturbed Sample Thin Wall Undisturbed Sample U100 Undisturbed Sample Pocket Penetrometer Test Piston Sample	SS.									
Small Disturbed Sample Large Disturbed Sample SPT Liner Sample Thin Wall Undisturbed Sample Thin Wall Undisturbed Sample U100 Undisturbed Sample Pocket Penetrometer Test Piston Sample	ĬĔ	-								
Small Disturbed Sample Large Disturbed Sample SPT Liner Sample Thin Wall Undisturbed Sample Thin Wall Undisturbed Sample U100 Undisturbed Sample Pocket Penetrometer Test Piston Sample	õ									
Small Disturbed Sample Large Disturbed Sample SPT Liner Sample Thin Wall Undisturbed Sample Thin Wall Undisturbed Sample U100 Undisturbed Sample Pocket Penetrometer Test Piston Sample	힐									
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	ne		Small Disturbed	Sample <b>Y</b>	Water I	_evel				REMARKS
	PΑ	2					er Test	LOGGED	J. MARTIN	Co-ordinates were obtained from Google Forth and are
	Ν	Ì						1		approximate only.
	4 T	EI II		_ <u>.</u>				DATE	09/02/2017	
	GS	L			-	-				
	∀						napipe Tip	CHECKED	D. MAHONEY	
	넕								40100100:-	
	Sept.	P/S	Piston Sample	~	In-situ	Vane She	ar Test	DATE	10/02/2017	
		Aurec	on New Zealand L	imited, , . Tel: Fax	:			1		



**HA105** HOLE NO.

PROJECT NO.

PROJECT	Falcons Landing Rolleston						
CLIENT	GW Rolleston Ltd.	CO-ORDINATES (NZTM)	SHEET	1	of	1	
METHOD	НА	E 1551616 N 5171270	DATE from	09/02/2017	to	09/02/2017	
MACHINE	% N∩ <b>N</b> Δ	ORIENTATION VERTICAL	GROUND-I F	:\/FI +4	00	m RI	

Г									CTDATA DECORIDION
				ō					STRATA DESCRIPTION
	_	Tests	Samples	Reduced Level	₽	덜		SUBORDINATE FF STRI	ACTION, MAJOR FRACTION, MINOR FRACTION, COLOUR, JCTURE, STRENGTH, MOISTURE CONDITION SPADING, BEDDING, PLASTICITY, ETC
	Water	<u></u>		Reduc	Depth (m)	Legend		(NZ GEOTECHN	GRADING, BEDDING, PLASTICITY, ETC ICAL SOCIETY - FIELD DESCRIPTION OF SOIL AND ROCK)
	≥ 3	<u> </u>	Type Ref Depth	ш _	0.00	ا ٿا		(112 020 120 111	or E cooler 1 Thee Become monor cone and monory
F			Type Ref Depth 0.00		0.00	1.74 1×. 1/1/	SILT with mir	or sand and trace o	f rootlets; dark brown. Dry, low plasticity; sand, fine to
						17.31,	medium. (TO	PSOIL)	· · · - · · · · · · · · · · · · · · · ·
						F > 1	`	,	
L					L	76 70			
						17. 317.			
				+39.85	0.15	××	CII T with oar	no condiliabt brown	Dry law placticity and fine to madium
			HA			×	SILT WITH SOF	ne sand; light brown	. Dry, low plasticity; sand, fine to medium.
ŀ					-	$ \times \times \times $			
						× ×			
						× ×			
L					L	× ×			
						×			
F				+39.65	0.35	× ×		Food of the	and A at 0.25 m. an 00/02/2017
								End of Ha	and Auger at 0.35m, on 09/02/2017 <i>n:</i> Too difficult to auger, gravel encountered.
ŀ					-			remination Reaso	n. 100 difficult to auger, graver encountered.
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P P	•	Small Disturbed S	Sample 🔻	Water L	_evel				REMARKS
Ā		Large Disturbed S			sion Pack	er Test	LOGGED	J. MARTIN	
Report ID: AGS4 HAND AUGER RECORD    Project: FALCON'S LANDING LOGS.GPJ    Library: AGS 4_0.GLB    Date: 10 February 2017	_	SPT Liner Sample				ation Test			Co-ordinates were obtained from Google Earth and are approximate only.
4   I			<u>.</u>				DATE	09/02/2017	
GS		Thin Wall Undistu			ability Tes				
Ϋ́	_	U100 Undisturbed		_		ndpipe Tip	CHECKE	D. MAHONEY	
뷘		Pocket Penetrome	eter Test	Packer	Test				
8	9/S	Piston Sample	~	In-situ	Vane She	ar Test	DATE	10/02/2017	
		on New Zealand Lim	nited Tal: Fav						
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**HA106** HOLE NO.

PROJECT NO.

PROJECT	Falcons Landing Rolleston					
CLIENT	GW Rolleston Ltd.	CO-ORDINATES (NZTM)	SHEET	1	of	1
METHOD	НА	E 1551551 N 5171379	DATE from	09/02/2017	to	09/02/2017
MACHINE 8	NO NA	ORIENTATION VERTICAL	GROUND-I	FVFI +4	00	m RI

- [										STRATA DESCRIPTION	
				0 '	Reduced	_			SUBORDINATE F		
	Ę.	Tests	•	Samples	Reduc	Depth (m)	enc		STR	RACTION, MAJOR FRACTION, MINOR FRACTION, COLOUR, UCTURE, STRENGTH, MOISTURE CONDITION GRADING, BEDDING, PLASTICITY, ETC	
	Water	<u><u><u>&amp;</u>  </u></u>			ال الله	E P	Legend		(NZ GEOTECHN	NICAL SOCIETY - FIELD DESCRIPTION OF SOIL AND ROCK)	
ŀ			$\dashv$	Type Ref Depth 0.00		0.00		SILT with co	me sand and trace o	of rootlets; dark brown. Dry, low plasticity; sand, fine to	
- [							<u> </u>	medium. (TO	PSOIL)	or rootiets, dark brown. Dry, low plasticity, sailu, line to	
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							77.77				
	_				+39.70	0.30	12 3 1/2 V				
Γ							×××		me sand; light browr	n with orange mottles. Dry, low plasticity; sand, fine to	
							× ×	medium.			
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117							×××				
y 20							×××				
Luai	-					-	×××				
Feb							×××				
9							×××				
Date				_ *	+39.20	0.80	× ^ ×		End of H	and Auger at 0.80m, on 09/02/2017	
= B									Termination Reason	and Auger at 0.80m, on 09/02/2017 on: Too difficult to auger, gravel encountered.	
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ANDING LOGS.GPJ    Library: AGS 4_0.GLB    Date: 10 February 2017						L					
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Report ID: AGS4 HAND AUGER RECORD    Project: FALCON'S L		Small Disturb	ed S	ample $\Psi$	Water L	evel				REMARKS	
DAI		Large Disturb				sion Pack	er Test	LOGGED	J. MARTIN	Co-ordinates were obtained from Google Earth and are	
ΝΨ	); []	SPT Liner Sar					ation Test			approximate only.	
S4 F	Ϊ́Ι	Thin Wall Und		<u>•</u>		bility Tes		DATE	09/02/2017		
AĞ		U100 Undistu				-		CHECKE	D. MAHONEY		
ä	U100 Undisturbed Sample					CHECKEL	D. WIAHUNET				
PS Piston Sample						ar Test	DATE	10/02/2017			
-	-ui ec	recon New Zealand Limited, , . Tel: Fax:									



**HA107** HOLE NO.

PROJECT NO.

254246

**Falcons Landing PROJECT** Rolleston CLIENT GW Rolleston Ltd. CO-ORDINATES (NZTM) SHEET 1 of 1 E 1551633 METHOD DATE from 09/02/2017 to 09/02/2017 N 5171394 MACHINE & NO. ORIENTATION VERTICAL GROUND-LEVEL **+41.00** m RL NA

					1				
									STRATA DESCRIPTION
				Reduced Level	_	-		SUBORDINATE F	
ē	_	Tests	Samples	ve du	Depth (m)	Legend			RACTION, MAJOR FRACTION, MINOR FRACTION, COLOUR, RUCTURE, STRENBITH, MOISTURE CONDITION GRADING, BEDDING, PLASTICITY, ETC
Wai	level			E &	ع ۾	Leg		(NZ GEOTECHI	NICAL SOCIETY - FIELD DESCRIPTION OF SOIL AND ROCK)
F			Type Ref Depth 0.00		0.00		CII T with mi	aar aand and trace	of readlate, dark brown Dry law placticity, and fine to
			T			71/2 1/1/	medium. (TC	nor sand and trace o	of rootlets; dark brown. Dry, low plasticity; sand, fine to
						1. 7.1.	modium. (10	i coil)	
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						17. 11.			
						: <u>```</u>			
ľ					_	4.14.			
				+40.75	0.25	31/21/1	011 = 111		
						××	SILI with so	me sand; light browr	n. Dry, low plasticity; sand, fine to medium.
ŀ					-	×××			
			   HA			×××			
						× ×			
F					F	×××			
						× ×			
						× ×			
L					L	×			
						× ×			
						×××			
						×××			
F					_	×××	0.60m Becor	nes light brown with	orange mottles.
017						× ×		Ū	· ·
7 2			1	. 40.00	0.70	× ×			
- Ina				+40.30	0.70	×		Fnd of H	and Auger at 0.70m, on 09/02/2017
Fe								Termination Reason	on: Too difficult to auger, gravel encountered.
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191	Çm	lall Disturbed S	Sample V	- Water L	evel	1			REMARKS
<u>۲</u>		rge Disturbed S			-evei sion Pack	or Toet	LOGGED	J. MARTIN	
HAND A		rge Disturbed s T Liner Sample				ation Test			Co-ordinates were obtained from Google Earth and are approximate only.
SS4 H/		-	rbed Sample				DATE	09/02/2017	approximate only.
l GS					bility Tes				
	U100 Undisturbed Sample			' CHECKE	D. MAHONEY				
					DATE	40/02/2047			
Repor	Pis	ton Sample	~	In-situ	vane She	ar Test	DATE	10/02/2017	
	con N	New Zealand Lin	nited, , . Tel: Fax	:					



HOLE NO. HA108

PROJECT NO.

PROJECT	Falcons Landing Rolleston						
CLIENT	GW Rolleston Ltd.	CO-ORDINATES (NZTM)	SHEET	1	of	1	
METHOD	НА	E 1551688 N 5171292	DATE from	09/02/2017	to	09/02/2017	
MACHINE &	& NO NA	ORIENTATION VERTICAL	GROUND-L	F\/FI +4	1 00	m RI	

								STRAT	TA DESCRIPTION		
.	Tests	Samples	Reduced	£	р		SUBORDINATE FRACTION, MAJOR FRACTION, MINOR FRACTION, COLOUR, STRUCTURE, STRENGTH, MOISTURE CONDITION				
level			Red	Depth (m)	Legend		(NZ GEOTECH	GRADING, E NICAL SOCIE	BEDDING, PLASTICITY, ETC TY - FIELD DESCRIPTION OF SOIL	L AND ROCK)	
_		Type Ref Depth 0.00		0.00	\(\frac{1}{2\psi 1^N}\)\(\frac{1}{2\psi 1^N}\)	SII T with son	ne sand and trace	of rootlet	s dark brown Dry le	ow plasticity; sand, fine to	
					1/. 11/.	medium. (TO	PSOIL)	J1 1001101	o, dan brown. Dry, i	ow placticity, carra, into to	
					16.16						
					17. 117.						
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				-	<u>1</u> . <u>1 1 </u>						
			+40.75	0.25	× ×	OII Toolin		- D I.		. A P	
				L	××	SILT WITH SON	ne sand; light brow	n. Dry, ic	ow plasticity; sand, fir	ne to medium.	
		HA			× ×						
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				-	× ×						
					×××						
				L	××						
					× × ×						
					^ × ^						
				-	× ×	0.60m Becom	nes light brown with	orange	mottles.		
_		<b> </b>	+40.35	0.65	× ×				ger at 0.65m, on 09/0	02/2017	
							Termination Reas	on: Too	difficult to auger, gra	vel encountered.	
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Sma	II Disturbed \$	⊥ Sample <u>▼</u>	- Water L	_evel	I			REMA	RKS		
	e Disturbed			sion Pack	er Test	LOGGED	J. MARTIN			from Google Earth and are	
	Liner Sample	<u> </u>			ation Test	DATE	09/02/2017	approx	imate only.		
		urbed Sample	-	Permeability Test							
	) Undisturbe ket Penetrom		∃ Piezom Packer		ndpipe Tip	CHECKED	D. MAHONEY				
	on Sample	v		Vane She	ar Test	DATE	10/02/2017				
		mited, , . Tel: Fax			-						



HOLE NO. HA109

PROJECT NO.

PROJECT	Falcons Landing Rolleston						
CLIENT	GW Rolleston Ltd.	CO-ORDINATES (NZTM)	SHEET	1	of	1	
METHOD	НА	E 1551657 N 5172119	DATE from	09/02/2017	to	09/02/2017	
MACHINE	R NO NA	ORIENTATION VERTICAL	GROUND	E\/EI ±4	3 00	m Pl	

	Water level	Tests	Samples	Reduced	0.0 Depth 00 (m)	Legend			STRATA DESCRIPTION  RACTION, MAJOR FRACTION, MINOR FRACTION, COLOUR, RUCTURE, STRENGTH, MOISTURE CONDITION GRADING, BEDDING, PLASTICITY, ETC WICKL SOCIETY- FIELD DESCRIPTION OF SOIL AND ROCK)
-	<u>  e</u> %		Type Ref Depth 0.00	K 7	0.00	<u>a</u>	SILT with mir medium. (TO	nor sand and trace o	of rootlets; dark brown. Dry, low plasticity; sand, fine to
-					_				
-				+42.75	0.25	× × × × × × ×	SILT with sor medium.	ne sand; light browi	n with orange mottles. Dry, low plasticity; sand, fine to
-					_	× × × × × × × × × × × × × × × ×			
-			HA   		_	× × × × × × × × × × × ×			
) February 2017					_	× × × × × × × × × × × ×			
Report ID: AGS4 HAND AUGER RECORD    Project: FALCON'S LANDING LOGS.GPJ    Library: AGS 4_0.GLB    Date: 10 February 2017					_	× × × × × × × × × × × ×			
Library: AGS 4			<u> </u>	+42.00	1.00	* * * * * * * * * * * * * * * * * * *		End of H	and Auger at 1.00m, on 09/02/2017
IG LOGS.GPJ					_			Termination Reaso	on: Too difficult to auger, gravel encountered.
CON'S LANDIN					_				
RD    Project: FAL					-				
IGER RECOR	• ••	nall Disturbed S	Samnle ▼	Water L	evel				REMARKS
AND AL	La	rge Disturbed S	Sample	Impres	sion Pack		LOGGED	J. MARTIN	Co-ordinates were obtained from Google Earth and are
GS4 H/	Th	T Liner Sample in Wall Undistu	rbed Sample	Permea	ability Tes		DATE	09/02/2017	approximate only.
rt ID: A	Pocket Penetrometer Test			Piezometer / Standpipe Tip Packer Test			D. MAHONEY		
Repo	P/S Pis	ston Sample	~	In-situ	Vane Shea	ar Test	DATE	10/02/2017	



**HA110** HOLE NO.

PROJECT NO.

254246

**Falcons Landing PROJECT** Rolleston CLIENT GW Rolleston Ltd. CO-ORDINATES (NZTM) SHEET of 1 E 1551632 METHOD DATE from 09/02/2017 to 09/02/2017 N 5172044 MACHINE & NO. ORIENTATION VERTICAL GROUND-LEVEL +43.00 m RL NA

				_					STRATA DESCRIPTION
				99	_	-		SUBORDINATE F	RACTION, MAJOR FRACTION, MINOR FRACTION, COLOUR,
ā	<u> </u>	Tests	Samples	e <del>G</del>	l ta_	eu		STR	RACTION, MAJOR FRACTION, MINOR FRACTION, COLOUR, UCTURE, STRENGTH, MOISTURE CONDITION GRADING, BEDDING, PLASTICITY, ETC IICAL SOCIETY - FIELD DESCRIPTION OF SOIL AND ROCK)
7	level			Reduced Level	Depth (m)	Legend		(NZ GEOTECHN	IICAL SOCIETY - FIELD DESCRIPTION OF SOIL AND ROCK)
L <sup>2</sup>	- <del>-</del>		Type Ref Depth 0.00		0.00				
			0.00			1 2 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	SILT with mir	or sand and trace o	of rootlets; dark brown. Dry, low plasticity; sand, fine to
						1	medium. (TO	PSOIL)	
			HA I			F : :	`	,	
			₩	+42.90	0.10	11.11.11			
								End of H	and Auger at 0.10m, on 09/02/2017
								Termination Reason	on: Too difficult to auger, gravel encountered.
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• IGE	e-	nall Disturbed S	Sample V	Water L	evel				REMARKS
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S4 HAND A	La	rge Disturbed S			sion Pack			J. MARTIN	Co-ordinates were obtained from Google Earth and are
<b>≨</b>   []	SF	T Liner Sample	,	Standa	rd Penetra	ation Test	DATE	00/02/2047	approximate only.
8	Th	in Wall Undistu	rbed Sample	Permea	ability Tes	t	DATE	09/02/2017	
ğ		00 Undisturbed			-	ndpipe Tip	,  _		
			_			napipe III	, CHECKE	D. MAHONEY	
<u> ۲</u>		cket Penetrome		Packer					
Report ID: AGS4 HAND AUGER RECORD    Project FALCON'S LANDING LOGS.GP∪    Library: AGS 4_0.GLB    Date: 10 February 2017	Pis	ston Sample	~	In-situ	Vane She	ar Test	DATE	10/02/2017	
		Now Zooland ! !-	aited Tel. F						
Aur	econ	ivew ∠ealand Lin	nited, , . Tel: Fax						



**HA111** HOLE NO.

PROJECT NO.

PROJECT	Falcons Landing Rolleston					
CLIENT	GW Rolleston Ltd.	CO-ORDINATES (NZTM)	SHEET	1	of	1
METHOD	НА	E 1551728 N 5171996	DATE from	09/02/2017	to	09/02/2017
MACHINE 8	k NO. <b>NA</b>	ORIENTATION VERTICAL	GROUND-L	EVEL +42	2.00	m RL

	Water level	Tests	Samples	Reduced	00.0 Depth (m)	Legend	STRATA DESCRIPTION  SUBORDINATE FRACTION, MAJOR FRACTION, MINOR FRACTION, COLOUR, STRUCTURE, STRENGTH, MOISTURE CONDITION GRADING, BEDDING, PLASTICITY, ETC (NZ GEOTECHNICAL SOCIETY - FIELD DESCRIPTION OF SOIL AND ROCK)
-			Type Ref Depth 0.00		-		: (TOFSOIL)
ebruary 2017			HA	+41.75		x x x x x x x x x x x x x x x x x x x	SILT with minor sand; light brown. Dry, low plasticity; sand, fine to medium.
ANDING LOGS.GPJ    Library: AGS 4_0.GLB    Date: 10 February 2017				+40.90	1.10	x x x x x x x x x x x x x x x x x x x	0.80m Becomes brown with orange mottles and moist.
Report ID: AGS4 HAND AUGER RECORD    Project: FALCON'S LANDING LOG:			•	**************************************	-	X X	End of Hand Auger at 1.10m, on 09/02/2017 Termination Reason: Too difficult to auger, gravel encountered.
Report ID: AGS4 HAND AUGEF	● Small Disturbed Sample  Large Disturbed Sample  SPT Liner Sample  Thin Wall Undisturbed Sample  U100 Undisturbed Sample  U100 Undisturbed Sample  Pocket Penetrometer Test  Piston Sample  Water Level  Impression Packer Test  Standard Penetration Test  Permeability Test  Piezometer / Standpipe Tip  Packer Test  In-situ Vane Shear Test			sion Pack and Penetra ability Tes neter / Star Test	ation Test t ndpipe Tip	DATE <u>09/02/2017</u>	



**HA112** HOLE NO.

PROJECT NO.

PROJECT	Falcons Landing Rolleston					
CLIENT	GW Rolleston Ltd.	CO-ORDINATES (NZTM)	SHEET	1	of	1
METHOD	НА	E 1551781 N 5172081	DATE from	09/02/2017	to	09/02/2017
MACHINE 8	& NO. <b>NA</b>	ORIENTATION VERTICAL	GROUND-L	EVEL +4	2.00	m RL

_									
									STRATA DESCRIPTION
				bec		_		SUBORDINATE F	
	<u> </u>	Tests	Samples	Reduced Level	Depth (m)	pue		STR	RACTION, MAJOR FRACTION, MINOR FRACTION, COLOUR, UCTURE, STRENGTH, MOISTURE CONDITION GRADING, BEDDING, PLASTICITY, ETC
	Water level			Reduc	B E	Legend		(NZ GEOTECHI	VICAL SOCIETY - FIELD DESCRIPTION OF SOIL AND ROCK)
Ľ			Type Ref Depth 0.00		0.00		CIL T		for all the deale have been Down level to the second for the
			1 0.00			<u> </u>	SILT with mir medium. (TO	nor sand and trace o	of rootlets; dark brown. Dry, low plasticity; sand, fine to
						1. 11.	inedium. (10	PSOIL)	
						<u> </u>			
Γ						/			
				+41.80	0.20	71/			
ı				741.00	0.20	××	SILT with sor	ne sand; light browr	n with orange mottles. Dry, low plasticity; sand, fine to
						× ×	medium.	, 0	3, 1, 3, ,
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ANDING LOGS.GPJ    Library: AGS 4_0.GLB    Date: 10 February 2017			<b>*</b>	+41.30	0.70	× ×		End of H	and Auger at 0.70m, on 09/02/2017
Fe								Termination Reason	and Auger at 0.70m, on 09/02/2017 on: Too difficult to auger, gravel encountered.
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