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# Rosemerryn Subdivision, Lincoln

Stages 19 to 24 Geotechnical Investigation Report

#### Fulton Hogan Land Development Limited

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# 1 Executive Summary

#### Introduction

Fulton Hogan Land Development Limited is proposing to subdivide approximately 23ha area of rural land in Lincoln, for Stages 19 to 24 of the Rosemerryn residential subdivision. The site is located on the eastern side of the wider Rosemerryn Subdivision that is currently being developed and will comprise approximately 240 residential lots with reserves and roading.

Fulton Hogan Land Development Limited (FHLD) has engaged Aurecon New Zealand Ltd (Aurecon) to undertake a geotechnical investigation and assessment for Stages 19 to 24 of the Rosemerryn Subdivision, which is continuation of our work on the wider site since 2005. The purpose of the investigation is to assess the suitability of the land for residential development to characterise the risk of liquefaction and lateral spreading to the development and to provide a report to support the resource consent application.

#### **Geotechnical Investigations**

The geotechnical investigations comprised a review of Environment Canterbury (ECan) well logs and previous geotechnical investigations undertaken across the site since 2011, Cone Penetration Tests (CPTs), piezometer installations and Multi-channel Analysis of Surface Waves (MASW) soundings.

Based on the results of our geotechnical investigations, the ground conditions across the site can separated into three different ground profiles based on the depth to the underlying gravel. To the north, gravel is at relatively shallow depths of 2m or less, with the depth to gravel deepening towards the south. At the southern corner of the site the gravels are approximately 7m below ground level. The gravel is overlain by interbedded loose to medium dense Sands and Silty Sands, and firm to stiff Sandy Silts and Silts.

Piezometer readings indicate groundwater levels in the order of 1.4m to 1.5m depth, with the exception of BH203 adjacent to the stream, which indicated water at 1m depth. It is noted that groundwater levels will vary seasonally or following prolonged rainfall.

#### Liquefaction Assessment

A liquefaction assessment has been carried out at the site and the results indicate the following:

- Based on the O'Rourke et. al. (2012) PGA model the site has been "sufficiently tested" (MBIE Guidelines (2012)) 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). Therefore, we have used the lack of ground damage observed at the site after the 4 September 2010 earthquake event to help calibrate our liquefaction assessment.
- The GNS Science report on liquefaction (GNS, 2012), a review of aerial photography, and site observations made by Aurecon and Fulton Hogan staff confirms that there was no evidence of liquefaction observed at the site after the 4 September 2010 Darfield earthquake, or any subsequent earthquakes part of the Canterbury Earthquake Sequence.
- In the northern part of the site, liquefaction induced settlements and damage are likely to be minimal and consistent with a TC1 classification while elsewhere the calculated liquefaction induced settlements and assessed ground damage are consistent with TC2 and TC3 classifications. However, when compared to actual site performance, the level of calculated damage is well overstated, as the back analysis indicates that moderate to major ground damage should have occurred when only limited to minor damage was observed at and around the site.

- The liquefaction induced lateral spreading potential is considered to be minor.
- Based on our liquefaction assessment, and the limited evidence of ground damage, we infer that only minor to moderate land damage from liquefaction is possible in future large earthquakes at parts of the site.

#### **Technical Category Classification**

Based on our liquefaction assessment we consider that the northern part of Stage 19 to 24 is consistent with the classifications of **Technical Category 1 (TC1)** and the remainder of the site is consistent with the classification of **Technical Category 2 (TC2)**. Across Stages 19 to 24 future land damage from liquefaction is unlikely in the Technical Category 1 area, and possible in the Technical Category 2 area in future large earthquakes. The locations of the Technical Category zones are shown on see Figure 11 in Appendix A.

#### **Bearing Capacity**

Based on the available investigation logs it is unlikely that shallow bearing for a typical house foundation of 300kPa ultimate bearing capacity will be achieved. Therefore "good ground" as per New Zealand Standards Timber Framed Buildings (NZS3604:2011) and Concrete Masonry Buildings Not Requiring Specific Engineering Design (NZS4229:1999) will not be met at this site and specifically designed foundations will be required based on the building consent investigations.

Therefore, irrespective of any potential liquefaction risk at the site, typical light weight timber framed or masonry houses (which would generally be designed within the guidelines of NZS3604:2011 or NZS4229:1999) will require specific foundation investigation and design (which are outside the scope of this report). We believe, that TC2 enhanced slab foundations will be suitable for soils with bearing capacities of 200kPa or more. Where lower bearing capacities are encountered shallow foundations can be specifically designed to ensure deformations are within acceptable limits. Based on our experience we believe that TC2-type enhanced slab foundations or robust rib rafts will be suitable for the lower bearing capacity soils. These foundation types will also mitigate the impact from shallow liquefaction induced land damage.

Site specific testing (including hand augers and DCPs) will be required on all lots to confirm the actual ground conditions and to determine available bearing capacities.

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

A risk assessment approach has been undertaken on the significant geotechnical hazards that may affect the site (see Appendix I). Based on this assessment we consider that there are no significant geotechnical hazards at the site other than the potential for earthquake induced soil liquefaction. However, provided that the geotechnical recommendations provided within this report are followed, and the appropriate engineering measures are implemented, then we consider that the development is unlikely to be affected by significant geotechnical hazards nor will the development worsen, accelerate or result in material damage. **Therefore, from a geotechnical perspective we consider that the residential subdivision development will comply with the requirements of RMA Clause 106.** 

The geotechnical investigations were aimed at assessing the site for geotechnical suitability for subdivision into residential lots with associated access roads and rights-of-way. Detailed design of house foundations is not part of this report and will need to be undertaken by the individual lot owner. This report shall be read as a whole and our limitations are provided in Section 8.

# 2 Introduction

Fulton Hogan Land Development Limited is proposing to subdivide approximately 23ha area of rural land in Lincoln, for Stages 19 to 24 of the Rosemerryn residential subdivision. The site is located on the eastern side of the wider Rosemerryn Subdivision that is currently being developed and will comprise approximately 240 residential lots with reserves and roading.

Fulton Hogan Land Development Limited (FHLD) has engaged Aurecon New Zealand Ltd (Aurecon) to undertake a geotechnical investigation and assessment for Stages 19 to 24 of the Rosemerryn Subdivision, which is continuation of our work on the wider site since 2005. The purpose of the investigation is to assess the suitability of the land for residential development, and to characterise the risk of liquefaction and lateral spreading to the development. The scope of the works undertaken was as follows:

- A detailed desk study of readily available geological and geotechnical information available for this site.
- A site walkover by a Senior Engineering Geologist.
- Review the existing geotechnical work carried out in the area by Aurecon.
- Undertake further geotechnical investigations comprising of fifteen cone penetration tests, installation of five piezometers and MASW soundings.
- A liquefaction analysis using latest MBIE and NZGS Guidelines to identify the liquefaction potential of the underlying natural soils and to confirm the technical categories across the site based on the liquefaction assessment.
- Provide recommendations on potential liquefaction remediation options for the site.
- Provide recommendations for further testing (if required).
- Assess the site against Section 106 of the Resource Management Act (RMA).
- Prepare a geotechnical investigation report for Rosemerryn Subdivision Stages 19 to 24.

This geotechnical report presents the results of our geotechnical investigations and assessment, confirms the suitability of the land for residential development, as well providing recommendations for site development.

Our work has been carried out under the existing ACENZ/IPENZ Short Form Agreement between FHLD and Aurecon, as per Aurecon's fee proposals dated 24 April 2018. Approval to proceed was given by Greg Dewe on 25 April 2018.

Our limitations are provided in as Section 8 of this report and this report shall be read as a whole.

# 3 Site Conditions

# 3.1 Site Description

The site is located on the eastern side of the wider Rosemerryn subdivision (See Figures 1 and 2 in Appendix A and the Davie Lovell Smith drawing in Appendix B). The main site features are:

- The site has an approximate area of 23ha and has an irregular rectangular shape.
- The site topography is relatively flat with less than 1.5m height change across the area.
- The site is bound to the north by rural land, to the west by previous stages of the Rosemerryn Subdivision, to the south by Edward Street and to the east by Ellesmere Road.
- There is a small stream which runs through the Rosemerryn subdivision and divides the northern section from the southern section. The stream is approximately 0.5m deep and 2m to 3m wide with no significant bank.
- The site is currently being used for pastoral and crop farming and is covered in grass with localised shelter belts along the fence lines.
- Current drainage is inferred to be via direct soakage to the ground or via runoff to the small stream.

# 3.2 Regional Geology

The geology of the site is shown on the Geological and Nuclear Sciences Map 16, Geology of Christchurch area, scale 1:25,000 (compiled by Forsyth, Barrell and Jongens, 2008). The map indicates that the site is underlain by *grey river alluvium beneath plains of low-level terraces (Q1a)*.

# 3.3 Seismicity

The GNS Science Active Fault System database (GNS, 2012a and 2012b) indicates that the site is within an area of recent seismic activity known as the Canterbury Earthquake Sequence (CES) and is approximately:

- 12km south-east of the eastern extension of the Greendale Fault, which was responsible for the Magnitude M<sub>w</sub>7.1 Darfield (Canterbury) Earthquake on 4 September 2010.
- 16km south-west of the epicentre of the Magnitude M<sub>w</sub>6.2 Christchurch Earthquake on 22 February 2011 (GNS, 2011b);
- 21km south-west of the epicentre of the Magnitude  $M_w6.0$  major aftershock on 13 June 2011 (GNS, 2011b); and
- 23km south-west of the epicentre of the Magnitude M<sub>w</sub>5.9 major aftershock on 23 December 2011 (GNS, 2011b).

Based on the O'Rourke et. al. (2012), as shown on the New Zealand Geotechnical Database, peak ground accelerations of approximately 0.33g were experienced at the site during the 4 September 2010 Darfield Earthquake.

# 3.4 Recorded Earthquake Damage

Based on the GNS 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 ground damage after the 4 September 2010 or 22 February 2011 earthquakes. Minor surface expression of liquefaction was observed in areas 500m southeast of the site. The locations of observed damage are shown in Figures 3 and 4 in Appendix A.

Based on reviews of aerial photography, discussions with Fulton Hogan staff who are familiar with the site, and Aurecon site walk overs in 2011, 2012, 2013, 2015 and 2018, no surface expression, of liquefaction or land cracking occurred within the proposed subdivision. The lack of observations of liquefaction induced ground damage is consistent with the GNS report.

### 3.5 MBIE Land Classification

The current land classification for the site, according to the Ministry of Business Innovation and Employment (MBIE) Technical Categories map, is "*N/A – Rural & Unmapped*". To the east of the site on the eastern side of Ellesmere Road it is classified as "*Technical Category 2*" and to the west of the site it is classified as "*Technical Category 1*".

"*N/A* – *Rural & Unmapped*" means that normal consenting procedures apply in these areas. "*Technical Category 1*" means that future land damage from liquefaction is unlikely, and ground settlements are expected to be within normally accepted tolerances. Standard foundations (NZS 3604) are acceptable in TC 1 areas subject to shallow geotechnical investigation. "*Technical Category 2*" means that minor to moderate land damage from liquefaction is possible in future large earthquakes. Lightweight construction or enhanced foundations are likely to be required such as enhanced concrete raft foundations (i.e. stiffer floor slabs that tie the structure together).

# 4 Geotechnical Investigations

# 4.1 General

The objective of the geotechnical review and site investigation was to determine the ground and groundwater conditions across the site in order to assess the suitability of the site for subdividing into residential sections.

Geotechnical investigations have been carried out across the site at various stages since August 2011 with more recent investigations in Stages 19 to 24 carried out in May 2018. As part of our assessment for the site we have reviewed previous investigations on and around Stages 19 to 24, as well as the results from the recent investigations.

The geotechnical review and investigation included the following information:

- Readily available Environment Canterbury well logs from Canterbury Maps.
- Previous geotechnical investigations, which comprised geotechnical boreholes, test pits, cone penetration tests (CPT) and Multi-channel Analysis of Surface Waves (MASW).
- Additional investigations which comprised
  - Fifteen CPTs to target depths of 10m or refusal.
  - Four piezometers installed to depths ranging from 3m to 5m.
  - One geotechnical borehole to 12m with standard penetration tests (SPT) at 1.5m centres and piezometer installation.
  - o 1,125m of MASW lines.

Details of the geotechnical investigations is presented in the following sections.

### 4.2 Environment Canterbury Well Logs

A review of the Canterbury Maps and Environment Canterbury GIS Database (ECan, 2015) indicates five Environment Canterbury boreholes with logs on the site. The borehole logs, locations, and depths are summarised in Table 1 below.

Borehole	Location	Depth	Groundwater Depth	Summary of Stratigraphy
M36/8674	South western corner of the site	6.0m	1.1m	<ul> <li>0 to 0.2m – Topsoil</li> <li>0.2 to 6.0m – Silty Clay</li> </ul>
M36/8675	On the eastern side of the site	5.8m	1.5m	<ul> <li>0 to 0.2m – Topsoil</li> <li>0.2 to 3.6m – Silty Clay</li> <li>3.6 to 5.8m – Silty Sandy Gravel</li> </ul>
M36/8676	On the west side of the site, north of the stream	5.2m	1.6m	<ul> <li>0 to 0.2m – Topsoil</li> <li>0.2 to 3.6m – Sandy Silt, Silt and Silty Clay</li> <li>3.6 to 5.2m – Gravel</li> </ul>
M36/8679	On the western side of the northern part of the site	5.8m	1.1m	<ul> <li>0 to 0.2m – Topsoil</li> <li>0.2 to 4.2m – Sandy Silt and Silty Clay</li> <li>4.2 to 5.8m – Gravel</li> </ul>

Table 1: Summary of ECan borehole logs

Borehole	Location	Depth	Groundwater Depth	Summary of Stratigraphy
M36/8680	North western corner of the site	6.7m	1.4m	<ul> <li>0 to 0.2m – Topsoil</li> <li>0.2 to 3.2m – Silty Sand and Silty Clay</li> <li>3.2 to 6.7m – Gravel</li> </ul>

The locations of the ECan borehole logs are presented in Figure 5 in Appendix A and the borehole logs are presented in Appendix C.

### 4.3 **Previous Geotechnical Investigations**

Previous investigations carried on and around Stages 19 to 24 have comprised of geotechnical boreholes, test pits, cone penetration tests (CPT) and Multi-channel Analysis of Surface Waves (MASW). A summary of the previous investigations is presented in Table 2.

Year	Testing Type	Relevant Test
2011	Boreholes	BH3 and BH4
2011	CPTs	CPT18 to CPT27
2011	Test Pits	TP33 to TP47
2012	CPTs	CPT1, CPT2, CPT4 and CPT27
2012	Test Pits	TP1
2013	CPTs	CPT19, CPT, 21 and CPT22
2015	Boreholes	BH102 and BH103
2015	MASW	3.1km of MASW line carried out of which approximately 1.1km is in Stage 19 to 24.

Table 2: Summary of relevant previous investigations

The location of these investigations is presented in Figures 6 and 7 in Appendix A and the logs are presented in Appendix D.

# 4.4 Recent (2018) Investigations

#### 4.4.1 Cone Penetration Testing

An additional 15 Cone Penetration Tests (CPT) were undertaken within Stages 19 to 24 between 18 and 22 May 2018. The CPTs were undertaken by McMillan Drilling using a track mounted CPT rig and the tests were undertaken to effective refusal (tip pressure reaching 40MPa) of the rig at 2m to 7m depth. The CPT locations are shown in Figure 6 in Appendix A and the logs are presented in Appendix E.

#### 4.4.2 Boreholes and Piezometers

Five machine boreholes were drilled to install piezometers between 17 and 18 May 2018 to allow the ongoing measurement of groundwater levels. The piezometers were drilled and installed by McMillan Drilling using a track mounted dual tube rig. As the purpose of the boreholes was to install the piezometers, Boreholes BH201 to BH204 in Stages 19 to 24 were blind driven to the required depths (3m to 5m) with no soil recovered for logging. Borehole BH205, located to the west in a previous stage, was carried out at a

new sewer proposed pump station location. This borehole was drilled to a target depth of 12m with Standard Penetration Tests (SPT) at 1.5m centres and a piezometer installed with the response zone at 7m depth. Soil recovered from the borehole was logged by a Geotechnical Engineer from Aurecon, in accordance with NZ Geotechnical Society's *Guideline for the Field Classification and Description of Soil and Rock for Engineering Purposes* (NZGS, 2005).

Although Borehole BH205 is not located in Stages 19 to 24, it has been included in this report to provided information on groundwater levels. The piezometer installations comprised of 32mm pipe with 1m slotted section at the base of the hole. The locations of the boreholes are shown in Figure 6 in Appendix A and the driller's logs are presented in Appendix F.

Previous work at Rosemerryn has found relatively complex groundwater conditions across the site with a phreatic surface at shallow depths and sub-artesian pressures within the underlying gravels. The depth to groundwater has been critical in the determining the likely site performance and hence piezometers were installed at varying depths across the site. The depth of the piezometers installation is presented in Table 3.

Borehole	Depth of Installation	Comments
BH201	5m	Installed in the underlying gravel to monitor sub-artesian pressures
BH202	3m	Installed in the overlying silts and sands to measure the phreatic surface.
BH203	3m	Installed in the overlying silts and sands to measure the phreatic surface.
BH204	4m	Installed in the overlying silts and sands to measure the phreatic surface.
BH205	7m	Installed in the underlying gravel to monitor to sub- artesian pressures

In addition to the piezometers, groundwater level observations were taken in tests holes carried out at the various investigation stages. These groundwater levels are likely to be less accurate than those measured in the piezometers but they can provide indicative values to correlate between piezometers.

#### 4.4.3 MASW Soundings

Five Multi-channel Analysis of Surface Waves (MASW) profile lines were undertaken by Southern Geophysical Limited in May 2018. These profile lines had a total length of 1,125m and comprised individual MASW soundings at approximately 10m centres.

From the MASW soundings, shear wave velocity profile sections have been produced for the upper 25m of the soil profile. The MASW soundings were undertaken to obtain information between the physical control points (CPT, borehole and test pits). MASW provided information on the depths of the gravel layer as well as the presence of sand lenses within the gravel layer. The locations of the profile lines are shown in Figure 7 in Appendix A and the velocity profiles are presented in Appendix G.

The shear wave velocity (Vs) profiles when calibrated to the CPT, test pit and borehole logs indicate:

- Upper Sands and Silts Vs < 180m/s
- Gravels (Upper 10m) 180m/s <  $V_{\rm s}$  < 350 m/s
- Sand Lenses  $180m/s < V_s < 220 m/s$  (only apparent in northern part of site)
- Gravels (Deeper) 350m/s < Vs

# 5 Engineering Considerations

# 5.1 General

Fulton Hogan Land Development Limited is proposing to subdivide 23ha of rural land in Lincoln into Rosemerryn Stages 19 to 24. The subdivision will comprise approximately 240 residential lots as well as reserve areas and road. The Ministry of Business, Innovation and Employment (MBIE, 2012) guidelines on residential development, requires that ground conditions and geotechnical hazards, including liquefaction, are assessed and, based on the result of this assessment, mitigation measures (if required) can be developed.

This section of the report presents the:

- Geotechnical ground model for the site.
- Potential for seismically induced liquefaction.
- Implications for building foundations.
- Assessment against the Resource Management Act (RMA) Section 106.

# 5.2 Geotechnical Ground Model

#### 5.2.1 Ground Conditions

Based on the results of our geotechnical site investigation results, including calibration on the MASW soundings with intrusive investigations, the ground conditions across the site can be separated into three ground profiles. These ground profile areas are presented in Figure 8 in Appendix A and are summarised in Tables 4, 5 and 6.

Unit	Depth to Start of Layer	Depth to End of Layer	Material
1	Surface	0.2 to 0.3m	Topsoil
2	0.2 to 0.3m	0.6 to 2.1m	Loose to medium dense Sands and Silty Sands interbedded with layers of stiff Sandy Silts and Silts
3	0.6 to 2.1m	10m onwards	Predominately medium dense to very dense Sandy Gravels and Gravel with occasional sand lenses up to 1.5m thick

#### Table 4: Inferred Ground Profile 1 (Northern section of site)

#### Table 5: Inferred Ground Profile 2 (Middle section of site)

Unit	Depth to Start of Layer	Depth to End of Layer	Material
1	Surface	0.2 to 0.7m	Topsoil
2	0.2 to 0.7m	2.5 to 4.2m	Loose to medium dense Sands and Silty Sands interbedded with layers of firm to stiff Sandy Silts, Silts and Clayey Silts
3	2.5 to 4.2m	15m onwards	Medium dense to very dense Sandy Gravels and Gravels

#### Table 6: Inferred Ground Profile 3 (Southern section of site)

Unit	Depth to Start of Layer	Depth to End of Layer	Material
1	Surface	0.2 to 0.4m	Topsoil
2	0.2 to 0.4m	5.1m to 7.1m	Loose to medium dense Sands and Silty Sands interbedded with layers of soft to firm to stiff Sandy Silts, Silts and Clayey Silts
3	5.1m to 7.1m	15m onwards	Medium dense to very dense Sandy Gravels and Gravels

The main difference between the above soil profiles lies in the depth to the gravel layer. The gravel is at relatively shallow depths in the north part of the site and deepens to the south. Aspects of note are as follows:

- Sand lenses are present within the gravel in the northern section of the site (Ground Profile 1), as noted in Borehole BH102 at 4.56m depth, MASW Line 4 Chainage 20m, and MASW Line 10 Chainage 217m. The sand lenses appear to be limited in extent, with one lens logged as approximately 1.5m thick.
- The top of the gravel in the middle section of the site (Ground Profile 2) is not a consistent surface but appears to be undulating, which likely reflects the deposition environment where the undulation represents old eroded channels that are now infilled.
- Similar to Ground Profile 2, the top of the gravel in the southern section of the site (Ground Profile 3) varies, with areas of deeper gravel such as on the western side next to Stage 18. As above the variable depth to gravel is likely to reflect the deposition environment of old eroded channels within the gravel that are now infilled.
- In the upper soil profile in the southern section of the site there are soft silt layers interbedded with firm and stiff silt layers. Generally, these soft layers are limited in thickness ranging from 0.2m to 0.5m thick and are typically below 2.5m depth.

The ground conditions encountered in Stage 19 to 24 are consistent with those of the previous subdivision stages to the west.

#### 5.2.2 Groundwater

The depth to groundwater is considered critical in the determining the likely site performance and therefore our assessment of the groundwater level has been carried out based on the ECan groundwater model, piezometer readings and groundwater levels encountered during the investigations.

ECan groundwater models available on Canterbury Maps, provide a depth to groundwater for wells installed at depth, presumably measuring piezometric pressures in the underlying gravel formations. A review of shallow wells located nearby monitored by ECan since 1980's indicates variable groundwater levels over the year with deeper groundwater levels from late November to early May and higher levels from late May to early November. The groundwater variability over the course of the year ranges from 0.8m to 1.2m. So, groundwater levels are expected to vary seasonally or with period of high or low precipitation.

Shallow piezometer readings indicate groundwater levels in the order of 1.4m to 1.5m depth, with the exception of BH203 adjacent to the stream, which indicates groundwater at 1m depth. The relative levels (RL) based on these depths are presented in Table 7.

Borehole	Groundwater Depth (m)	Groundwater RL (m)
BH201	1.4	8.6
BH202	1.5	7.8
BH203	1.0	8
BH204	1.5	6.6
BH205	1.5	8.7

#### Table 7: Groundwater levels and relative levels

Boreholes BH201 and BH205, installed in the underlying gravels, have consistent groundwater levels and RL, which is likely to represent the sub-artesian groundwater levels within the gravel. It is anticipated that this groundwater level will vary depending on the time of year and the recharge of the gravel layer. Given that this artesian pressure is within the gravel layer, it is not anticipated to govern the shallow groundwater level in the overlying soils, or influence the site liquefication potential.

Boreholes BH202 to BH204, installed at shallower depths, are likely to represent the phreatic groundwater surface across the site. Based on a review of the groundwater depth, the depth to groundwater appears to be consistent across the site at 1.5m depth but is a 1m depth near the stream running through the centre of the site. The shallower depth may be influence by the presence of ponded water in the stream channel, or possibly there is a zone of elevated groundwater levels due to the interaction of the stream and groundwater levels in the underlying soil profile. Reviewing the groundwater level RLs indicates a general fall in water level towards the south, with an elevated RL around the stream.

The levels in Table 7 above were taken in late May, and based on water levels in the ECan wells are likely to be above median groundwater levels and hence, are considered to be suitable for assessing the site future land performance. The groundwater levels across the site are presented in Figure 9 in Appendix A.

The groundwater levels in Table 7 have been compared to groundwater levels encountered during the course of the various investigation, from observations within test pits and boreholes, and from dipping CPT holes. Although observations during investigations may not be accurate as measured groundwater levels, there does appear to be a reasonable level of correlation between groundwater levels in the test holes and the piezometric information on Table 7 discussed above.

It is noted that the groundwater levels in the northern part of the site are higher than those measured in the adjacent previous stages (Stage 10 to 18), but the site topography in Stage 19 to 24 is slightly lower, which will account for the relatively higher groundwater level. Further to the south a higher groundwater level of 1m has been used in the past on the previous stages, but given that the above groundwater levels have been measured from piezometers we consider the levels in Table 7 to be more accurate.

### 5.3 Site Flexibility

We have assessed the site flexibility based on the following:

- Site stratigraphy comprises approximately sands and silts underlain by gravels to at least 15m depth (maximum depth investigated at the site).
- Clause 3.1.3 and Table 3.2 of NZS 1170.5:2004.

We consider that the site subsoil category in terms of NZS 1170.5:2004 Clause 3.1.3 is Class D (Deep soil site).

# 5.4 Liquefaction Assessment

#### 5.4.1 General

Under cyclic loading (i.e. during an earthquake) loose, non-cohesive materials such as gravels, sands, siltysands, tend to decrease in volume. This tendency to decrease in volume is much greater in loose than in dense soils. When loose non-cohesive soils are saturated and rapid loading occurs under undrained conditions, the soils 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 liquefaction occurs when the effective stress drops to zero. Liquefaction can lead to large displacements of foundations, flow failures of slopes and ground surface settlement, sand boils, and post-earthquake stability failures.

In determining the liquefaction potential at the site, the main factors to be considered are:

- How has the site performed during the major seismic events of the Canterbury earthquake sequence?
- Which layers have liquefied?
- What is the likelihood of further liquefaction in the future?
- How the potential liquefaction affects the development?

Each of these is considered below.

#### **Observations after Previous Major Earthquake Events**

As outlined in Section 3.4 there is no evidence of liquefaction observed at the site after the 4 September 2010 Darfield Earthquake or any subsequent earthquakes during the Canterbury Earthquake Sequence. This suggests limited potential for soil liquefaction at the site for shaking levels close to a ULS design event.

#### **Potential for Liquefaction**

Three primary factors contribute to liquefaction potential:

- Soil grading and density.
- Groundwater.
- Earthquake intensity and level of ground shaking.

Each of these is discussed below.

#### Soil Grading and Density

The CPT logs show layers of loose to medium dense sands, silty sands and sandy silts. These layers are considered to be potentially susceptible to liquefaction from a soil grading and density perspective.

#### Groundwater

We have adopted a groundwater level of 1.5m below ground level for most of the site with an elevated groundwater level at 1m around the stream. Therefore, soils are potentially liquefiable from a depth of 1m to 1.5m from a saturation criterion. It should be noted that groundwater levels are subject to seasonal changes.

#### Earthquake Intensity and Level of Shaking

The level of ground shaking is one of the key factors in determining whether liquefaction will or will not occur. For this analysis, we have assessed three design levels of shaking. The residential structures to be constructed on site will likely be classified as Importance Level 2 (IL2) structures in accordance with Table 3.2 of the New Zealand structural loadings standard (NZS 1170.0.2004) and the building will have a nominal 50 year design life. To determine the design level for earthquake shaking we have adopted the MBIE/NZGS (2016) recommendations, which correspond to design level earthquake events as follows:

- ULS shaking a M<sub>w</sub>7.5 earthquake with 0.35g peak ground acceleration (PGA)
- SLS-a shaking a M<sub>w</sub>7.5 earthquake with 0.13g PGA
- SLS-b shaking a Mw6.0 earthquake with 0.19g PGA

For an Ultimate Limit State (ULS) earthquake, buildings are expected to retain their structural integrity and form and not endanger life. Some plastic deformation of structural elements within the structure is expected to occur but ideally the damage can be repaired and the structure can be returned to service after the event, although repair may be uneconomical.

For a Serviceability Limit State (SLS) earthquake, buildings are expected to perform well for the SLS event and be returned to service after limited repair.

In addition, we have assessed two peak ground acceleration cases of the 4 September 2010 earthquake event as a back analysis of past event to calibrate the liquefaction assessment. We have considered the 4 September 2010 Darfield earthquake as there is PGA data available from the O'Rourke et al (2012) model that extended into Lincoln area. The model indicates PGAs of 0.33g.

Based on this PGA model and the MBIE Guidelines (2012) the site has been 'sufficiently tested' as the PGA for the 4 September 2010 event exceeded 170% of the SLS PGA (i.e. 1.7 x 0.13g = 0.22g). For the assessment we have used a PGA of 0.33g as well as a lower bound PGA of 0.19g (i.e. 0.33g/1.7) to account for any uncertainty in the model. The levels of shaking used for our analysis are presented in Table 8.

The 4 September 2010 event shaking parameters are similar to ULS design event, while the lower bound 4 September 2010 event shaking parameters are similar to SLS-b design event. Given these comparable ground shaking parameters and that the site has been sufficiently tested, we consider the ground damage observations at the site after the 4 September 2010 earthquake event can be used to calibrate our liquefaction assessment.

Earthquake Event	Magnitude	Peak Ground Acceleration
4 September 2010-a	M <sub>w</sub> 7.1 <sup>(1)</sup>	0.33g <sup>(1)</sup>
4 September 2010-b	M <sub>w</sub> 7.1 <sup>(1)</sup>	0.19g <sup>(2)</sup>
ULS	M <sub>w</sub> 7.5	0.35g
SLS-a	M <sub>w</sub> 7.5	0.13g
SLS-b	M <sub>w</sub> 6.0	0.19g

#### Table 8: Earthquake design level events for liquefaction analysis

- (1) Magnitude and peak ground acceleration from O'Rourke et. al. (2012) (as shown on the NZGD 2018)
- (2) Approximately 60% (1/170%) of the peak ground acceleration of the O'Rourke et. al. (2012) to account for uncertainty of PGA model

#### 5.4.2 Liquefaction Potential Assessment

The ground investigations show that the site is directly underlain by sandy and silty soils which in turn is underlain by predominately gravels with some sand lenses. Based on the geotechnical investigations the gravels have been assessed to be non-liquefiable in design level events due to the recorded relative densities and grain size distribution. Therefore, to define the liquefaction hazard at the site we need to assess the liquefaction potential of the upper soils as well as the sand lenses within the gravel layers.

To assess the liquefaction potential of the sand lenses we have considered the relative density of the sandy layers from the SPT and shear wave velocity data, and to assess the liquefaction potential of the upper soils we have used a cone penetration test (CPT) results.

#### Liquefaction in the Deeper Soil Layers

Sand lenses within the underlying gravels were encountered in Borehole BH102 (2015) and are inferred from the MASW soundings, where there are shear wave velocities between 180m/s and 220m/s. The sand lenses appear to be localised in the northern part of the site.

To assess liquefaction of these sand lenses we have considered:

- SPT testing undertaken in this layer
- Shear wave velocity profiles obtained from the MASW soundings
- Consideration of past land performance including the mechanism of liquefaction triggering and the likely damage from it occurring and the previous observed lack of damage.

Using the single SPT (BH102 at 4.56m depth) from a sand lenses we have assessed the liquefaction potential of this layer based on the Boulanger and Idriss (2014) SPT based liquefaction assessment method assuming a clean sand. The calculated factors of safety are shown in Table 9.

Earthquake Event	Calculated Factor of Safety Against Liquefaction		
4 September 2010-a	0.4		
4 September 2010-b	0.7		
SLS-a	1.0		
SLS-b	0.8		
ULS	0.4		

#### Table 9: Summary of SPT based liquefaction analysis for sand lenses

From this SPT based liquefaction assessment, the sand lenses are assessed as being liquefiable even at relatively low levels of shaking. The calculated factor of safety against liquefaction for 4 September 2010 event lies between the factors of safety for a SLS and ULS design event.

To supplement this SPT result we have also considered the shear wave velocity obtained from the MASW soundings. The sand lenses have a shear wave velocity of less than 215m/s which, based on Idriss and Boulanger (2008), is the maximum shear wave velocity for liquefiable soils. The liquefaction analysis considered shear wave velocity from the MASW investigation using the method of Kayen et al (2013). We have taken the shear wave velocity profiles of MASW Line 4 Chainage 20m and MASW Line 10 Chainage 217m, which both had a low velocity pocket at depth inferred to be sand lenses in the gravel. This analysis indicates that the sand layers have a factor of safety as summarised in Table 10.

Earthquake Event	Calculated Factor of Safety Against Liquefaction		
4 September 2010-a	0.5 to 0.6		
4 September 2010-b	0.9 to 1.0		
SLS-a	>1.0		
SLS-b	>1.0		
ULS	0.4 to 0.5		

#### Table 10: Summary of Vs based liquefaction analysis for sand lenses

The shear wave velocity method indicates that there is the potential for liquefaction of the sand lenses. However, in MASW Line 4 Chainage 20m the liquefiable layer is at 6.5m depth and in MASW Line 10 Chainage 217m the liquefiable layer is at 7m depth. In both case these are overlain by medium dense to dense gravel from ground level.

In addition, we have considered the mechanism of the liquefaction process. When loose non-cohesive soils are saturated and rapid loading occurs under undrained conditions, the soils 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 liquefaction occurs when the effective stress drops to zero. However, as these sand lenses as surrounded by gravel, drainage is likely to occur, limiting and reducing the build-up of excess pore water pressure, and thus reducing the liquefaction potential of these sand lenses.

The effects of these sand lenses liquefying also required needs to be considered. The log of Borehole BH102 indicates 4.5m of medium to very dense gravels overlying the potentially liquefiable sand lenses, while the MASW profiles indicate 6.5m to 7m of medium to very dense gravels overlying the potentially liquefiable sand lenses. This depth of gravel will form a thick non-liquefiable crust, which based on observations in Christchurch during the CES is likely to supress liquefaction induced ground damage on shallow founded structures, even if these sand layers were to liquefy.

Lastly, no significant ground damage, including settlement or land cracking, was observed across areas with and without sand lenses, which suggests that either theses layers did not liquefy, or the upper gravel layer has supressed the surface expression of liquefaction induced damage in these areas.

Based on this assessment we consider the that liquefaction effects occurring in these deeper localised sand lenses will have minimal effect on shallow founded domestic structures and therefore we have not considered it further in our assessment. Instead we have focussed on liquefaction in the upper soils as the main mechanism that could drive land damage in Stages 19 to 24.

#### Liquefaction in the Upper Soil Layers

#### Methodology

The ability for the subsoils to resist the effect of ground shaking associated with the design level events has been assessed from the upper subsoil information obtained from the CPTs. The liquefaction assessment was carried out using the methods outlined in MBIE Guidelines (2014) and are summarised in Table 11.

#### Table 11: Liquefaction Assessment Methodology Summary

Test	Liquefaction Assessment <sup>(1)</sup>	Fines Content	Liquefaction Cut Off	Liquefaction Settlement Method <sup>(2)</sup>
CPT	Boulanger and Idriss (2014)	Based on a soil Character Index (I <sub>c</sub> ) with a Co-efficient for Fines Content ( $C_{fc}$ ) =0	Based on a 2.6 l₅ cut off	Zhang et al (2002)

(1) A 15% probability of liquefaction (PL) has been considered with all methods.

(2) We note that there is an inherent uncertainty when identifying liquefiable layers in CPT analysis, due to this inherent uncertainty, calculated settlements will likely differ from actual settlements experienced on site.

The fines content fitting parameter has been set as 0 as no laboratory testing has been undertaken on the soils at the site. Layers within the upper soils were inferred to be clayey silts to organic silts ( $I_c$  greater than 2.6). As limited laboratory testing has been carried out to aid in determining a liquefaction cut off on the soils underlying the site, soils have been assumed to be non-liquefiable where the CPT Soil Character Index,  $I_c$ , is greater than 2.6.

#### Liquefaction Effects

Liquefaction can have a number of effects on buildings and land. In this assessment we have considered the following effects:

- Liquefiable layers.
- Liquefaction induced reconsolidation settlement.
- Liquefaction induced ground damage.

These are discussed in the following sections:

#### Liquefiable Layers

The layers which may liquefy in a design level event are critical in regards to the foundation performance. The Boulanger and Idriss (2014) method has been used in this assessment and it has been assumed that soils are liquefiable when the factor of safety is below one.

#### **Liquefaction Induced Settlement**

The method of Zhang et. al. (2004) was used for calculating the potential liquefaction induced reconsolidation settlements in the CPT analysis. Due to the presence of dense gravel from the CPT refusal depth to at least 10m below ground level, index settlements have been calculated from the CPT data.

#### Liquefaction Induced Ground Damage

We have used two methods to assess the potential for liquefaction induced ground damage as outlined below:

a) Published information (after Ishihara, 1985) can be used to assess the potential for surface expression of liquefaction and hence the likelihood of inducing damage. Ishihara's method is for a single non-liquefiable layer overlying a single liquefiable layer only. The liquefaction analysis indicates multiple liquefiable layers within the CPT profiles and to account for this we have taken the thickness of the non-liquefied crust as the thickness from the ground surface to the top of the uppermost critical liquefiable layer, and the thickness of the critical liquefied layer as the sum of the thicknesses of all critical liquefiable layers.

Ishihara's plots do not explicitly indicate ground damage curves for specific PGAs such as 0.13g which is the SLS level PGA. To simplify the analysis, we have used following curves to assess the ground damage:

- The 0.20g curve when assessing damage under SLS design levels of ground shaking and the lower bound 4 September 2010 Darfield Earthquake.
- The 0.40g curve when assessing damage under ULS design level of ground shaking and the 4 September 2010 Darfield Earthquake.
- b) Tonkin & Taylor (T&T) developed the Liquefaction Severity Number (LSN) (Tonkin & Taylor 2013) based on investigation data and observations made following major earthquake events in Christchurch. The LSN uses the settlements calculated from the Idriss and Boulanger (2008) method with the Robertson and Wride (1998) fines content method and the Zhang et. al. (2004) settlement method to assess the expected ground damage that could be caused by liquefaction in future earthquakes. The level of ground damage associated with LSN numbers is summarised in Table 12.

LSN Range	Predominate Performance				
0-10	Little to no expression of liquefaction, minor effects				
10-20	Minor expression of liquefaction, some sand boils				
20-30	Moderate expression of liquefaction, with sand boils and some structural damage				
30-40	Moderate to severe expression of liquefaction, settlement can cause structura damage				
40-50	Major expression of liquefaction, undulations and damage to ground surface severe total and differential settlement of structures				
>50	Severe damage, extensive evidence of liquefaction at surface, severe total an differential settlement affecting structures, damage to services				

#### Table 12: LSN descriptions

#### **Upper Liquefaction Results**

The result of the liquefaction assessment for the 4 September 2010 event are summarised in Table 13 and the results of the design level events are summarised in Table 14. The liquefaction outputs are presented in Appendix H.

Earthquake Event	Earthquake Effects	Ground Profile 1 Northern Section	Ground Profile 2 Middle Section	Ground Profile 3 Southern Section
4 September 2010 Darfield Earthquake	Liquefiable Layers <sup>(1)</sup>	Limited layers in Unit 2 below the water level	Unit 2 below the water level	Unit 2 below the water level
(M <sub>w</sub> 7.1, 0.33g)	Settlement <sup>(2)</sup>	0 to 10mm	10 to 55mm	40 to 135mm
	Ground Damage <sup>(3)</sup>	No	Yes	Yes
	LSN	0 to 7	6 to 26	12 to 35
	Comments	Little to minor damage	Minor to Moderate damage	Moderate to major damage
4 September 2010 Darfield Earthquake (Mw7.1, 0.19g)	Liquefiable Layers <sup>(1)</sup>	Limited layers in Unit 2 below the water level	Some of the sandy layers of Unit 2 below the water table	Some of the sandy layers of Unit 2 below the water table
	Settlement <sup>(2)</sup>	<10mm	0 to 45mm	35 to 105mm
	Ground Damage <sup>(3)</sup>	No	Yes in parts of the site	Yes over half of the site
	LSN	0 to 4	1 to 20	10 to 25
	Comments	Little to minor damage	Minor damage	Moderate damage

- (2) Settlements are calculated over the full CPT profile. Settlements are presented to the nearest 5mm. Due to the inherent uncertainty in calculating liquefaction induced settlements, the calculated settlements are indicative only and actual settlements will vary from those above.
- (3) Ground damage based upon published information after Ishihara (1985).

Earthquake Event	Earthquake Effects	Ground Profile 1 Northern Section	Ground Profile 2 Middle Section	Ground Profile 3 Southern Section
ULS (1 in 500 year event) (Mw7.5, 0.35g)	Liquefiable Layers <sup>(1)</sup>	Limited layers in Unit 2 below the water level	Unit 2 below the water level	Unit 2 below the water level
	Settlement <sup>(2)</sup>	0 to 10mm	15 to 60mm	40 to 135mm
	Ground Damage <sup>(3)</sup>	No	Yes	Yes
	LSN	0 to 7	7 to 26	12 to 35
	Comments	Little to minor damage	Minor to Moderate damage.	Moderate to major damage

#### Table 14: Summary of liquefaction analysis for the design level events

<sup>(1)</sup> Due to the inherent uncertainty in calculating liquefiable layers, the calculated layers are indicative only. Actual positions and thickness of liquefiable layers could vary from those above.

Earthquake Event	Earthquake Effects	Ground Profile 1 Northern Section	Ground Profile 2 Middle Section	Ground Profile 3 Southern Section
SLS-a (1 in 25 year	Liquefiable Layers <sup>(1)</sup>	Limited layers Limited layers		Limited layers
event) (M <sub>w</sub> 7.5,	Settlement <sup>(2)</sup>	<5mm	0 to 15mm	10 to 60mm
0.13g)	Ground Damage <sup>(3)</sup>	No	No	No
	LSN	0	0 to 6	3 to 12
	Comments	No damage	Little to no damage	Little to minor damage
SLS-b (1 in 25 year event) (M <sub>w</sub> 6.0, 0.19g)	Liquefiable Layers <sup>(1)</sup>	Limited layers Some of the sandy layers of Unit 2 below the water table		Some of the sandy layers of Unit 2 below the water table
	Settlement <sup>(2)</sup>	<5mm	0 to 40mm	30 to 90mm
	Ground Damage <sup>(3)</sup>	No	No	Yes in parts of the site
	LSN	0 to 3	0 to 17	8 to 23
	Comments	Little to no damage	Little to minor damage	Minor to Moderate damage.

- (1) Due to the inherent uncertainty in calculating liquefiable layers, the calculated layers are indicative only. Actual positions and thickness of liquefiable layers could vary from those above.
- (2) Settlements are calculated over the full CPT profile. Settlements are presented to the nearest 5mm. Due to the inherent uncertainty in calculating liquefaction induced settlements, the calculated settlements are indicative only and actual settlements will vary from those above.
- (3) Ground damage based upon published information after Ishihara (1985).

#### Lateral Spreading

Lateral spreading is a co-seismic effect where surface soils move on a layer, or layers, of liquefied soil downslope or towards a free edge, such as a river or basin. Lateral spreading can occur during an earthquake under seismic loading and following the earthquake until the excess pore water pressure caused by ground shaking dissipate and the soil regains strength.

When assessing liquefaction induced lateral spreading we considered the following:

- There is a small stream which runs through the site which is approximately 0.5m deep and 2m to 3m wide with no significant bank.
- In the south east corner of the site is a stormwater basin that has been installed as part of the overall Rosemerryn Subdivision development, which is in the order of 0.5m deep.
- No other significant rivers or significant changes in height are in close proximity to the site.
- The site is relatively level and we understand that there will be no significant change in the site levels once the development is undertaken.
- We understand that no additional stormwater basins or open channels will be built as part of this development.

Based on the site topography, the depth of the stream and stormwater basin, and the depth to groundwater across the site we consider that the global lateral movement and lateral stretch potentials across the site is considered to be minor or less and will not govern the MBIE Technical Category assessment. It is noted that TC2 type foundations have the ability to sustain minor levels of lateral movement and lateral stretch. As such no further assessment of lateral spreading has been undertaken.

#### **Technical Classification**

We have assessed the risk of future liquefaction in terms of the technical category classification system as per the MBIE Guidelines (2012 and 2014). This classification system is divided 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.

MBIE has indicated the following liquefaction and lateral spreading deformation limits for house foundations as summarised in Table 15.

Technical Category Vertical SLS ULS	Index Liqu	x Liquefaction Deformation Limits			Likely Implication for House
	Vertical	Vertical		oread	Foundations (subject to individual assessment)
	ULS	SLS	ULS		
TC1	15mm	25mm	Nil	Nil	Standard NZS3604 type foundations with tied slabs
TC2	50mm	100mm	50mm	100mm	MBIE enhanced foundation solutions
ТС3	>50mm	>100mm	>50mm	>100mm	Site specific foundation solution

#### Table 15: Liquefaction deformation limits and house foundation implications

#### Discussion

As the Bradley and Hughes (2012a, b) does not extend into Lincoln so we have considered the O'Rourke et. al. (2012) PGA model which indicates a PGA of 0.33g for the 4 September 2010 Darfield Earthquake event. Based on the MBIE Guidelines (2012) the site has been 'sufficiently tested' as the median value for the PGA for the 4 September 2010 earthquake event exceeded 170% of the SLS PGA (i.e. 1.7 x 0.13g = 0.22g).

No damage was observed on the site due to liquefaction after the 4 September 2010 earthquake event. Based upon this actual site response we infer that the liquefaction assessment method over estimates likely settlement and damage under future large earthquakes. Therefore, we have calibrated the liquefaction assessment based on observations from the previous 4 September 2010 earthquake event.

It is not possible to compare the calculated and actual settlements for the 4 September 2010 Darfield earthquake event at the site because there is no quality information on actual ground settlements. We can however make the following comments based on observations of ground performance, and calculated settlements and ground damage for the three design earthquakes:

- Based on the GNS (2012) report on liquefaction in eastern Canterbury, discussions with Fulton Hogan staff and the original farm owner who are familiar with the site, review of aerial photography, and Aurecon site walkovers in 2011, 2012, 2013 and 2015, no liquefaction induced damage was noted on the site and its direct surroundings.
- The back analysis of the 4 September 2010 earthquake indicates that moderate to major ground damage should have occurred when assessing against the measured and lower bound PGA. However, this calculated level of damage is not supported by field observations

- For the northern part of the site (Ground Profile 1) where gravel is at shallow depths, the calculated ULS settlements are less than 10mm and the calculated SLS-b settlements are less than 5mm which is consistent with a MBIE TC1 classification.
- To the north of the stream (Ground Profile 2), where the gravel layer is deeper, the calculated ULS settlements are between 15mm and 60mm and the calculated SLS-b settlements are between 0mm and 40mm which is consistent with a MBIE TC2 classification.
- South of the stream (Ground Profile 3), the calculated ULS settlements are between 40mm and 135mm and the calculated SLS-b settlements are between 30mm and 90mm which is consistent with MBIE TC2 and TC3 classifications respectively. These calculated settlements are similar to the 4 September 2010 earthquake back analysis.

The back analysis also indicates that in a ULS event moderate to major damage is likely which is similar those calculated in the 4 September 2010 earthquake event, and in a SLS-b event minor to moderate damage is likely, which is less than that calculated for the 4 September 2010 earthquake event lower bound PGA.

The assessment also calculated that lower levels of vertical settlement and ground damage will occur in a SLS-a earthquake event than the 4 September 2010 Darfield Earthquake.

In summary, south of the stream, the liquefaction assessment overstates the liquefaction potential when compared to actual site performance as only limited to minor damage was observed at and around the site after the 4 September 2010 earthquake event but the back analysis indicates that moderate to major ground damage should have occurred.

Hence, based on our liquefaction assessment, and the observed ground damage we infer that minor to moderate land damage from liquefaction is possible in future large earthquakes at parts of the site. Therefore, we conclude:

- The northern part of the site underlain by shallow gravel is consistent with a Technical Category 1 (TC1) classification.
- The remainder of Stage 19 to 24 is consistent with a **Technical Category 2 (TC2)** classification.

The areas of TC1 and TC2 classified land are shown in Figure 11 in Appendix A.

#### 5.4.3 Summary of MBIE Technical Category Liquefaction Assessment

The liquefaction analysis indicates the following:

- Based on the O'Rourke et. al. (2012) PGA model the site has been "sufficiently tested" (MBIE Guidelines (2012)) 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). Therefore, we have used the lack of ground damage observed at the site after the 4 September 2010 earthquake event to calibrate our liquefaction assessment.
- The GNS report on liquefaction (GNS, 2012), a review of aerial photography, and site observations made by Aurecon and Fulton Hogan staff confirms there was no evidence of liquefaction observed at the site after the 4 September 2010 Darfield earthquake, or any subsequent earthquakes in the Canterbury Earthquake Sequence.
- In the northern part of the site liquefaction induced settlements and damage are likely to be minimal and are consistent with a TC1 classification while elsewhere the calculated liquefaction induced settlements and assessed ground damage are consistent with a TC2 or TC3 classification. However, when compared to actual site performance, the level of calculated damage is overstated, as the back analysis indicates that moderate to major ground damage should have occurred, when only limited to minor damage was observed at and around the site.
- The liquefaction induced lateral spreading potential is considered to be minor.
- Based on our liquefaction assessment and observed ground damage we infer that minor to moderate land damage from liquefaction is possible in future large earthquakes at parts of the site.

• Therefore, based on our liquefaction assessment, we consider that the northern part of Stage 19 to 24 is consistent with a **Technical Category 1 (TC1)** classification and the remainder of the site is consistent a **Technical Category 2 (TC2)** classification, see Figure 11 in Appendix A.

# 5.5 Liquefaction Mitigation

#### 5.5.1 General

We consider that parts of the site in its current assessed state are susceptible to varying degrees of seismically induced liquefaction in a future major seismic event. In terms of liquefaction hazard mitigation at this site, and considering the proposed site layout and development, there are two basic approaches available as follows:

#### **Building Strengthening**

Structurally design the building to accommodate the effects of liquefaction. Examples of this include using raft or piled foundations. These methods do not remove the liquefaction hazard but reinforce the structure in such a way that it maintains stability during a liquefaction event. This approach is recommended in the TC2 equivalent area.

#### **Ground Improvement**

Improve the soil at the site so that it is less susceptible to seismically induced liquefaction. This general approach can be divided into three categories:

- 1. Densify the soil so that soil grain skeleton will not collapse under earthquake loading. Examples of this include compaction and replacement (refilling with material which will not liquefy).
- 2. Soil reinforcement. Examples include stone columns, driven piles to densify and stiffen the soil, deep soil mixing, soil cement columns etc.
- 3. Allow dissipation of excess pore water pressure so that liquefaction is reduced. Examples of this include installation of drains, drainage blankets, and or stone columns.

The recommended approach for liquefaction mitigation in each Technical Category classification zone is discussed below.

#### 5.5.2 Technical Category 1

As per the MBIE (2012) Guidelines with TC1 sites *"Future land damage from liquefaction is unlikely, and ground settlements from liquefaction effects are expected to be within normal accepted tolerances"*. For Technical Category 1 areas the MBIE Guidelines has recommended Standard NZS3604:2011 type foundations with tied slabs provided there is suitable bearing.

MBIE Guidelines recommend that a site specific geotechnical assessment be carried out by suitability qualified chartered engineer with experience in residential house development at the detailed house design stage.

#### 5.5.3 Technical Category 2

This section provides generic foundation advice for the wider subdivision development. It *does not* constitute a detailed design of house foundations. 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.

It is considered that parts of the site in its current assessed state is consistent with a MBIE TC2 classification. Land with the deformation characteristics of TC2 does not meet the definition of "good ground" as per the New Zealand Standards (NZS3604 *'Timber Framed Buildings'* and NZS4229 *'Concrete Masonry Buildings not requiring Specific Engineering Design'*) without modification to the standard foundation system

as described below. The generic foundation types in these documents are not appropriate due to their potential for damage in liquefaction events.

The risk of building damage due to liquefaction in TC2 land can be mitigated by providing strengthened foundations, which reduce the differential settlement of the building and are designed to be readily relevellable following a major earthquake. There are a range of standard foundation types available for TC2 land which are presented in the MBIE Guidelines and include enhanced raft or rib raft foundations.

Although it is not an explicit consent requirement, we recommend that lightweight cladding and roofing materials are used on all dwellings in TC2 areas, as reducing the dwelling mass will lead to reduced foundation movements and less building damage in future large earthquakes.

As part of the detailed foundation design, particular attention should be paid to detailing the connection joints of buried services (water and sewer pipes, power conduits, etc.) between the house foundation and the insitu ground. The design should allow sufficient movement and ductility to account for seismic shaking and liquefaction induced movement, and to allow for easy reinstatement if they were to be damaged during a future seismic event.

Other foundation solutions are available (i.e. ground improvement to achieve TC1 site characteristics etc.). However, these options are unlikely to be economic relative to the options below.

It should be noted that this report provides guidance only on residential foundation design and should not be taken as detailed design. MBIE Guidelines require that for detailed house design, a site specific geotechnical assessment shall be carried out by suitability qualified chartered engineer with experience in residential house development.

### 5.6 Bearing Capacity

The criteria for determining whether suitable founding is available follows that outlined in Section 3 of NZS 3604: 2011 'Timber-framed Buildings'. NZS 3604 requires:

#### Clause 3.4.1

All foundations shall bear on a solid bottom in undisturbed good ground material or upon firm fill where a certificate of suitability has been issued under NZS 4431.

Where good ground is at a depth greater than 0.6m, the excavation between the good ground and the foundation base may be filled with mass concrete having a minimum strength of 10MPa at 28 days.

#### Clause 3.3.7.1

The soil below the underside of the foundations shall be assumed to have a bearing pressure of not less than 300kPa when:

- a) None of the following is encountered below the depth of the underside of the proposed footing at any test site:
  - i) Organic Topsoil;
  - ii) Soft or very soft peat;
  - iii) Soft or very soft clay;
  - iv) Fill material except where a certificate of suitability has been issued in terms of NZS 4431;
- b) Scala Penetrometer tests conducted in accordance with 3.3.2(a) where the number of blows per 100mm depth of penetration below the underside of the proposed footing at each test sites exceeds:
- *i)* Five down to a depth equal to the width of the widest footing below the underside of the proposed footing;
- ii) Three at greater depths; and
- iii) Providing the set blow is relatively uniform, the number of blows per 100mm may be obtained by averaging the number of blows for depths not exceeding 300mm; and
- c) Comparison of results at all test sites show that soil conditions are closely similar at each test site.

We interpret Clause 3.4.1 as meaning that if "good ground" is found at less than 600mm depth, the foundations will comply with the requirements of NZS 3604. Otherwise, specific engineering design is required.

Based on the available investigation logs it is unlikely that shallow bearing for a typical house foundation of 300kPa ultimate bearing capacity could be achieved in these areas. Therefore "good ground" as per New Zealand Standards Timber Framed Buildings (NZS3604:2011) and Concrete Masonry Buildings Not Requiring Specific Engineering Design (NZS4229:1999) will not be met and specific ground investigations and foundation design will be required based at the building consent stage.

Therefore, irrespective of any potential liquefaction risk at the site, typical light weight timber framed or masonry houses (which would generally be designed within the guidelines of NZS3604:2011 or NZS4229:1999) will require specific foundation investigation and design. TC2 enhanced slab foundations are suitable for bearing capacities of 200kPa and can be modified for lower bearing capacities, so it is likely that TC2 enhanced slab foundations will be suitable for the lower bearing soil as well as mitigation against liquefaction induced land damage.

It is noted that earthworks across Stages 19 to 24 is likely to include placement of fill. Depending on the depth of the fill, and provided it is placed to a suitable level of compaction, the earthworks may render the site compliant with the definition of "good ground", however this will need to be assessed on a lot by lot basis as part of the building consent investigations.

It is noted that soft layers are present south of the stream ranging from 0.2m to 0.5m thick and typically below 2.5m depth. At these depths, settlement of the soft layer is anticipated to be negligible under additional surcharge. TC2 enhanced foundation systems are suitable solutions as raft foundations can distribute the loads and induced deformations to acceptable limits.

In any case, site specific testing (including hand augers and DCPs) will be required on the individual lots to determine ground conditions and provide bearing capacities of residential building design.

# 6 Assessment Against the RMA

Section 106 of the Resource Management Act (RMA) (2017) states inter alia

#### Consent authority may refuse subdivision consent in certain circumstances

1) A consent authority may refuse to grant a subdivision consent, or may grant a subdivision consent subject to conditions, if it considers that—

- a) there is a significant risk from natural hazards; or
- b) Repealed
- c) sufficient provision has not been made for legal and physical access to each allotment to be created by the subdivision.

1A) For the purpose of subsection (1) (a), an assessment of the risk from natural hazards requires a combined assessment of—

- a) the likelihood of natural hazards occurring (whether individually or in combination); and
- b) the material damage to land in respect of which the consent is sought, other land, or structures that would result from natural hazards; and
- c) any likely subsequent use of the land in respect of which the consent is sought that would accelerate, worsen, or result in material damage of the kind referred to in paragraph (b).

2) Conditions under subsection (1) must be-

- a) for the purposes of avoiding, remedying, or mitigating the effects referred to in subsection (1); and
- b) of a type that could be imposed under section 108.

A risk assessment approach has been undertaken on the significant geotechnical hazards that may affect the site, which is presented in Appendix I.

Based on this assessment we consider that at the site there are no significant geotechnical hazards other than the potential for earthquake induced soil liquefaction of varying degrees. However, provided that the geotechnical recommendations provided within this report are followed, and the appropriate engineering measures are implemented, then we consider that the development is unlikely to be significant affected by geotechnical hazards nor will the development worsen, accelerate or result in material damage. Therefore, from a geotechnical perspective we consider that Stage 19 to 24 of the Rosemerryn residential subdivision development can proceed.

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# 8 Limitations

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.

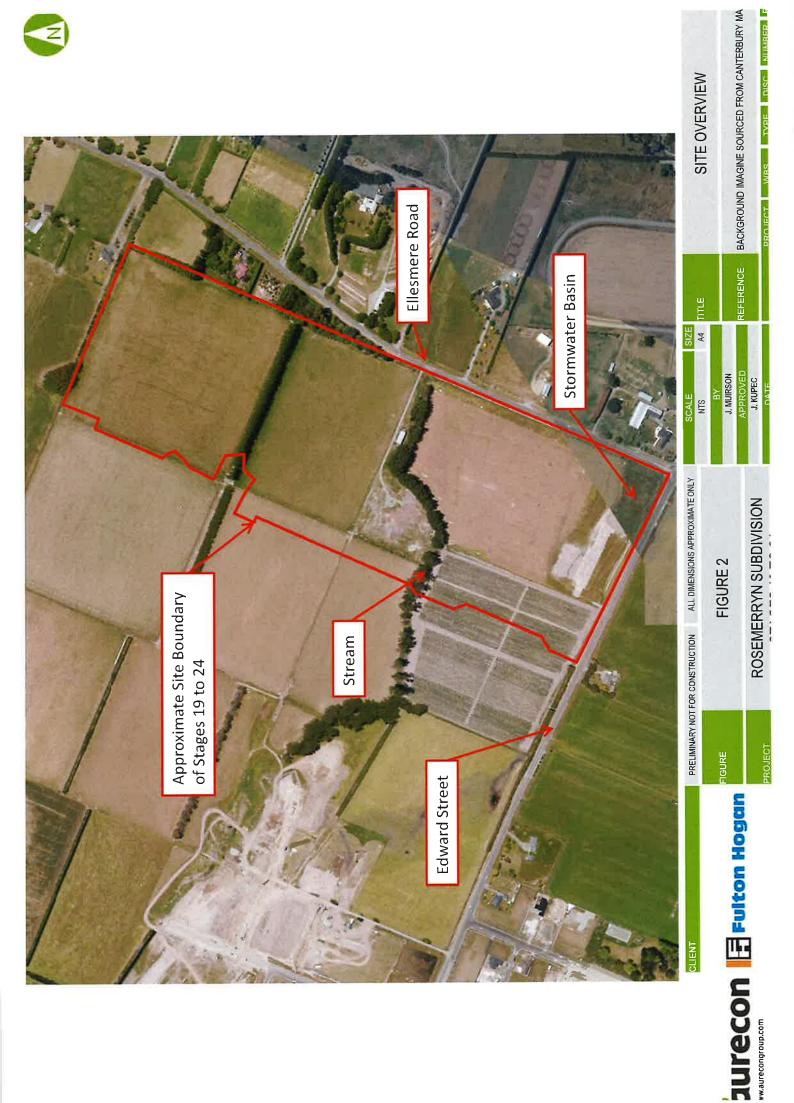
Subsurface conditions relevant to construction works should be assessed by contractors who can make their own interpretation of the factual data provided. They should perform any additional tests as necessary for their own purposes.

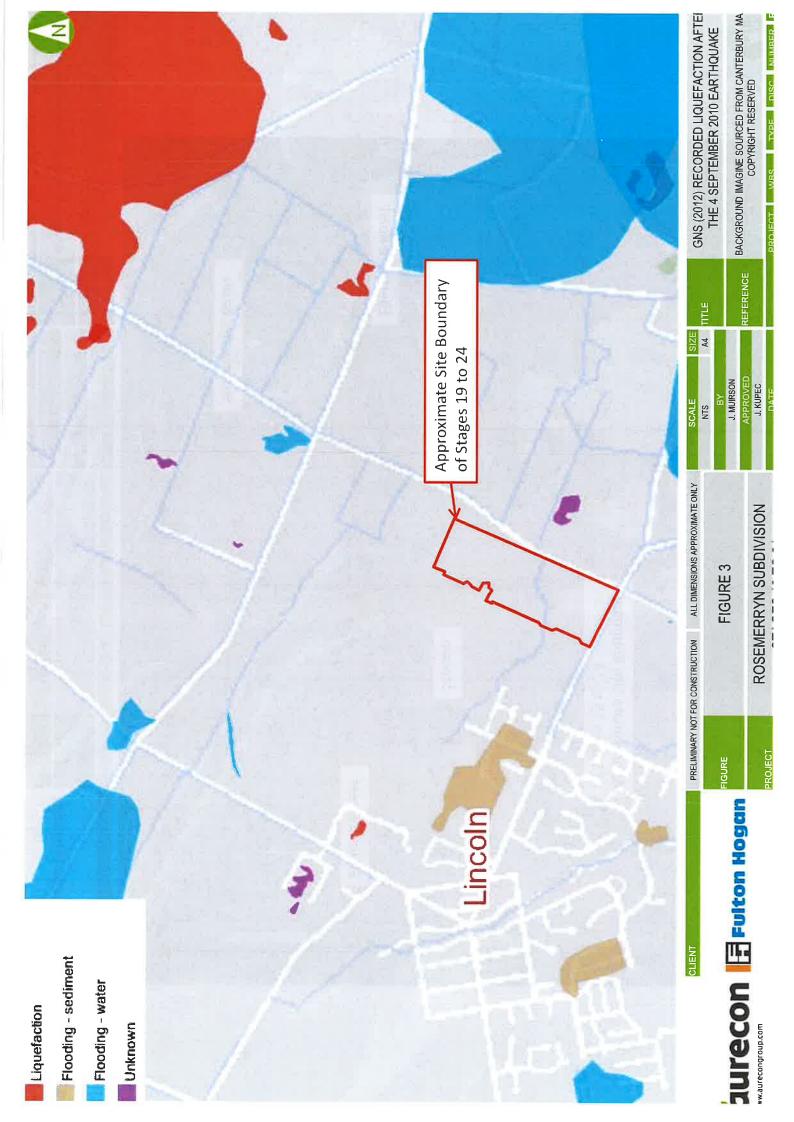
Subsurface conditions, such as groundwater levels, can change over time. This should be borne in mind, particularly if the report is used after a protracted delay.

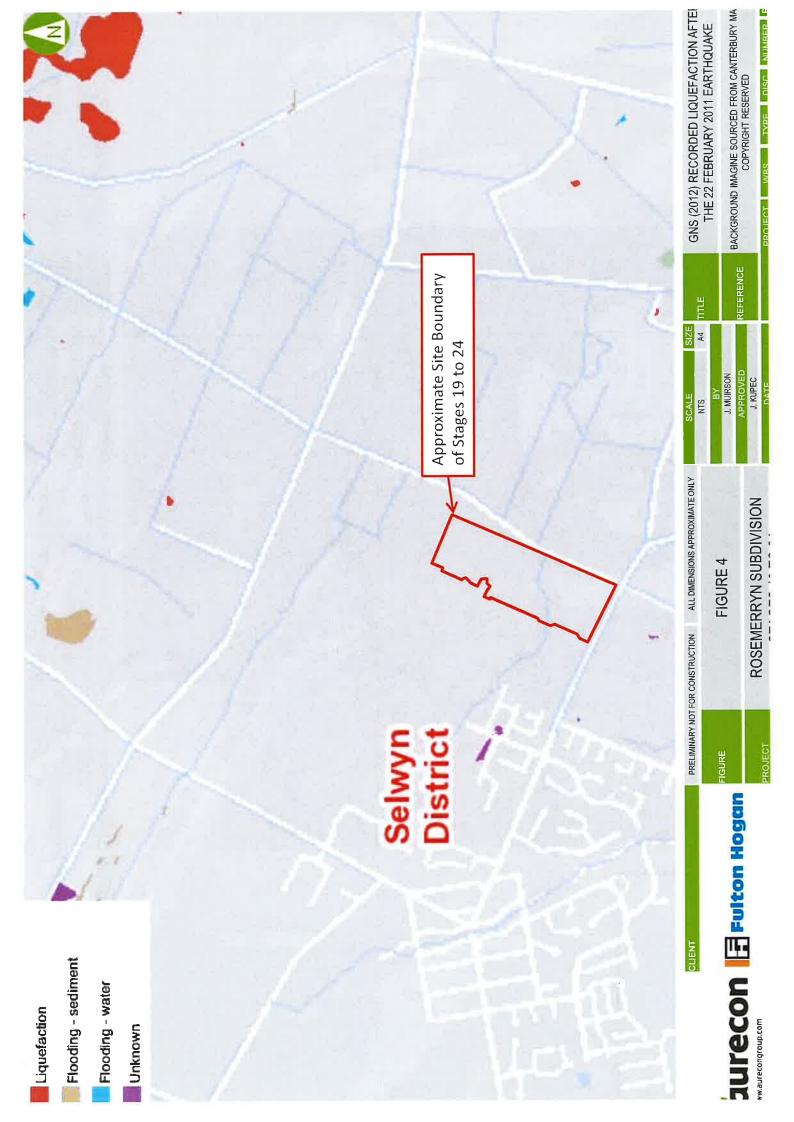
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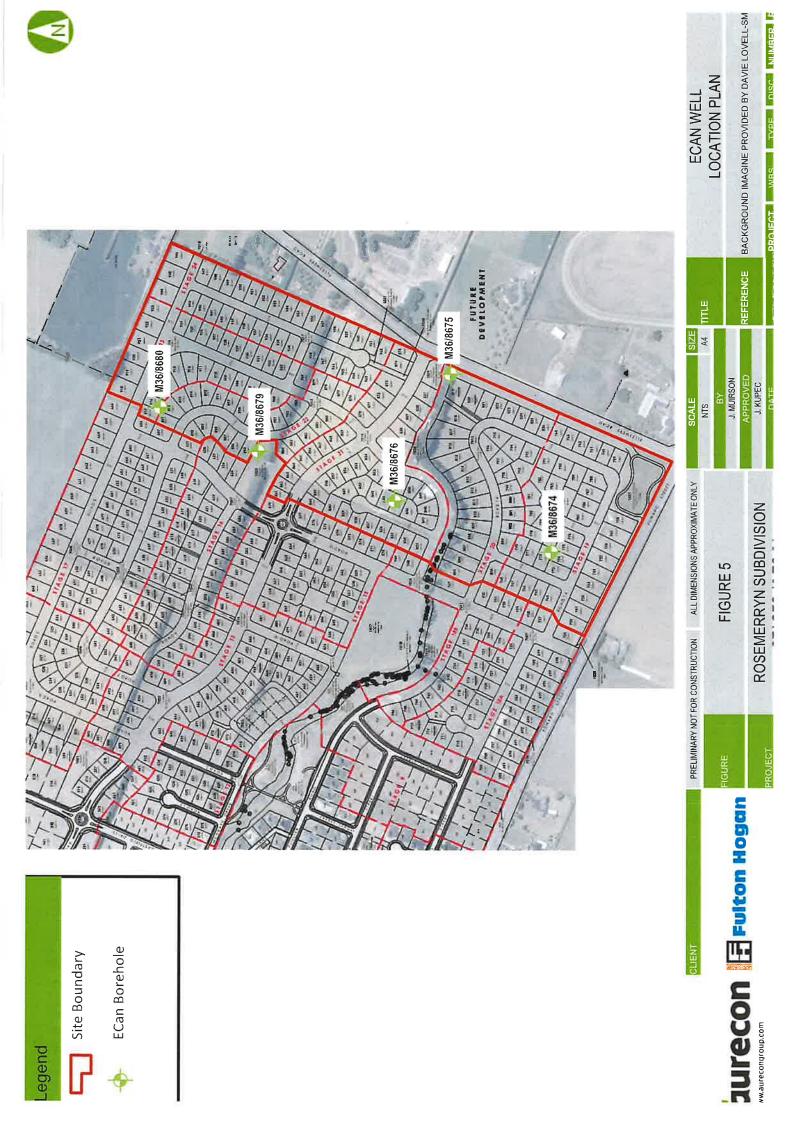


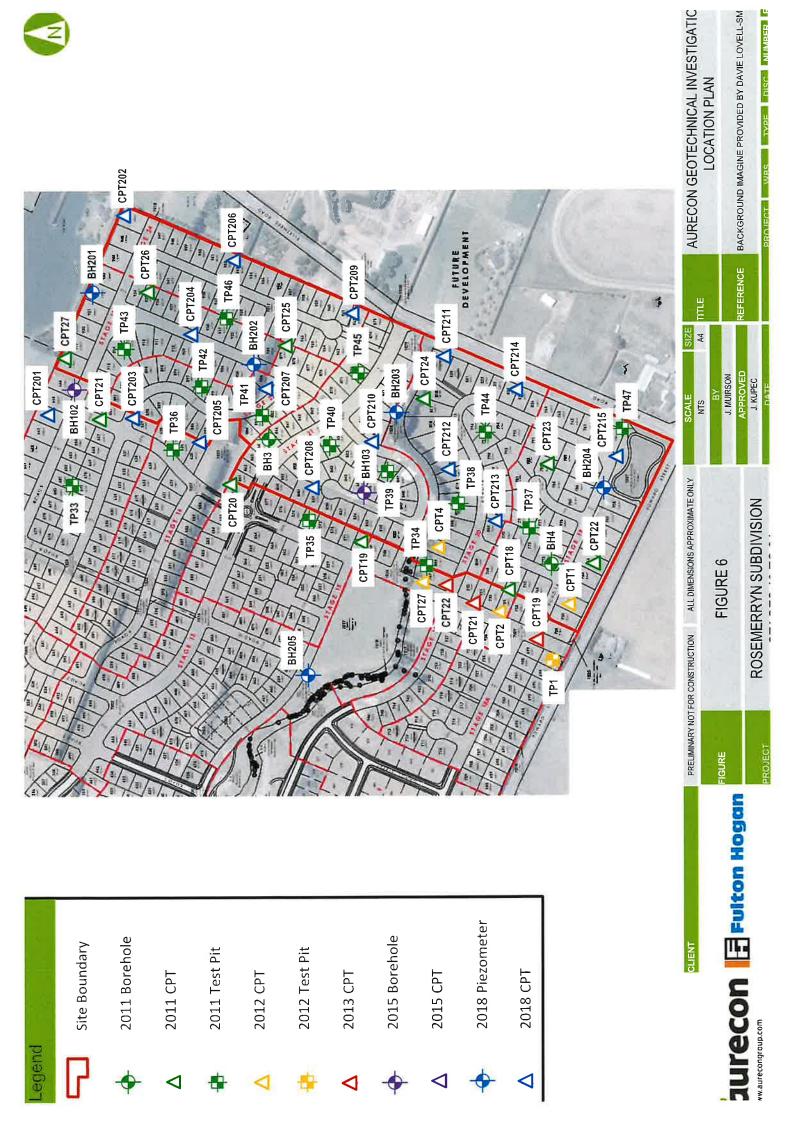


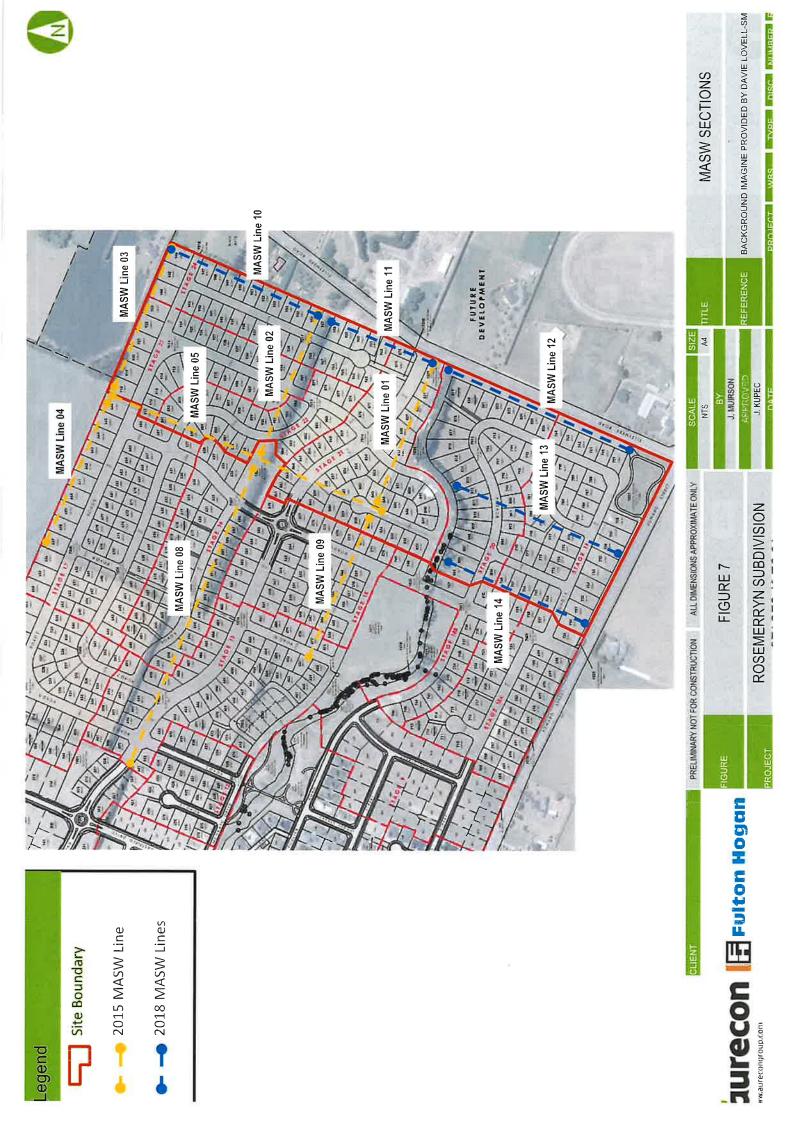


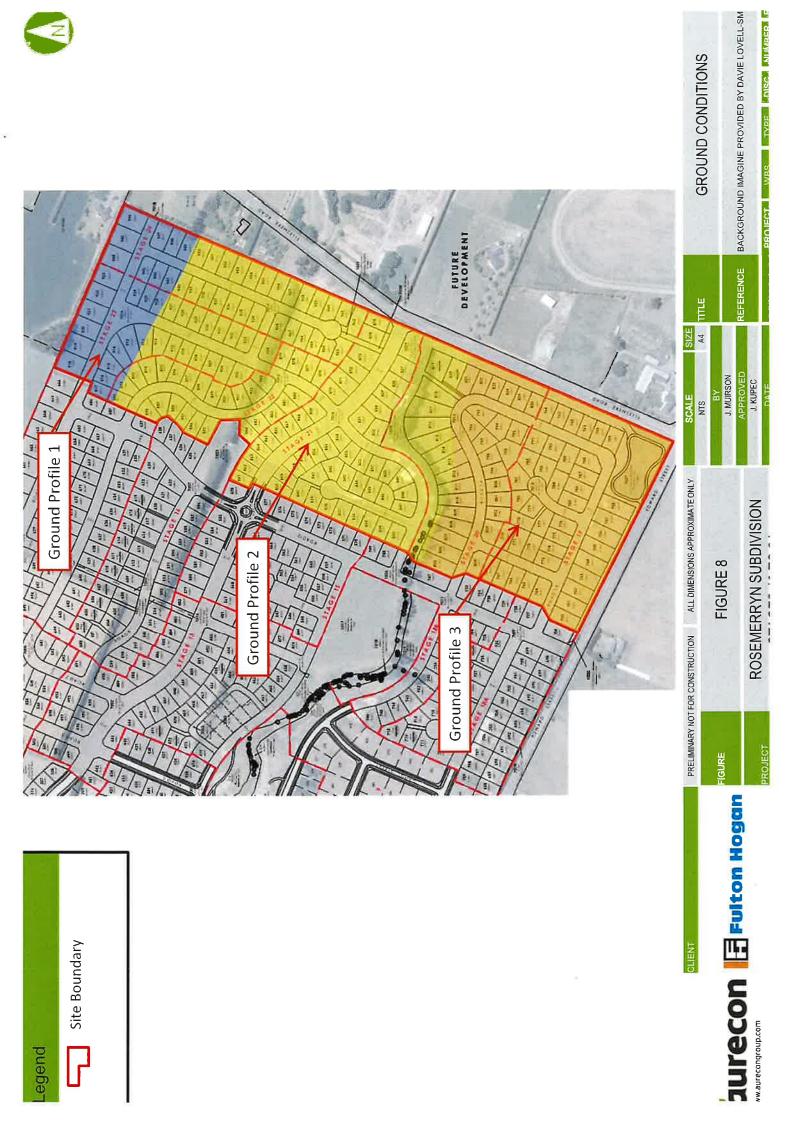


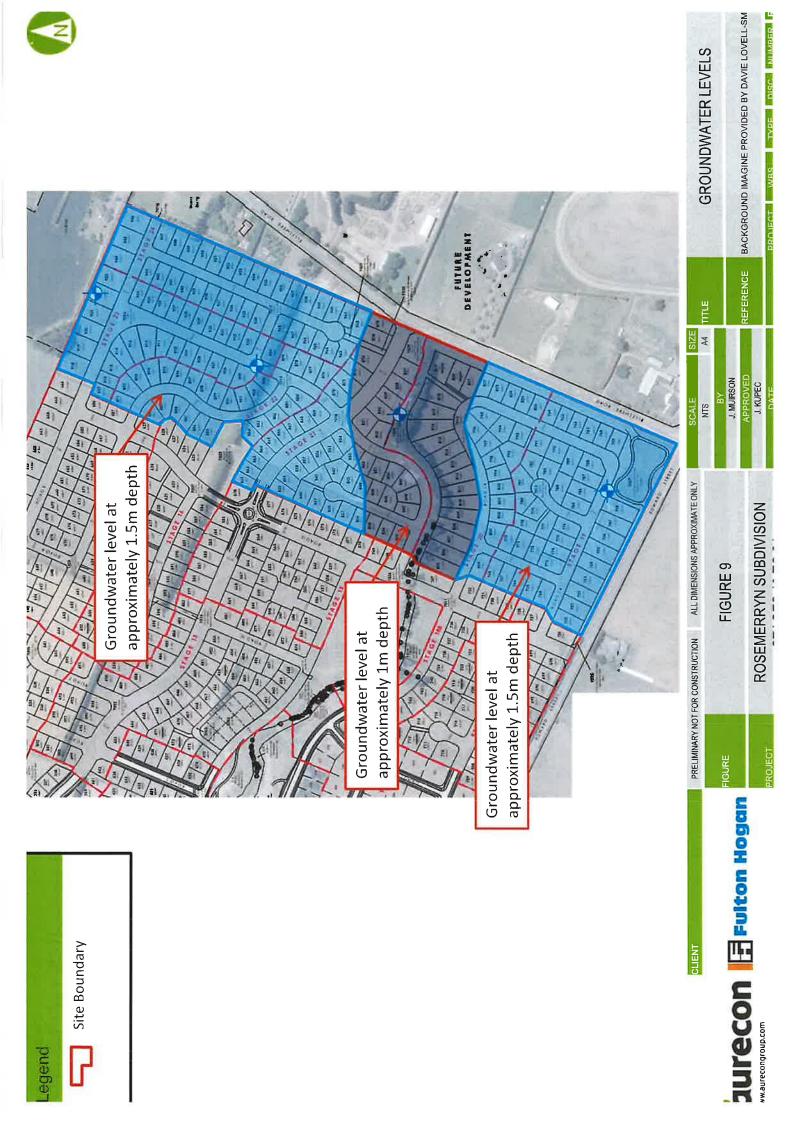




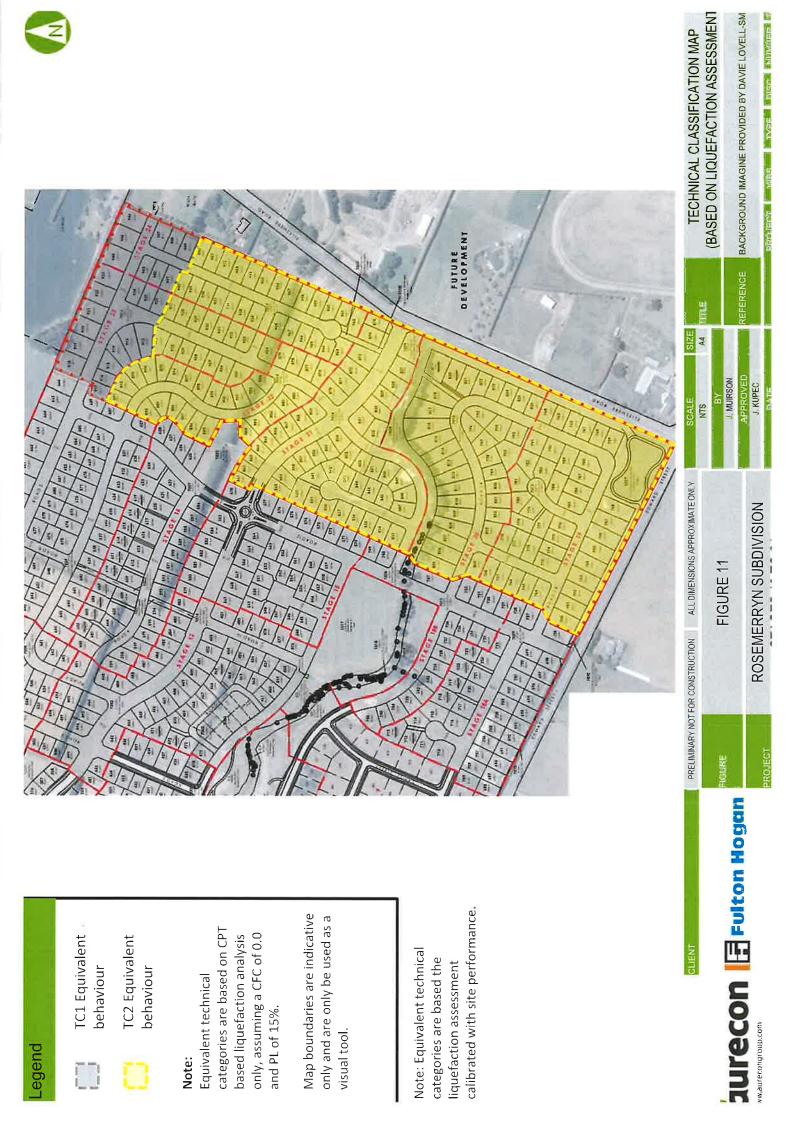






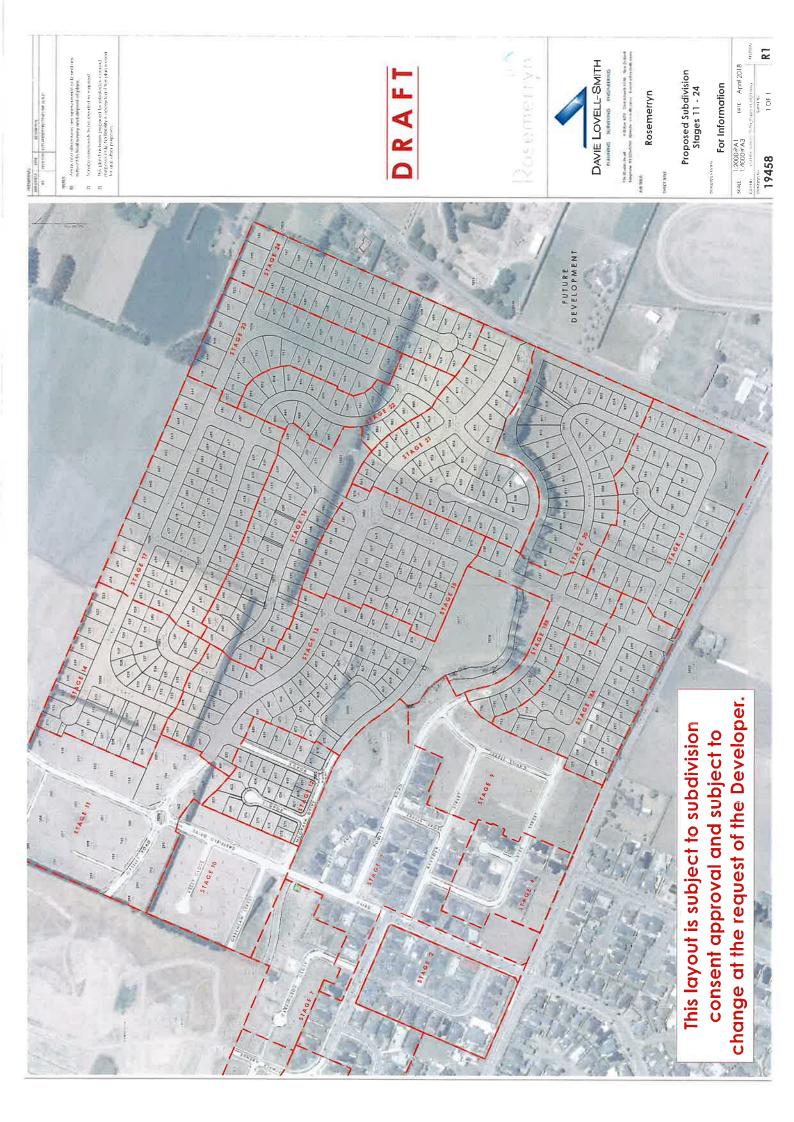






## **DLS** Plans

B



# ECan Logs

С

Grid Reference (NZTM): 1559985 mE, 5167473 mN Location Accuracy: 2 - 15m Ground Level Altitude: 8.5 m +MSD Accuracy: < 2.5 m Driller: not known Drill Method: Rotary/Percussion Borelog Depth: 6.0 m Drill Date: 09-Oct-2008



Scale(m)	Water Level	Depth(m	1)	Fuil Drillers Description	Formation Code
			brown a	Dark grey loamy topsoil	
-		0.20m		Very soft light grey, mottled with orange, silty clay, minor patches of rusty brown sand	
1					
2		2.00m		Very soft blue grey sitty clay (pug)	
		2.40m			
3 4 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1				Very soft blue grey sitty clay with patches of rusty brown sitty clay and occasional pieces of timber	

Grid Reference (NZTM): 1560265 mE, 5167627 mN Location Accuracy: 2 - 15m Ground Level Altitude: 8.0 m +MSD Accuracy: < 2.5 m Driller: not known Drill Method: Rotary/Percussion Borelog Depth: 5.8 m Drill Date: 09-Oct-2008



1     0.20m     Dark grey barry topsol       1     0.20m     Soft grey intermised with hown sity day. Specied with pathes of anings and some timber       1     1.20m     Soft blue grey sity clay with pieces of umber       2     Soft blue grey sity clay with pieces of umber       3     3.20m       3     Oney brown sand mixed with soft grey brown sity clay       4     Oney brown sand mixed with soft grey brown sity clay       5     Oney sity sandy grave!	Scsie(m)	Water	Depth(m	i)	Full Drillers Description	Formation Code
3     Soft grey intermised with basines of orange and some timber       1     1.20m       3     Soft blue grey sity clay with paces of timber       3     Soft blue grey sity clay with paces of timber       3     Soft blue grey sity clay with paces of timber       3     Soft blue grey sity clay with paces of timber       3     Soft blue grey sity clay with paces of timber       3     Soft blue grey sity clay with paces of timber       3     Soft blue grey sity clay with paces of timber       3     Soft blue grey sity clay with paces of timber       4     Soft blue grey sity clay with paces of timber       5     Soft blue grey sity clay with paces of timber		Level	Departm	honord		
1       1.20m       Soft blue grey silty clay with pieces of imber         2       Soft blue grey silty clay with pieces of imber         3       3.20m       Grey brown sand mixed with soft grey brown silty clay         3       3.00m       Grey brown sand mixed with soft grey brown silty clay         4       0.001000000000000000000000000000000000	-		0.20m		clay. Speckled with patches of orange	
2       3       3.20m       Grey brown sand mixed with soft grey brown sand mixed with soft grey brown saily clay         3       3.60m       Grey brown sand mixed with soft grey brown saily clay         4       00.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.	1		1.20m			
3       3.20m       Grey brown sand mixed with soft grey brown sity clay         3.60m       0.000       Grey sity sandy grave!         4       0.000       0.000         5       0.000       0.000         5       0.000       0.000	-					
4 5 5 5 5 5 5 5 5 5 5 5 5 5	3		3.20m			
4 5 6 6 6 7 6 7 7 7 7 7 7 7 7 7 7 7 7 7			3.60m			
5.80m					Grey silty sandy gravel	

Grid Reference (NZTM): 1560062 mE, 5167719 mN Location Accuracy: 2 - 15m Ground Level Altitude: 9.3 m +MSD Accuracy: < 2.5 m Driller: not known Drill Method: Rotary/Percussion Borelog Depth: 5.2 m Drill Date: 09-Oct-2008



Scale(m)	Water Level	Depth(rr	1)	Full Drillers Description	Formation Code
			NY NY NY	Dark grey loarny topsoil	
		0.20m		Firm grey sity clay speckled with orange	
1		1.00m		Grey sitty clay speckled with orange	
		1.20m		sandy silt	
2				Soft blue grey sitt with pieces of timber	
3		2.80m		Blue grey sitt with patches of grey sendy sit	
		3.20m			
		3.69m	1         1         control (2)         control (2) </td <td>Grey sandy sitt</td> <td></td>	Grey sandy sitt	
4				Grey grave!	
		5.20m	p0000000000		

Grid Reference (NZTM): 1560150 mE, 5167922 mN Location Accuracy: 2 - 15m Ground Level Altitude: 10.1 m +MSD Accuracy: < 2.5 m Driller: not known Drill Method: Rotary/Percussion Borelog Depth: 5.8 m Drill Date: 09-Oct-2008



Water Level	Depth(m)		Full Drillers Description	Formation Code
		NANA	Dark grey loamy topsoil	
	0.20m _		Soft light grey & yellow silty clay with minor patches of rusty orange sandy silt	
	1.40m _		Soft grey sitty clay	
	2.00m			
	2.60m _		timbe <i>r</i>	
	4.00m		Soft blue grey sity clay with patches of brown sand	
	-	EEEE	Firm brown yellow sitty clay	
	4.20m		Grey gravel	
		Level Depth(m) 0.20m 1.40m 2.00m 4.00m 4.20m	Level Depth(m) 0.20m 1.40m 2.00m 2.60m 4.00m 4.20m	Level     Depth(m)     Full Differs Description       0.20m     Dark grey barry topsoil       0.20m     Soft light grey & yelow sity clay with minor patches of nusty orange sandy sit       1.40m     Soft grey sity clay       2.00m     Soft blue grey sandy sit with pieces of timber       2.00m     Soft blue grey sandy sit with pieces of timber       2.00m     Soft blue grey sandy sit with pieces of timber       2.00m     Soft blue grey sandy sit with pieces of timber       2.00m     Soft blue grey sandy sit with pieces of timber       2.00m     Soft blue grey sandy sit with pieces of timber       2.00m     Soft blue grey sandy sit with pieces of timber       2.00m     Soft blue grey sandy sit with pieces of timber       2.00m     Soft blue grey sandy sit with pieces of timber

Grid Reference (NZTM): 1560211 mE, 5168084 mN Location Accuracy: 2 - 15m Ground Level Attitude: 10.1 m +MSD Accuracy: < 2.5 m Driller: not known Drill Method: Rotary/Percussion Borelog Depth: 6.7 m Drill Date: 09-Oct-2008



Scale(m)	Water Level D	epth(m)		Full Drillers Description	Formation Code
	0.1		NAVAVA	Dark grey ioarny top≲oi	
-		20m _		Firm light grey silty clay mixed with yellow orange silty clay	
1	0.4	80m _		Soft blue grey sity clay with minor patches of light yellow.	
2	2.0	00m _		Grey & light yellow sitty sand. Sand faction increasing with depth	
	3.2			Grey gravel. 2-20mm diameter in size. Stone size increasing with depth	
4					
5					
6	6.7				

# Previous Investigations

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Method/Casing	Core Recovery (%)	Water Loss (%)	Groundwater Level (m)	R.L (m)	Depth (m)	Graphic Log		Ma	iterlai Descriptio	ท		USC Description	Consistency/Density	Moisture	Sample	In-Situ Testing	Laboratory Testing	Notes	Backfill	Geological Unit
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WASH			Y		- 1	X X X X X X X X X X		ILT; Dark g	rey. Low plastic	ity. Firm. Moi:	st.	ML				SP⊺ati.6m N ≆ 7 1,1/1,1,2,3 460mm (SC)			intribution in the second second	
-					- 3		Borehole	⇒ Terminate	d al 3m (Targel	Depth)							RATORY TESTING			
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Method       USC Classification       Constituency       Soil Samples       In Stu Testing       Graphic Log         CC       concrete core       CM       Inequaric CLAYS high plasticity       Soil Samples       In Stu Testing       Graphic Log         SSA       soild stam suger       CM       Inequaric CLAYS medium plasticity       Soild stam suger       Film       B bulk       Undiskurbed       Pp pen penetronetor       Graphic Log         VASA       holgwash drill       Constitution suger       Constitution suger       Graphic Log       Impact State       Impact Impact State       Impact Impa						1 pipe														

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Method/Casing	Core Recovery (%)	Water Loss (%)	Groundwater Level (m)	Rf (m)		(m) mdeu	Graphic Log		Me	aterial Descriptic	วก		USC Description	Consistency/Density	Moisture	Semple	kn-Siku Testing	Laboretory Testing	Notae	Backfill	Geological Unit
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80	Client:         FULTON HOGAN LAND DEVELOPMENT           Armonic Nice Zedard) Useder         Project Name:         ROSEMERRYN FARM SUBDIVISION           Doctories Nice         Telephone: #43 3808020         Location:         SEE PLAN           Project Reference:         224464         Project Reference:         2509/2011           Sortender Neuer         Date Startled:         15/09/2011           Billing Method:         CO-ORDINATES N/A         Date Startled:         15/09/2011															neet 2				
Dri Dia	iling M meter ntracto	Core	d: Ca b: 10	AT 31	2 Tra		)	Easting: Northing: Ground Lev	N/A N/A		D		iplete C		/08/2		Logged by: JSM Input by: JSM Charcined by: JSM Verified by: JK			
Method/Casing	Core Recovery (%)	Water Lose (%)	Groundwatter Level (m)	R.L. (m)	Depth (m)	Graphic Log		Material Description							Sample	In-Situ Testing	Laboratory Testing	Notes	Backfill	Geological Unit
WASH					- 11 - 12 - 14		mottling. coarse g grained.	Dense. Wr rained and ( <i>Layer Con</i>	AVEL: Dark grey with orange brown Dense. Wet to saturated. Gravel fine to ained and rounded. Sand fine to medium Layer Continued from previous page)							SPT et 10m N = 40 B. 6/10, 15, B, 16 460mm (SC)	IORY TESTING			
				والمتعادين والمتعادين والمتعاط والمتعام والمتعالية و	- 16 17 19												NO LABORAT			
Nethod         USC C (sestRication           DB open barrel         CH inorganic CLAYS high p           DB open barrel         CH inorganic CLAYS match           DB open barrel         CH onorganic CLAYS match           DB open barrel         CH onorganic CLAYS match           DB open barrel         CH onorganic CLAYS match           CAS Ho Tipbe Tube         CP poorty Crandad GRAVEL           DB open open barrel         CH onorganic SLT frein pien           DB open open barrel         CH onorganic SLT frein pien           DB open open barrel         CH onorganic SLT frein pien           DP open open open open open open open open						Class norgan norgan Disyay G Sity GR Dorty G Nat Gn norgan DRGAN DRGAN DRGAN DRGAN DRGAN DRGAN DRGAN DRGAN	fication c CLAYS high plan c CLAYS madium c CLAYS madium r	ticty piedicty enty ky y o high plasticty He	Consistency VS vary soft 5 soft F firm S stiff H hard Density VL very loase L loces Density VL very loase L loces Density VL very vary dense D very vary dense	Soil Semple B bulk U undisturb D disturbed Water Z at end of excavation \$ at time of excavation \$ at time of excavation \$ at time of	ed SPT SS SC HB SH Mole N Mole	tu Testir pen pen vana sh stid, pen solid coi hammer solid coi hammer solid	etrom ear test on	cing Yn Wei		Braphic Log Topol SLT Survey RAND Survey	Biough Bacdfill Pipe group. 1 pi	1 pa pb=		

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Datebase File: TEST PITS, GPJ, Library: COPY OF CHCH LIBRARY MARCH 2011. GLB, Data templets: CHCH DATA TEMPLATE NOV 2010. GDT, Leet Generated: 19/10/2011.

## **CPT ANALYSIS NOTES**

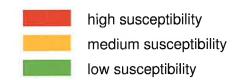
### Soil Type

Interpretation using chart of Robertson & Campanella (1983). This is a simple but well proven interpretation using cone tip resistance ( $q_c$ ) and friction ratio ( $f_R$ ) only. No normalisation for overburden stress is applied. Cone tip resistance measured with the piezocone is corrected with measured pore pressure ( $u_c$ ).



#### **Liquefaction Screening**

The purpose of the screening is to highlight susceptible soils, that is sand and siltsand in a relatively loose condition. This is not a full liquefaction risk assessment which requires knowledge of the particular earthquake risk at a site and additional analysis. The screening is based on the chart of Shibata and Teparaksa (1988).



High susceptibility is here defined as requiring a shear stress ratio of 0.2 to cause liquefaction with  $D_{50}$  for sands assumed to be 0.25 mm and for silty sands to be 0.05 mm.

Medium susceptibility is here defined as requiring a shear stress ratio of 0.4 to cause liquefaction with  $D_{50}$  for sands assumed to be 0.25 mm and for silty sands to be 0.05 mm.

Low susceptibility is all other cases.

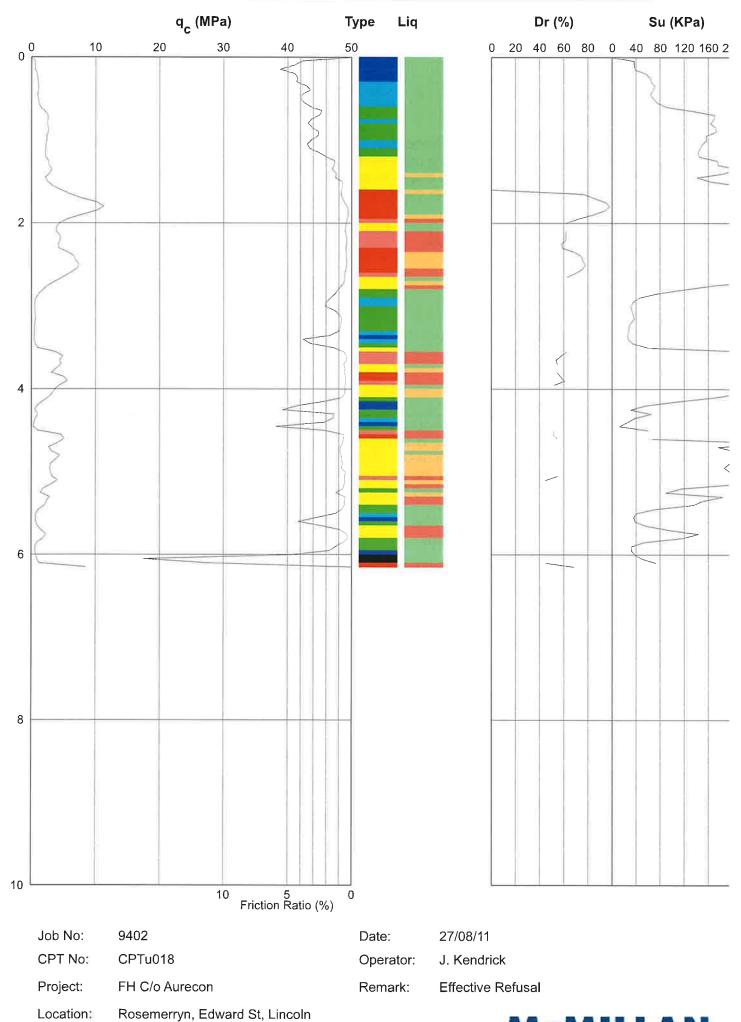
## Relative Density (D<sub>R</sub>)

Based on the method of Baldi et. al. (1986) from data on normally consolidated sand.

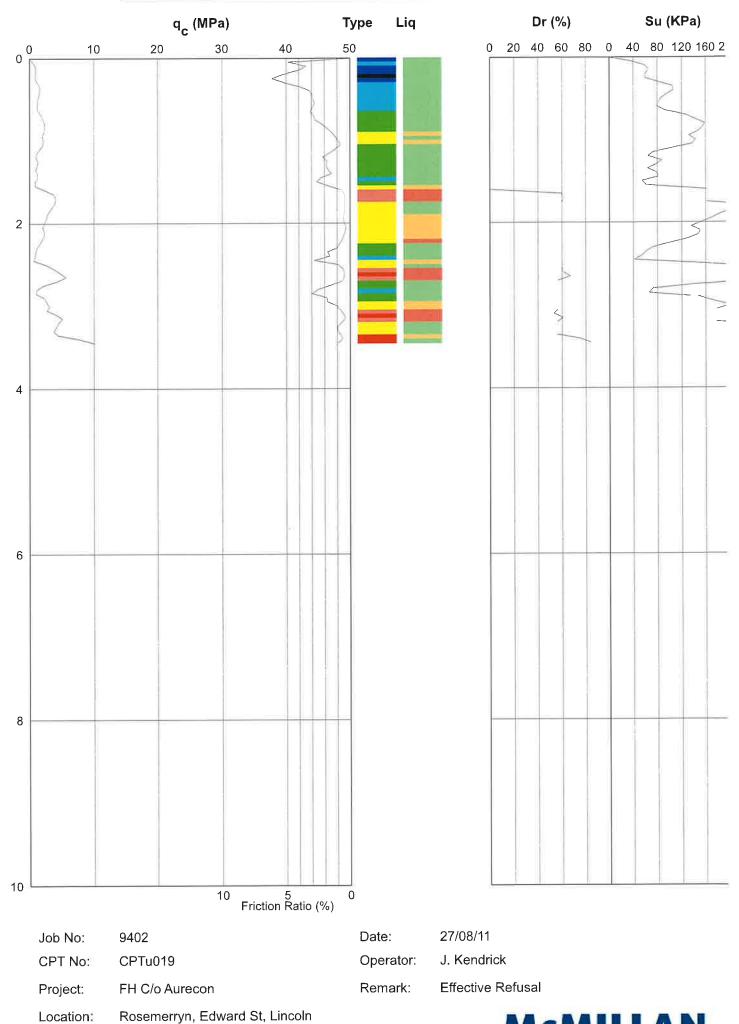
#### Undrained Shear Strength (S<sub>U</sub>)

Derived from the bearing capacity equation using  $S_U = (q_C - \sigma_{VO})/15$ .

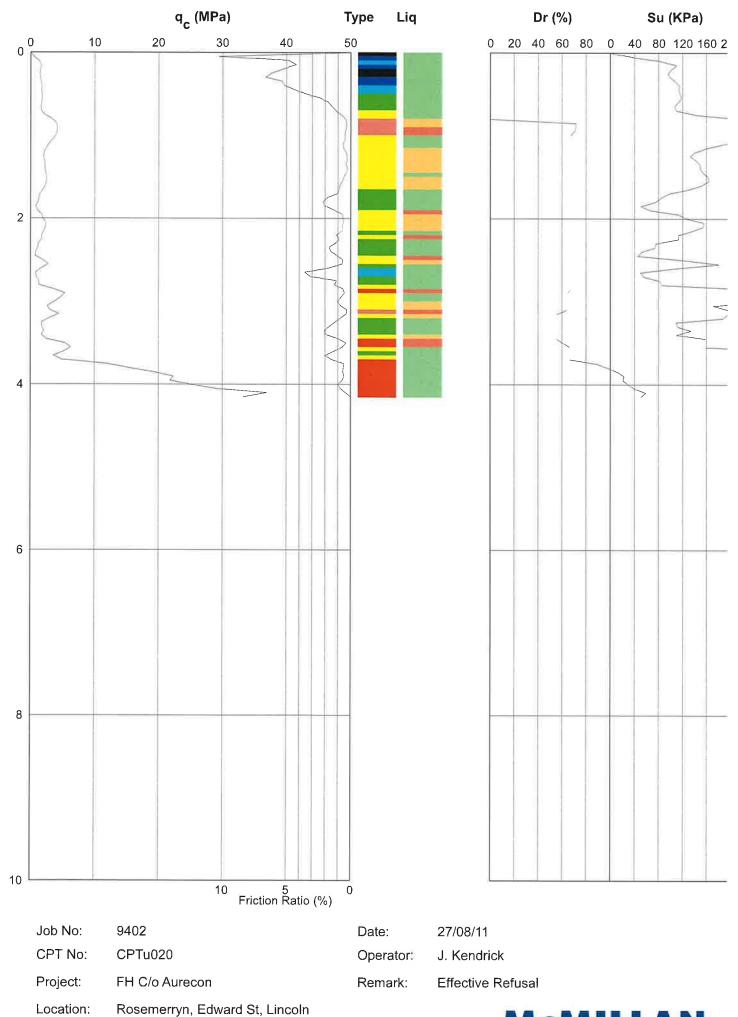




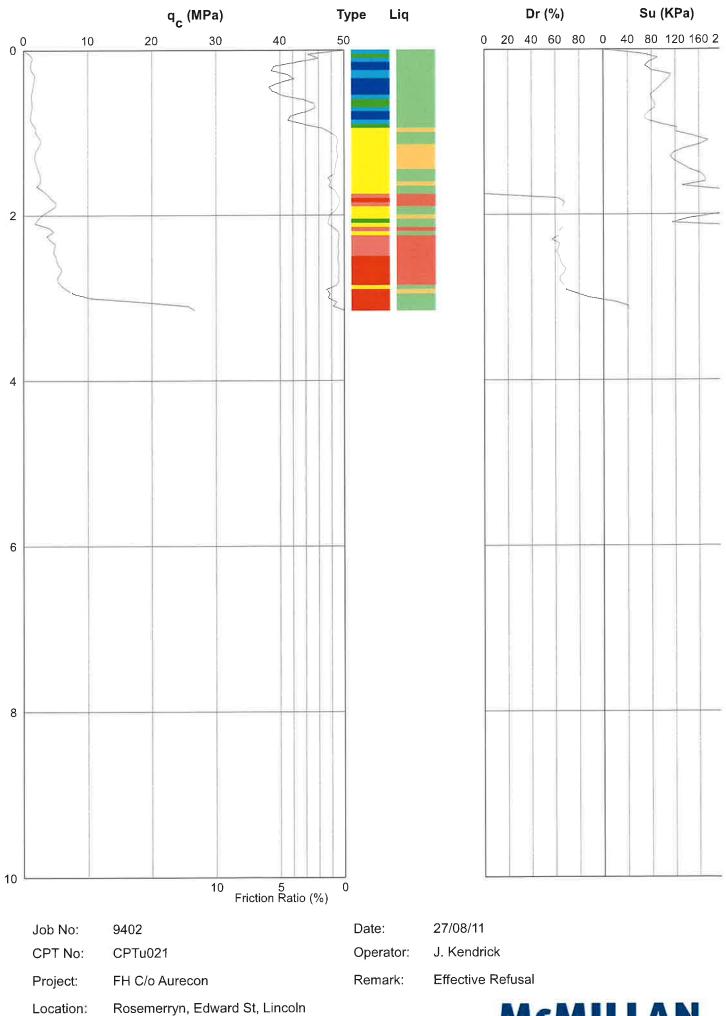




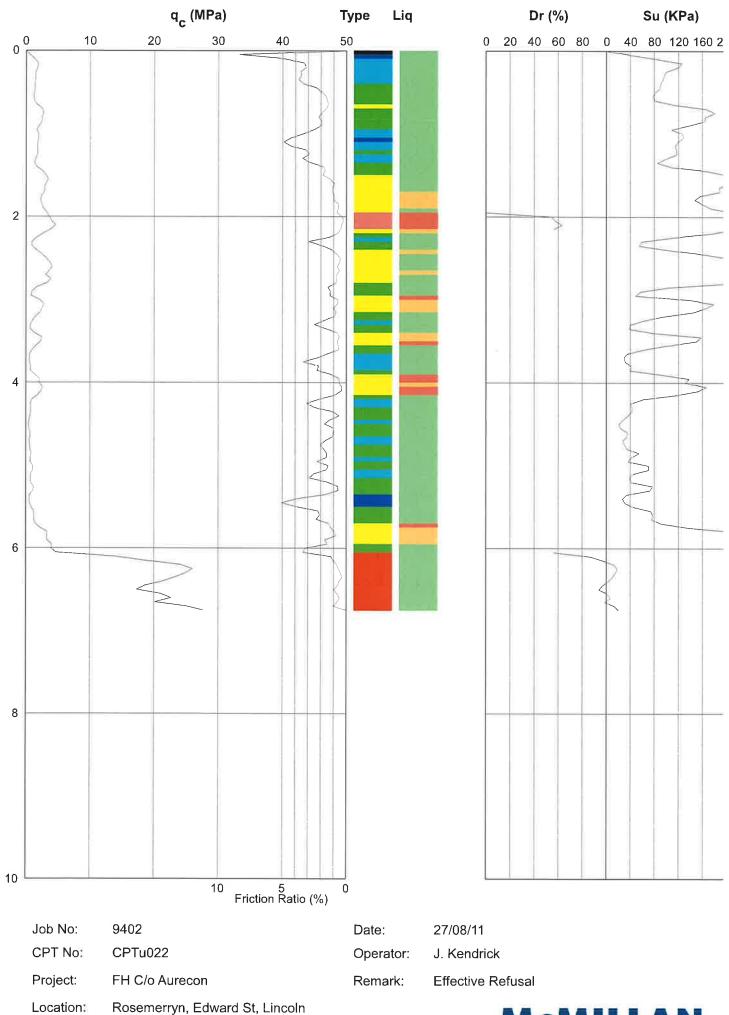




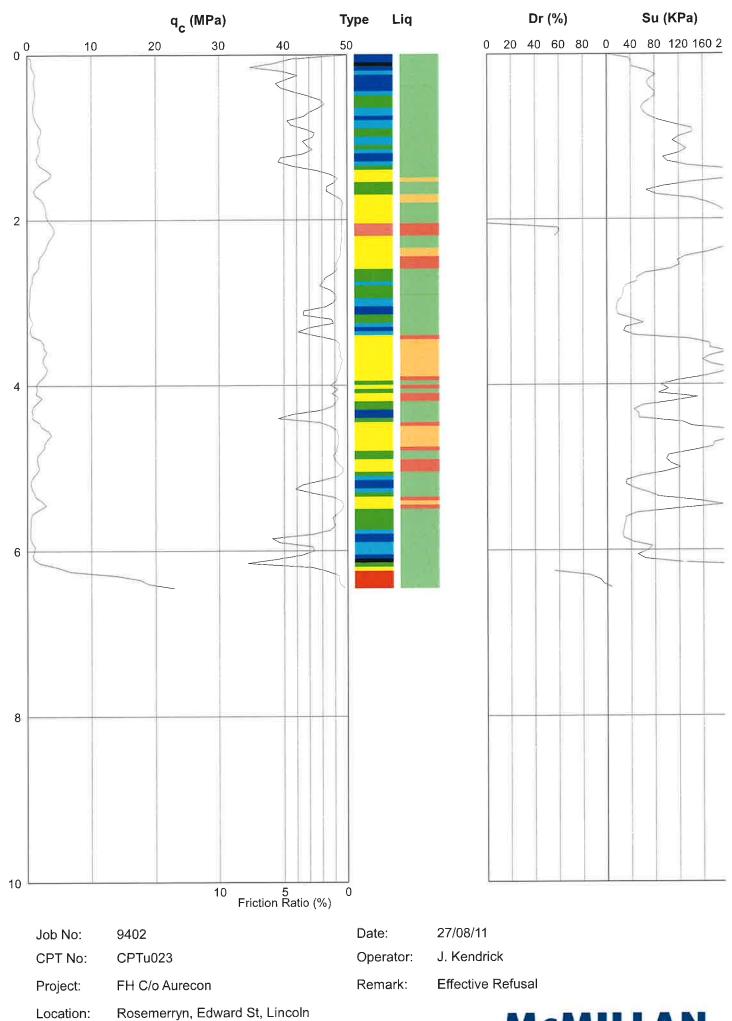




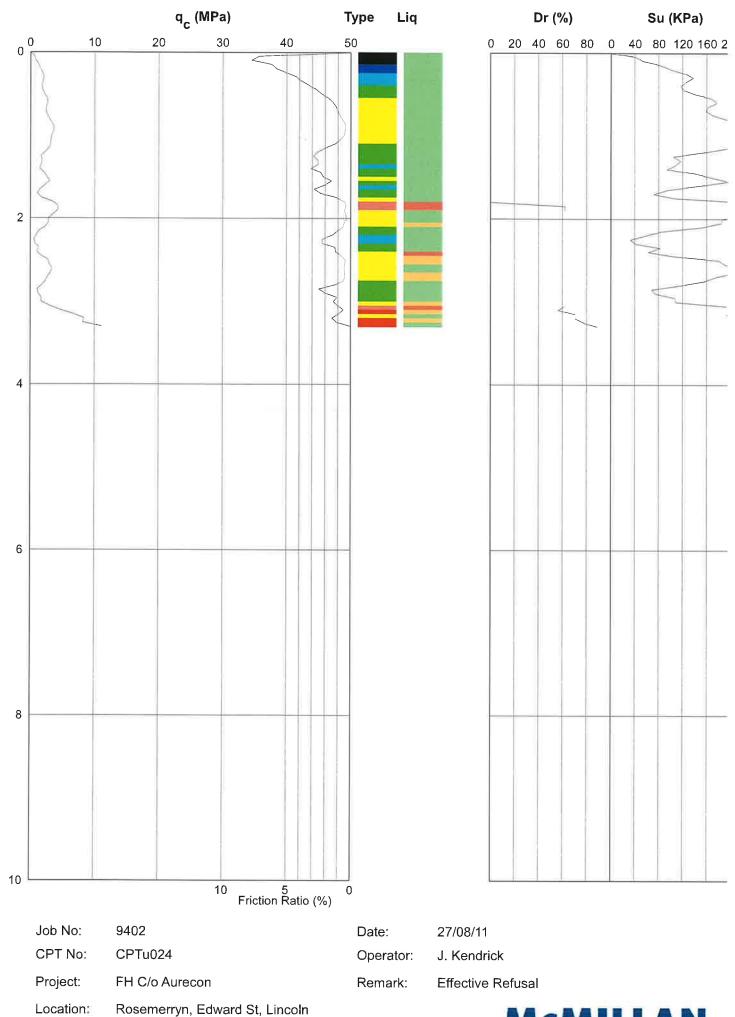




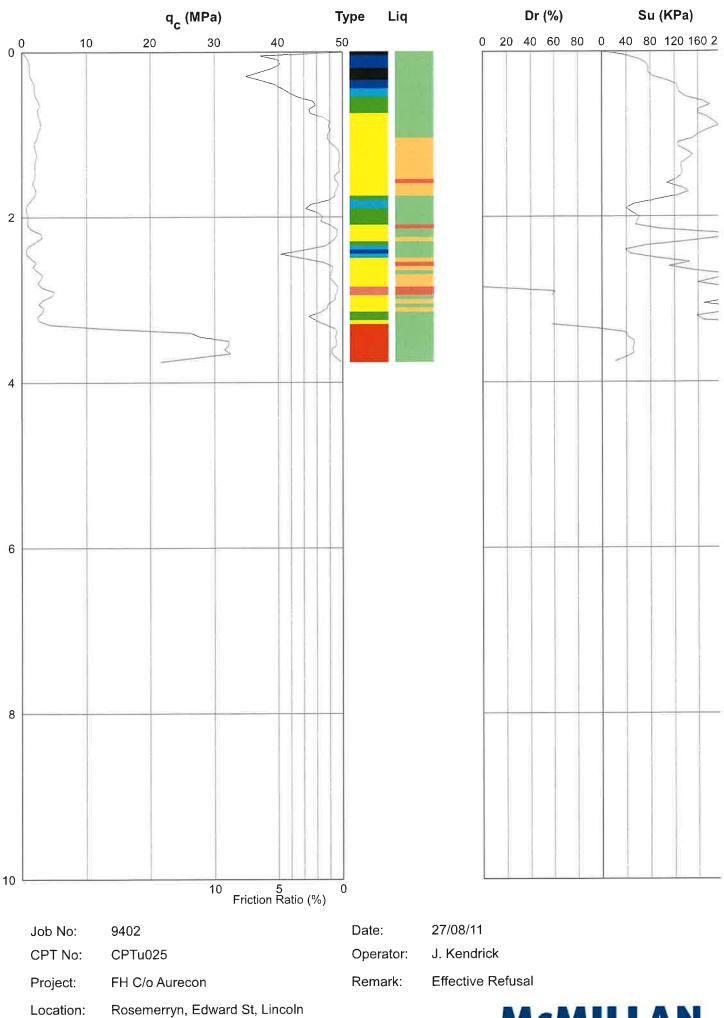








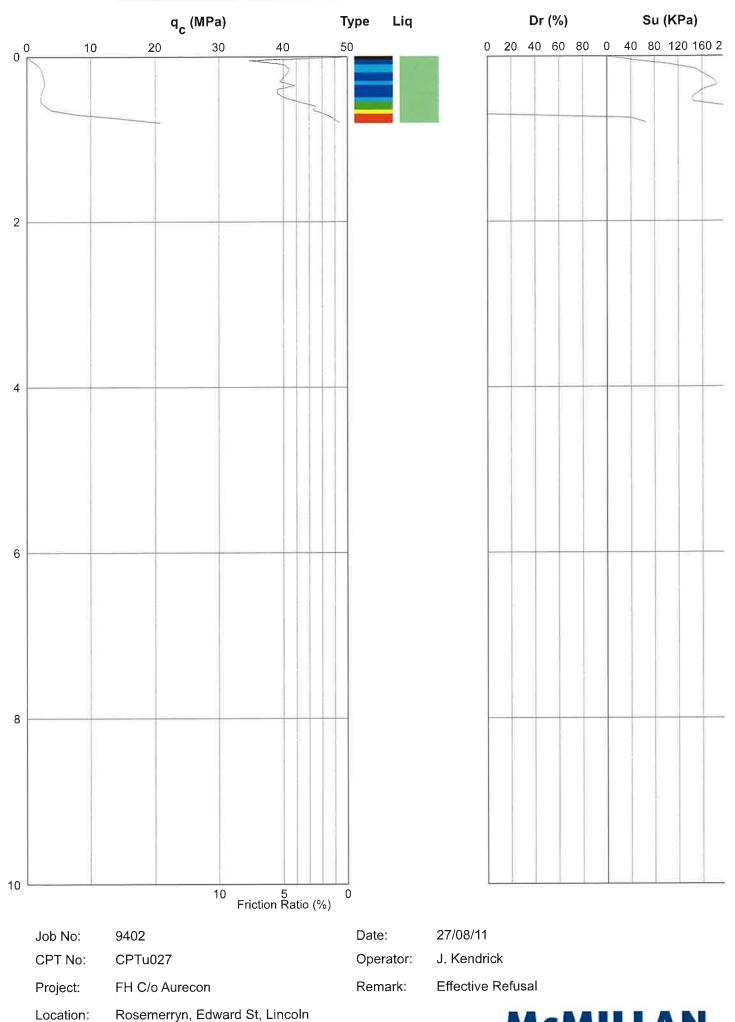








DRILLING SERVICES



DRILLING SERVICES

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aurecon	Client: FUL
Aurecon (New Zeeland) Umitad Umit 1, 50 Oewenden Md PO BOX 1001 Christourch 6140 New Zealand New Zealand Telephone, +64 3 369 0821 www.aurecongroup.com Facumite, +64 3 379 6955 Eyela Christourch the surrowings.pcom	Project Name Location: SE Project Refere

#### TON HOGAN LAND DEVELOPMENT **ROSEMERRYN** Location: SEE PLAN Project Reference: 224464

CO-ORDINATES N/A Easting: 1560049 m Northing: 5168133 m Ground Level: N/A

Sheet 1 of 1

**TP33** 

TEST PIT IN	IFORMATION								
Excavalor T	ype: 30t Excavator								
Test Pit Dimensions:									
Contractor:	Fulton Hogan								

Date Started: 9/09/2011 Date Completed: 9/09/2011

Logged by: LFS Input by: LFS Checked by: JSM Verified by: JK

Depth (m)	Sample	Water Level (m)	Graphic Log	Shear Vane Tests	Pocket Penetromater Tests	Soil Description					
).5 -			<u>5. 5. 5. 5.</u> <u>6. 5. 10. 5.17</u>			TOPSOIL SILT with trace sand and occaisional rootlets; Dark brown. Firm. Moist. Low plasticity. Sand fine grained. SAND; Grey with orange brown mottling. Loose. Moist. Sand fine grained.					
.0											
.0						Sandy GRAVEL; Grey with brown sand. Dense. Wet to saturated. Gravel fine to medium grained, rounded to sub-rounded. Sand fine grained.	-				
.5 -		Ţ				₂∞ End of Test Pit at 2.8m (GW Reached)	_				
.5 -											
.0 —											
.5 -											
emarks Groundw	:: vater @ 2.	8m				Logged by: LFS Input by: LFS Checked by: JSM Verified by: JK					
							1 of 1				

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-	-			~	
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#### FULTON HOGAN LAND DEVELOPMENT Client: Aurecon (New Zealand): Limited 122 Gloucester Street Po BOX 1061 Desident of 140 New Zealand New Zealand Telephone +64 3 355 0821 New Zealand Telephone +64 3 355 0821 Facation: SEE PLAN Project Reference: 224464 Project Name: ROSEMERRYN RESIDENTIAL SUBDIVISION

Sheet 1 of 1

**TP34** 

www.aurecorgoup.com Factore 45 3 379 6955 FTOJE Email christichurch@ap.aurecongroup.com TEST PIT INFORMATION Excavator Type: 30t Excavator Test Pit Dimensions: Contractor: Fulton Hogan					CO-ORDINATES NZTM     Date Started: 9/09/2011     Logged by:     LFS       Easting:     1559946 m     Date Completed: 9/09/2011     Input by:     LFS       Northing:     5167634 m     Checked by:     JSN       Ground Level:     N/A     Verified by:     JK			
Depth (m)	Sample	Water Level (m)	Graphic Log	Shear Vane Tests	Pocket Penetrometer Tests	Soil Description	Elevation (m)	
0.5 -			$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	Shear vane at 0,5m	Pockel Penetrometer	TOPSOIL SILT with trace sand and rootlets; Dark brown, Firm. Moist. Low plasticity. Sand fine grained.		
1.0 —			× × × × ×	44/24kPa /kPa /kPa /kPa Shear vane at 1m 107/18kPa /kPa	at 0.5m kN/m <sup>2</sup> Pocket Penetrometer at 1m kN/m <sup>2</sup>	Sandy SILT; Grey with orange brown mottling. Stiff. Moist. Low plasticity. Sand fine grained.		
1.5 -				Shear vane at 1.5m 27/12kPa /kPa /kPa	Pocket Penetrometer at 1.5m kN/m²	<sup>1,50</sup> Sandy SILT; Blue grey. Soft. Saturated. Low plasticity. Sand fine grained.		
2.0 —			* × × × × ×					
3.0 —			x x x x x x			3.20		
3.5 -						End of Test Pit at 3.2m (Pit Collapse)		
4.0 —								
4.5								

Logged by: Input by: Checked by: LFS LFS JSM Remarks: Groundwater seepage @ 1.6m Tree roots @ 1.8m Verified by: JK



## aurecon

#### Client: FULTON HOGAN LAND DEVELOPMENT Aurecon (New Zealand) Limited 122 Gloucester Street PO BOX 1051 Christchurch 8140 New Zealand www.aurecorgreps Ech Email: dwatchurch Steet Email: dwat Project Name: ROSEMERRYN RESIDENTIAL SUBDIVISION

Sheet 1 of 1

**TP35** 

Last Generated: 5/04/2018 10:28:47 AM

Email ornationarcomprovements TEST PIT INFORMATION Excavator Type: 30t Excavator Test Pit Dimensions: Contractor: Fulton Hogan				E N	Northing: 5167818 m Check			Logged by: LFS Input by: LFS Checked by: JSN Verified by: JK	5
Depth (m)	Sample	Water Level (m)	Graphic Log	Shear Vane Tests	Pocket Penetrometer Tests		Soil Description		Elevation (m)
).5 -			<u>viv</u> <u>viv</u> <u>viv</u> <u>x x x</u> <u>x x x</u>		1 1	plasticity. Sand fir SILT with minor s plasticity. Sand fir	and Grey with orange brown mottlin	g. Firm. Moist. Low	-
- - 0.						Wet. Low plasticit	and and tree roots. Grey with orange ty. Sand fine grained. se to medium dense. Wet, Sand fine		_
.5 -									
5 -			× × × × × ×			2.60 Wet. Low plasticit	and and tree roots. Grey with orange ty. Sand fine grained. tose to medium dense. Moist. Sand f	-	
0 —		<b>¥</b>	<u>, y U -</u>			Rounded. Sand n	Brown. Dense. Wet. Gravel medium nedium grained. 3.3m (GW Reached)	to coarse grained.	r
.5 -						End of Test Pit at	S.Sin (Gw Reached)		
5 -									
emarks	: ater seep	bage @	1.0m					Logged by: LFS Input by: LFS Checked by: JSM Verified by: JK	

## aurecon

### FULTON HOGAN LAND DEVELOPMENT Client: Aurecon (New Zealand) Limited 122 Gloucesters Street PO 80X 1051 Christchurch 8140 New Zealand Wew Zealand Wew Zealand Telephone +64 3 366 0821 Facamile +64 3 379 6955 Email christchurch@ap aurecongroup.com Project Name: ROSEMERRYN RESIDENTIAL SUBDIVISION

Sheet 1 of 1

**TP36** 

TEST PIT INFORMATION Excavator Type: 30t Excavator Test Pit Dimensions: Contractor: Fulton Hogan	CO-ORDINATES NZTM Easting: 1560102 m Northing: 5168002 m Ground Level: N/A	Date Started: 9/09/2011 Date Completed: 9/09/2011	Logged by: LFS Input by: LFS Checked by: JSM Verified by: JK

	Depth (m)	Sample	Water Level (m)	Graphic Log	Shear Vane Tests	Pocket Penetromeler Tests	Soil Description		Elevation (m)
-				$\frac{\sqrt{t}I_{f}}{\frac{1}{2}} = \frac{\sqrt{t}I_{f}}{\frac{1}{2}} = \frac{1}{2}$			TOPSOIL SILT with trace sand and rootlets; Dark brown plasticity. Sand fine grained,	n. Firm. Moist. Low	
				× × ×			SILT; Grey with brown mottling. Firm, Wet, Low plasticit	у.	
				× × × × × × ×					
0.8	5 -			×××	Shear vane at 0.5m 107/33kPa	Pockel Penetrometer al 0.5m kN/m <sup>2</sup>	SAND; Dark brown. Loose. Moist. Sand fine to medium	arained	
					/kPa /kPa	kN/m²	SAND, Dark brown, Loose, Moist, Gand fine to mediant	granica.	
1.0	0 —						SAND with some silt; Dark brown with orange brown mo	ottling. Loose. Moist.	
							SAND with some silt; Grey. Loose. Wet. Sand fine to m	edium grained.	
1.	5 -	_		× × ×			SILT with some tree roots; Dark blue grey. Loose to medium dense. Wet. Sand fine grained.		
				x x x					
	I			× × ×					
2.0	0 —			××××			SILT with tree roots; Dark grey. Firm. Wet. Low plasticit	у.	1
				× × × × ×					
		•		<u>* * </u>	*		SAND; Dark brown. Medium dense. Moist. Sand fine grained.		
2.5	5 -								
			V				2.80		
							End of Test Pit at 2.8m (GW Reached)		
3.0	0 —								
3.	5 -								
4.(	0 —								
	ļ								
4.	5 -								
AM									
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: 2/04/:	Remarks: Logged by: Input by:						Input by: LFS		
In Interacted	Groundwater seepage @ 1.2m Thee roots @ 2m							Verified by: JSM	
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Aurecon (New Zealand) Lim	rted	Project I	Name: I
122 Gloucester Street			
PO BOX 1061		Location	
Christehurch B140		Location	
New Zealand	Telephone +64 3 365 0821	Project F	Doforono
WARK ALTERATION FOR THE COMMING	Encircle: a64 3 376 2000	FIOLECL	Referenc

### N HOGAN LAND DEVELOPMENT ROSEMERRYN RESIDENTIAL SUBDIVISION Location: SEE PLAN

Sheet 1 of 1

**TP37** 

TEST PIT INFORMATION							
Excavator Type: 30t Excavator							
Test Pit Dimensions:							
Contractor: Fulton Hogan							

Depth (m)

Telephone +64 3 365 0821 Facurate +64 3 379 6955 congroup com Project Reference: 224464 www.aurecongroup.com Email christchurch@ap.aure CO-ORDINATES NZTM Easting: 1559999 m Northing: 5167503 m Ground Level: N/A Logged by: LFS Input by: LFS Checked by: JSM Verified by: JK Date Started: 9/09/2011 Date Completed: 9/09/2011 Water Level (m) Pocket Penetrometer Tests Graphic Log Shear Vane Tests Elevation (m) Sample Soil Description V11 111 V TOPSOIL SILT with trace sand and rootlets; Dark brown. Firm. Moist. Low plasticity. Sand fine grained. 1, 11, 14

3.0 - SAND with some sint and in Sand fine to medium graine 3.0 - Sand fine to medium graine 3.5 - Sand fine to medium graine	ed.
3.0 - Sand fine to medium graine	ed.
Sand fine to medium graine	ed.
2.5 - SAND with some silt and tr	ree roots; Dark blue grey. Medium dense. Wet.
	ose. Wet. Sand medium grained.
1.5 - X X X X X X X X X Shear vane at X X X Shear vane at X X X Shear vane at 1.5m Penetrometer At 1.5m: ArPa ktV/m* ktV/m* ktV/m*	
1.0	
0.5 -	nge brown mottling. Stiff. Moist. Low plasticity. Sand

## aurecon

### FULTON HOGAN LAND DEVELOPMENT Client: Aureon (New Zealand) United 122 Gloucester Street P0 B0X 1061 Chickhurch 8140 New Zealand www.aureongroup.com Telephone +64 3 366 0821 Facamole +84 3 379 6955 Enal chickhurch 820 avreongroup.com Project Name: ROSEMERRYN RESIDENTIAL SUBDIVISION

Sheet 1 of 1

TEST PIT INFORMATION Excavator Type: 30t Excavator Test Pit Dimensions: Contractor: Futton Hogan	CO-ORDINATES NZTM Easting: 1560038 m Northing: 5167595 m Ground Level: N/A	Date Started: 9/09/2011 Date Completed: 9/09/2011	Logged by: LFS Input by: LFS Checked by: JSM Verified by: JK
	<i>v</i> 2		

Depth (m)	Sample	Water Level (m)	Graphic Log	Shear Vane Tests	Pocket Penetrometer Tests	Soil Description	Elevation (m)
			100 00 X			TOPSOIL SILT with trace sand and rootlets; Dark brown. Firm. Moist. Low plasticity. Sand fine grained,	
0.5 -						SAND; Dark grey. Loose to medium dense. Moist. Sand fine grained.	
1.0 —			× × × × × × × × × ×			SILT with some peat inclusions. Light blue grey. Soft. Wet. Low plasticity.	
1.5 -			× × ×			SAND with tree roots; Light blue grey. Loose. Moist. Sand fine grained,	
2.0 —							
2.5						<sup>270</sup> Gravelly SAND; Light brown. Medium dense. Moist. Gravel fine grained. Su angular. Sand fine to medium grained.	b
3.0 —		Ţ				End of Test Pit at 3.1m (GW Reached)	
3.5 -							
4.0 —							
4.5 -							
Last Generated: 5/04/2018 10:28:49 AM Last Generated: 5/04/2018 10:28:49 AM Last Generated: 5/04/2018 10:28:49 AM	ots @ 2.5	m countere	d @ 3.1m			Logged by: LFS Input by: LFS Checked by: JSN Verified by: JK	
Last						Sh	eet 1 of 1

Aurecon (New Zealand) Limited 122 Glouceder Street PO BOX 1081 Christchurch 810 New Zealand Telennes +64 3 366 0821 Www.aurecongroup.com Facantie +64 3 376 6955 Email or instruturch@ga.aurecongroup.com			Location	Name: : <b>SEE F</b>	ON HOGAN LAND DEVELOPMENT ROSEMERRYN RESIDENTIAL SUBDIVISION PLAN ce: 224464	TP	<b>39</b>	
Excavate Test Pit	TINFORM or Type: 3 Dimensions tor: Fulton	0t Excav s:	rator	Ea No		1560077 m Date Completed: 9/09/2011 5167687 m	Logged by: LF Input by: LF Checked by: JS Verified by: JK	SM
Depth (m)	Sample	Water Level (m)	Graphic Log	Shear Vane Tests	Pocket Penetrometer Tests	Soil Description		Elevation (m)
0.5 -			x x			TOPSOIL SILT with trace sand and rootlets; Dark brown. Fi plasticity. Sand fine grained. SILT; Grey with orange brown mottling. Stiff. Moist. Low pla		
1.0 -	-					Silty SAND; Grey with orange brown mottling. Loose. Moist grained.		
2.0 —							-	
2.5 -								
3.5 -		Ţ				End of Test Pit at 3.1m (GW Reached)		
4.0 —								
4.5 -								
Remark	ks: ots @ 1.5n	n				ln Ct	ogged by: LFS put by: LFS hecked by: JSM erified by: JK Sheet	1 of 1

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uu	recon	
Aurecon (Nev	v Zealand) Limited	

# Client: FULTON HOGAN LAND DEVELOPMENT Project Name: ROSEMERRYN RESIDENTIAL SUBDIVISION

PO BOX Christchu New Zeal	urch 8140 land econgroup com	Fatamile	+54 3 366 0821 +64 3 379 6955 com	Locati	on: SEE P t Reference	Ce: 224464		Sheet	1 of 1	
Email christchurch@ap.aurecongroup.com TEST PIT INFORMATION Excavator Type: 30t Excavator Test Pit Dimensions: Contractor: Fulton Hogan					CO-ORDINATES NZTM         Date Started:         9/09/2011         Logged by:         LFS           Easting:         1560116 m         Date Completed:         9/09/2011         Input by:         LFS           Northing:         5167779 m         Ground Level:         N/A         Verified by:         JK					
Depth (m)	Sample	Water Level (m)	Graphic Log	Shear Vane Tests	Pocket Penetrometer Tests		Soil Description		Elevation (m)	
0.5 -			<u> </u>			TOPSOIL SILT with tra plasticity. Sand fine gra	ce sand and rootlets; Dark brown ined.	n, Firm. Moist. Low		
1.0 —			$\begin{array}{c} \underline{I_1} & \underline{A_1} & \underline{A_2} & \underline{A_3} \\ \times & \times & \times \\ \times & \times & \times \\ \times & \times & \times \\ \times & \times &$	Shear vane a' 1m 92/27kPa /kPa	t Pocket Penetrometer al 1m <sup>-</sup> kN/m <sup>2</sup>	1 1 10	brown mottling. Stiff. Moist. Low			
1.5 –			× × × × × × × × × × × × × × ×	/kPa		140	ght blue grey. Firm. Wet. Low pla			
2.0 —						2.00	ight grey. Loose. Wet. Sand fine dense. Moist. Sand medium gra			
2.5 -						2.79 SAND; Light grey. Med	lium dense. Moist. Sand fine gra	ined.		
3.0 —						SAND with tree roots; grained.	Light grey. Medium dense. Moist	. Sand medium		
3.5 -			× × × × × × × × × ×	-		350 SILT; Light blue grey. S	Soft. Wet. Low plasticity.		-	
4.0 —		Ţ	× × × × ×			≖∞ End of Test Pit at 4m (	GW Reached)			
4.5 -										
	-									

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**TP40** 

Sheet 1 of 1

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Aurecon (New Zealand) Limited 122 Gloucester Street PS BOX 103 Christhurch 8140 New Zasland Www.aurecongroup.com Enail Christhurch@ga purecongroup.com

#### Client: FULTON HOGAN LAND DEVELOPMENT Project Name: ROSEMERRYN RESIDENTIAL SUBDIVISION Location: SEE PLAN Project Reference: 224464

Sheet 1 of 1

TEST PIT INFORMATION Excavator Type: 30t Excavator Test Pit Dimensions:		CO-ORDINATES NZTM Easting: 1560155 m Northing: 5167871 m	Date Started: Date Completed:	9/09/2011 9/09/2011
	Contractor: Fulton Hogan	Ground Level: N/A		

Excaval Test Pit	TEST PIT INFORMATION Excavator Type: 30t Excavator Test Pit Dimensions: Contractor: Fulton Hogan					S NZTM         Date Started:         9/09/2011         Logged by:         LI           1560155 m         Date Completed:         9/09/2011         Input by:         Lif           5167871 m         N/A         Verified by:         Ji	ES SM K
Depth (m)	Sample	Water Level (m)	Graphic Log	Shear Vane Tests	Pocket Penetrometer Tesls	Soil Description	Elevation (m)
0.5 1.0 - 1.5 2.0 - 2.5 3.0 -		¥	1     1 <td></td> <td></td> <td>TOPSOIL SILT with trace sand and rootlets; Dark brown. Firm. Moist. Low plasticity. Sand fine grained. SAND; Brown with orange mottling. Loose to medium dense. Moist. Sand fine grained. Sandy SILT with tree roots; Dark blue grey. Soft. Wet. Low plasticity. Sand fine grained. SILT; Grey. Soft. Wet. Low plasticity. SILT; Grey. Soft. Wet. Low plasticity. End of Test Pit at 2.4m (GW Reached)</td> <td></td>			TOPSOIL SILT with trace sand and rootlets; Dark brown. Firm. Moist. Low plasticity. Sand fine grained. SAND; Brown with orange mottling. Loose to medium dense. Moist. Sand fine grained. Sandy SILT with tree roots; Dark blue grey. Soft. Wet. Low plasticity. Sand fine grained. SILT; Grey. Soft. Wet. Low plasticity. SILT; Grey. Soft. Wet. Low plasticity. End of Test Pit at 2.4m (GW Reached)	
3.5 -							
4.5 -							
Last Generated: 5/04/2018 10:28:50 AM Durou S Approved S Approve Approve Appr	ks: Iwater seep vater encol	bage @ untered	1.6m @ 2.4m			Logged by: LFS Input by: LFS Checked by: JSM Verified by: JK Shee	1 of 1

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Aurecon (New Zealand) Luniled 122 Gloucester Street P0 BDV 1061 Chrischurch B140 New Zealand Wew Zealand Wew Zealand Factomile +64 3 356 0821 Wew Zealand Factomile +64 3 379 6555 Emel chrischurch@ap aurecongroup.com

#### Client: FULTON HOGAN LAND DEVELOPMENT Project Name: ROSEMERRYN RESIDENTIAL SUBDIVISION Location: SEE PLAN Project Reference: 224464

Sheet 1 of 1

TEST PIT INFORMATION Excavator Type: 30t Excavator Test Pit Dimensions: Contractor: Fulton Hogan	CO-ORDINATES NZTM Easting: 1560194 m Northing: 5167963 m Ground Level: N/A	Date Started: 9/09/2011 Date Completed: 9/09/2011	Logged by: LFS Input by: LFS Checked by: JSM Verified by: JK

	Depth (m)	Sample	Water Level (m)	Graphic Log	Shear Vane Tests	Pocket Penetrometer Tests	Soil Description		Elevation (m)
				Mr. Mr. Mr.			TOPSOIL SILT with trace sand and rootlets; Dark brown plasticity. Sand fine grained.		
	0.5 -			× × × × × × × × × × × ×			Sandy SILT; Brown, Firm. Moist. Low plasticity. Sand fir	~	
							SAND; Orange brown. Loose to medium dense. Moist.	Sand fine grained.	
	1.0 —						1.20		
	1.5 -			* * * * * * * * * * * *			SILT with tree roots; Grey. Soft. Wet. Low plasticity.		
	2 2 2			××			SAND; Grey. Medium dense. Wet. Sand fine grained.		
	2.0 —						SAND; Brown and grey. Medium dense. Wet. Sand fine	grained.	
	2.5 -								
	3.0 —								
	3.5 -								
	1	-	Ť	1141-1172			End of Test Pit at 3.8m (GW Reached)		
	4.0 —								
	4.5 -								
8:51 AM									
2018 10:2									
Last Generated: 5/04/2018 10:28:51 AM	Remark Ground Tree roo	s: water see ots @ 1.8r	page @ n	1.8m				Logged by: LFS Input by: LFS Checked by: JSM Verified by: JK	
Last G								Sheet 1	of <b>1</b>

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1.0

1.5

2.0

2.5

3.0

3.5

4.0

4.5

Remarks:

Groundwater seepage @ 3.8m

Generated: 5/04/2018 10:28:52 AM

Last

#### FULTON HOGAN LAND DEVELOPMENT Client: Project Name: ROSEMERRYN RESIDENTIAL SUBDIVISION Location: SEE PLAN Telephone +64 3 3766 0821 Facsumile +64 3 379 6955 Project Reference: **224464**

Sheet 1 of 1

**TP43** 

	Ichurch@ap a			- 1 -				Sheet	TOLL
TEST PIT INFORMATION         CO-ORD           Excavator Type:         30l Excavator         Easting:           Test Pit Dimensions:         Northing:         Contractor:           Contractor:         Fulton Hogan         Ground L						1560233 m 5168055 m	Date Started: 9/09/2011 Date Completed: 9/09/2011	Logged by: LFS Input by: LFS Checked by: JSN Verified by: JK	
Depth (m)	Sample	Water Level (m)	Graphic Log	Shear Vane Tests	Pocket Penetrometer Tests		Soil Description		Elevation (m)
0.5 -			<u>(11) (11) (11)</u>			plasticity. Sand fine gra	ace sand and rootlets; Dark brown ained. nge mottling. Loose to medium de		
			0000			Sandy GRAVEL; Grey	with brown sand. Loose to mediu		1

0.80
Sandy GRAVEL; Grey with brown sand. Loose to medium dense. Wet to saturated. Gravel medium to coarse grained. Rounded to sub-rounded. Sand fine grained.

	saturated. Gravel medium to coarse grained. Rounded to sub-rounded. Sand fine grained.
	2.50
	Sandy GRAVEL; Grey with brown sand. Dense. Wet to saturated. Gravel medium to coarse grained. Rounded to sub-rounded. Sand fine grained.
000	

End of Test Pit at 3.8m (Pit Collapse)

Database File: TEST PITS.GPJ, Library: CHCH LIBRARY FEB 2011.GLB, Data template: CHCH DATA TEMPLATE NOV 2010.GDT, Last Generated: 5/04/2018.

LFS LFS

JSM

JK

Logged by: Input by: Checked by:

Verified by:

## aurecon

Aureon (New Zeatand Lunsted 122 Gloupster Street DP BDX 1051 Chrischurch 8140 New Zealand Telephone +64 3 366 0621 www.aureoongroup.com Facumet +54 3 376 6565 Email christohurch@ap.aurecongroup.com

#### Client: FULTON HOGAN LAND DEVELOPMENT Project Name: ROSEMERRYN RESIDENTIAL SUBDIVISION Location: SEE PLAN Project Reference: 224464

Sheet 1 of 1

TEST PIT INFORMATION Excavator Type: 30t Excavator Test Pit Dimensions: Contractor: Fulton Hogan	CO-ORDINATES NZTM Easting: 1560130 m Northing: 5167556 m Ground Level: N/A	Date Started: 9/09/2011 Date Completed: 9/09/2011	Logged by: LFS Input by: LFS Checked by: JSM Verified by: JK

Depth (m)	Sample	Water Level (m)	Graphic Log	Shear Vane Tests	Pocket Penetrometer Tests	Soil Description	Elevation (m)
0.5 -			<u>xto</u> <u>xto</u> <u>x</u> to			TOPSOIL SILT with trace sand and rootlets; Dark brown. Firm. Moist. Low plasticity. Sand fine grained. SAND; Brown with orange mottling. Medium dense. Moist. Sand fine grained,	
1.0 —						SAND; Orange brown. Medium dense. Moist. Sand medium grained.	
1.5 -			* * * * * * * * * * * * * * * * * *			Sandy SILT with tree roots; Light grey; Soft. Wet. Low plasticity. Sand fine grained.	
2.0 —			× × × × × × × × × × × × ×			<sup>220</sup> Silty SAND with tree roots; Grey. Medium dense. Wet. Sand medium grained.	
2.5			× × × × × × × × × × × × × × ×				
3.0 —			× × × × × × × × × × × × × ×				
3.5			× × × × × × × × × × × ×			I.60 End of Test Pit at 3.8m (Pit Collapse)	
4.0 —							
4.5 -							
Groundv	Remarks: Groundwater seepage @ 3.5m Tree roots @ 2.2m						
Last Ge						Sheet *	l of 1

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Last Generated: 5/04/2018 10:28 53 AM

Aurecon (New Zealand) Limited 122 Gloucester Street PO BOX 1061 Christchurch 8140 New Zealand Telephone

#### Client: FULTON HOGAN LAND DEVELOPMENT Project Name: ROSEMERRYN RESIDENTIAL SUBDIVISION Location: SEE PLAN Project Reference: 224464

Email ch	congroup.com nstchurch@ap.a	Facsinik vrecongroup	+64 3 379 6955	Projec	t Reference	ce: <b>224464</b>		Shee	et 1 of 1
TEST PIT Excavator Test Pit D Contractor	Type: 30 imensions	)t Excav :	rator		CO-ORDINATE Easting: Northing: Ground Level:	1560208 m 5167740 m	Date Started: 9/09/2011 Date Completed: 9/09/2011	Logged by: LF Input by: LF Checked by: JS Verified by: JK	S M
Depth (m)	Sample	Water Level (m)	Graphic Log	Shear Vane Tests	Pocket Penetrometer Tesls		Soil Description		Elevation (m)
0.5 -						plasticity. Sand fine gra	ce sand and rootlets; Dark brown iined. nge mottling. Loose. Moist, Sand		
1.0 —						SAND; Reddish brown	. Loose. Moist, Sand medium gra	ined.	
1.5 -			* × × × × × × × × ×			1.80	ght blue grey. Firm. Wet. Low plas ium dense. Moist. Sand medium	-	
2.0 —						2.30		granes.	
2.5 –						2.50	irm. Wet. Low plasticity. ium dense. Moist. Sand medium	grained.	
3.0 —									
3.5 -		Ţ				3.80			
4.0 —						End of Test Pit at 3.8m	(GW Reached)		
4.5 -									
Remarks Groundw Groundw	ater seep	age @ unterec	1.6m d@ 3.8m					Logged by: LFS Input by: LFS Checked by: JSM Verified by: JK	

Database File: TEST PITS.GPJ, Library: CHCH LIBRARY FEB 2011.GLB, Data template: CHCH DATA TEMPLATE NOV 2010.GDT, Last Generated: 5/04/2018.

## aurecon

122 Gloucester Stre PO BOX 1051 Christchurch 8140 New Zealand Telephone +64 3 366 0821 Facamile +64 3 379 6955

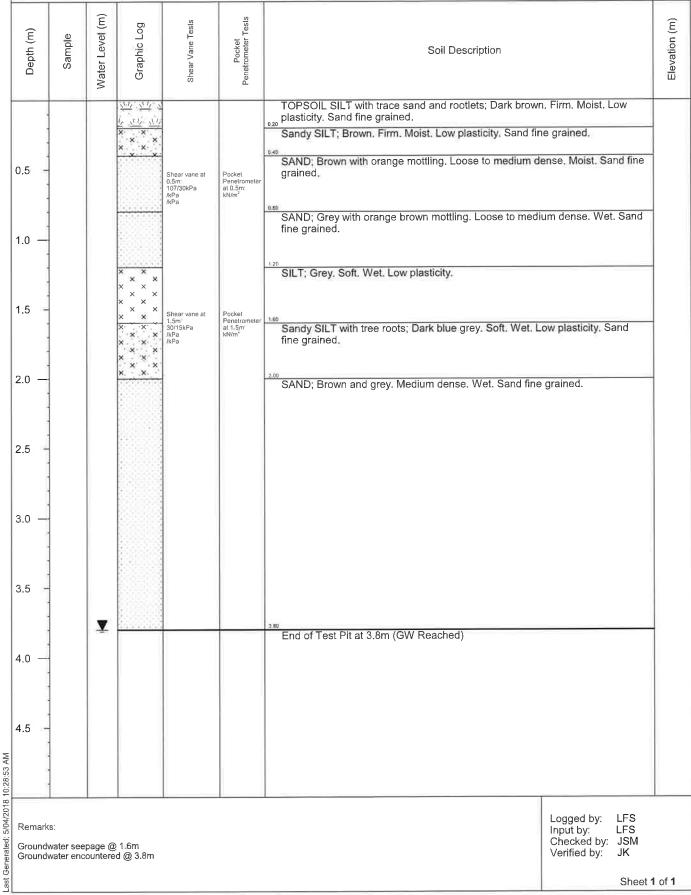
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#### FULTON HOGAN LAND DEVELOPMENT Client: Project Name: ROSEMERRYN RESIDENTIAL SUBDIVISION Location: SEE PLAN Project Reference: 224464

Sheet 1 of 1

**TP46** 

www.aurecongroup.com Email christonurch@ao.aur LFS LFS CO-ORDINATES NZTM 9/09/2011 Logged by: TEST PIT INFORMATION Date Started: Input by: LFS Checked by: JSM Verified by: JK Excavator Type: 30t Excavator Test Pit Dimensions: Contractor: Fulton Hogan Date Completed: 9/09/2011 Easting: Northing 1560286 m 5167924 m Ground Level: N/A



Aurrean () 122 Glouc PO BOX 1 Chnstchun New Zeala www.aureo	ch 6140	Telepho Fatsim	+64 3 366 DB21 +64 3 379 6955	Locati	ct Name: ion: <b>SEE F</b>	ROSEMERRYN RESIDENTIAL SUBDIVISION	<b>P47</b>
TEST PIT Excavator Test Pit Di Contractor	INFORM Type: 3 mensions	ATION 01 Excar s:				1560143 m         Date Completed:         9/09/2011         Input by: Checked by:	LFS _FS JSM JK
Depth (m)	Sample	Water Level (m)	Graphic Log	Shear Vane Tests	Penetrometer Tests	Soil Description	Elevation (m)
0.5 -			1         1	Shear vane a 0.5m 98/33kPa /kPa /kPa /kPa /kPa /kPa 74/18kPa	Penetrometer at 0.5m kN/m <sup>2</sup>	TOPSOIL SILT with trace sand and rootlets; Dark brown. Firm. Moist. Low plasticity. Sand fine grained. SILT; Grey with orange brown mottling; Stiff. Moist. Low plasticity.	
1.5 –				/kPa /kPa Shear vane a 1.5m 36/12kPa /kPa /kPa	kN/m² Pocket Penetrometer at 1.5m kN/m²	<ul> <li>Sandy SILT; Grey with orange brown mottling; Stiff. Moist. Low plasticity. Sa fine grained.</li> <li>Sandy SILT; Light grey; Stiff. Wet. Low plasticity. Sand fine grained.</li> </ul>	nd
2.0 —						Silty SAND; Grey. Loose to medium dense. Moist. Sand fine grained.	
3.0 —		Ţ	× × × × × × × × × ×			SILT; Dark grey. Firm. Wet. Low plasticity.	

End of Test Pit at 3m (GW Reached)

LFS LFS JSM JK

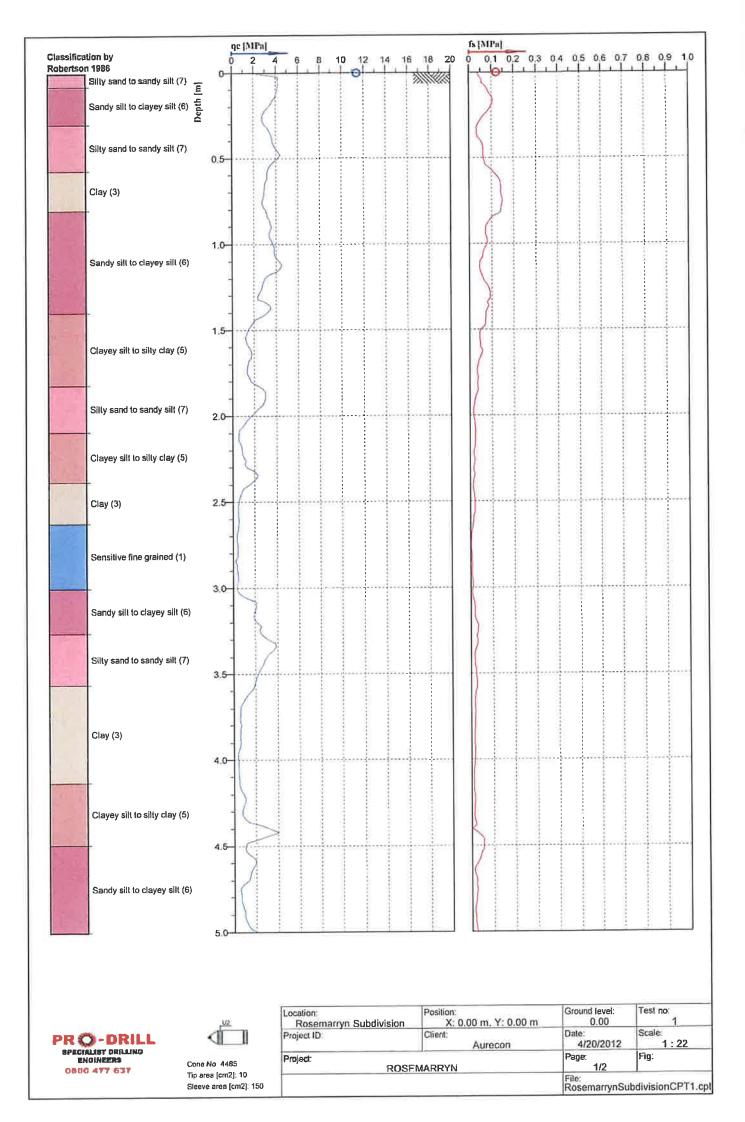
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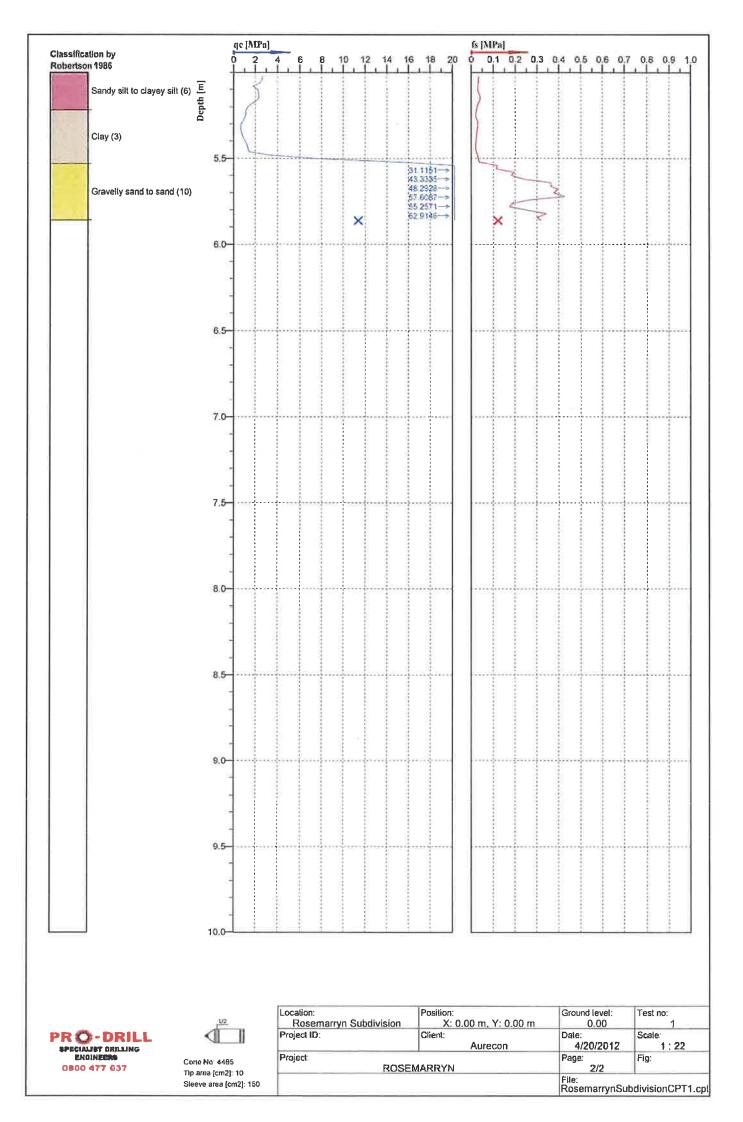
Last Generated: 5/04/2018 10:28:54 AM Remarks: Groundwater seepage @ 1.2m Groundwater encountered @ 3.0m

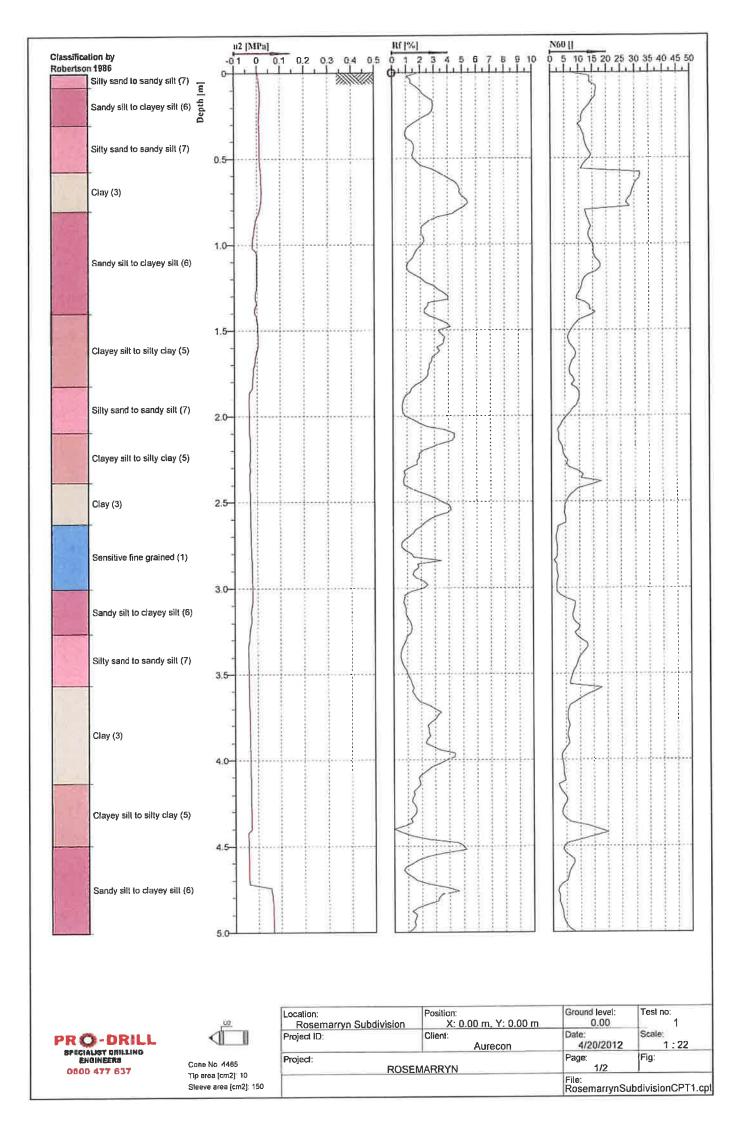
3.5

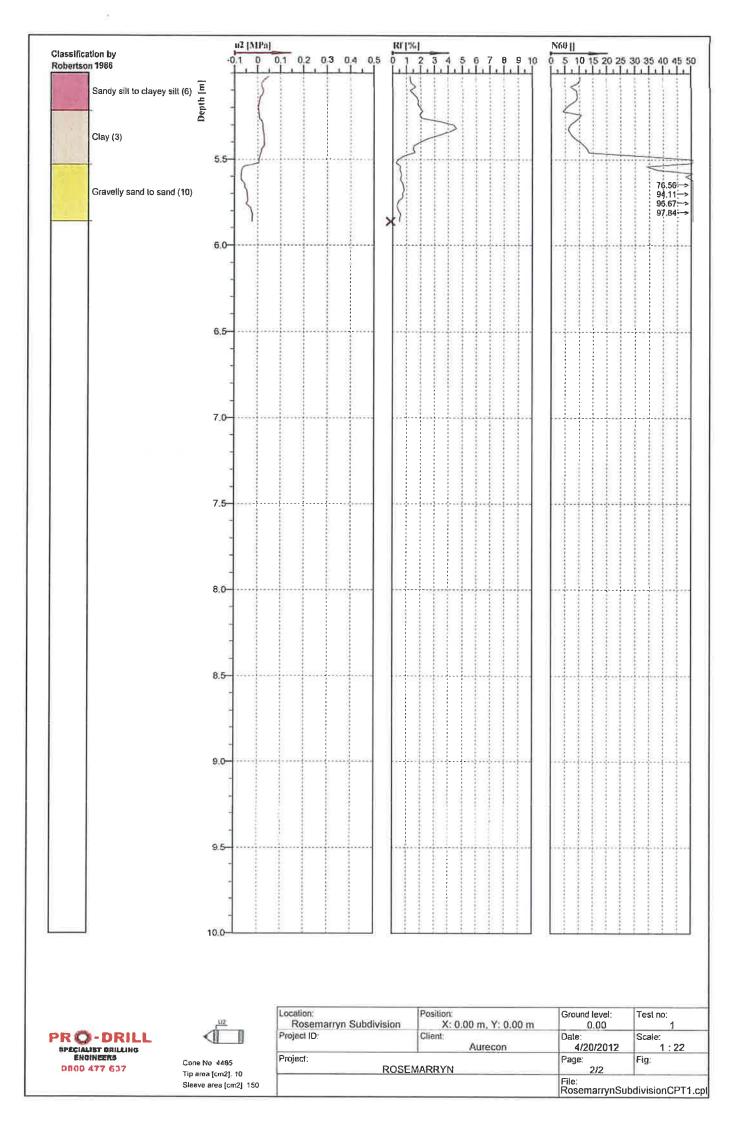
4.0

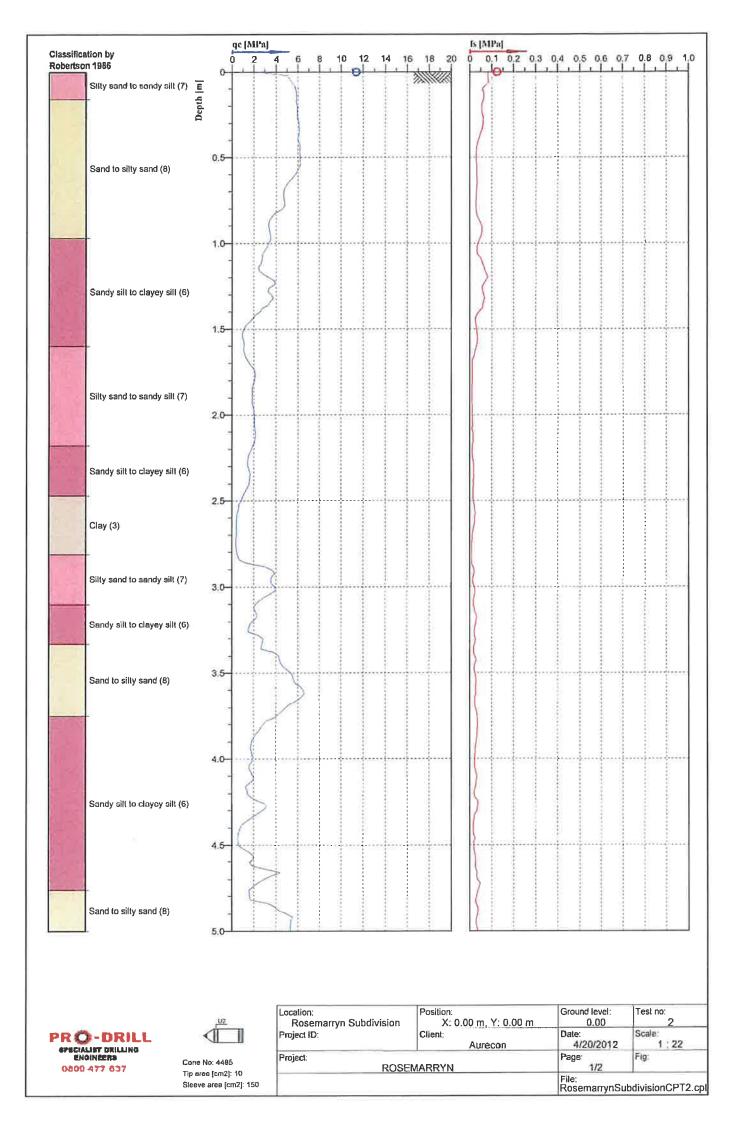
4.5

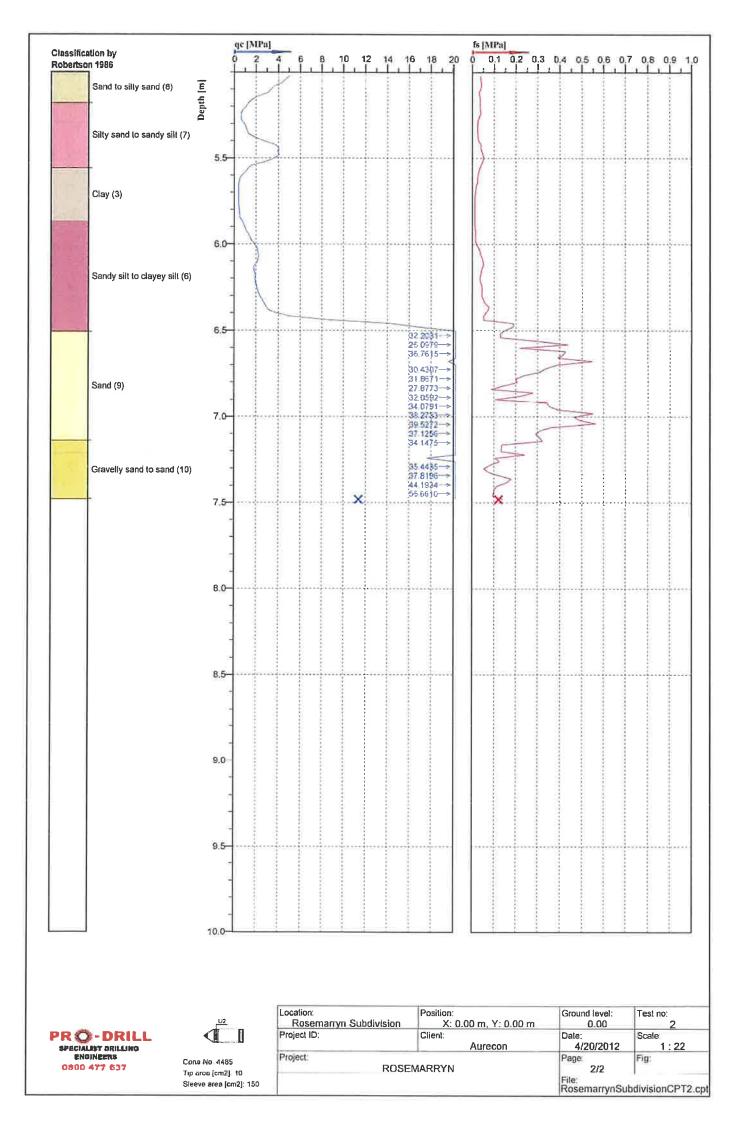


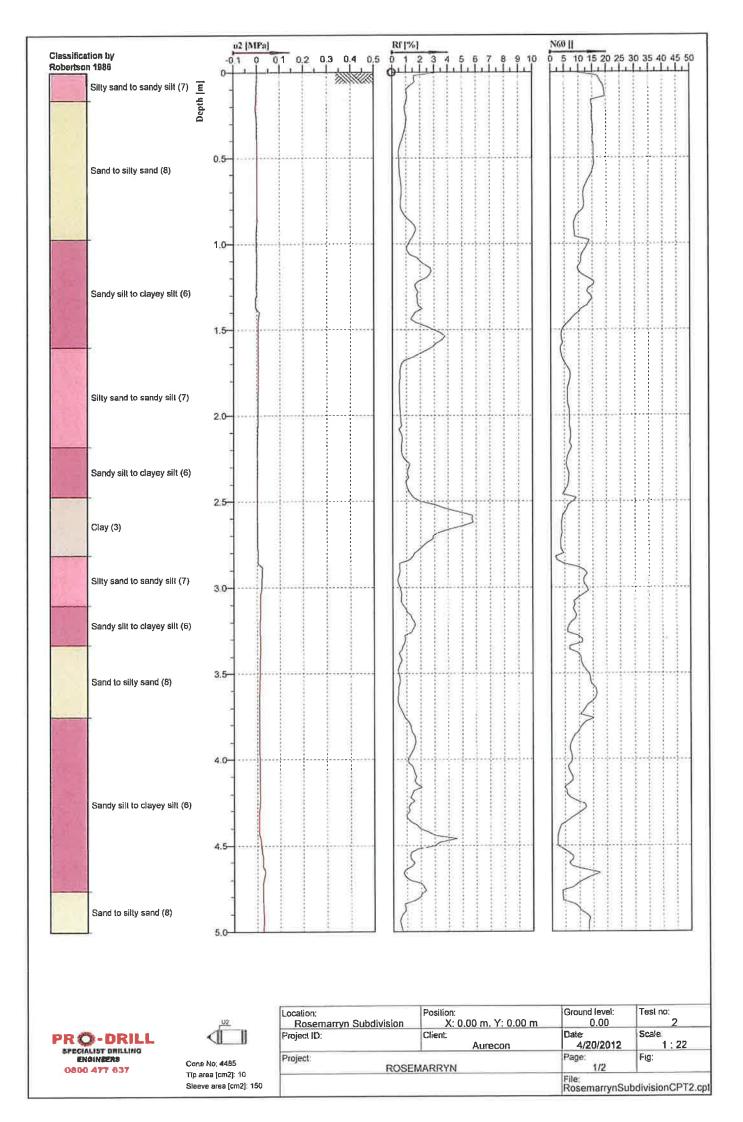


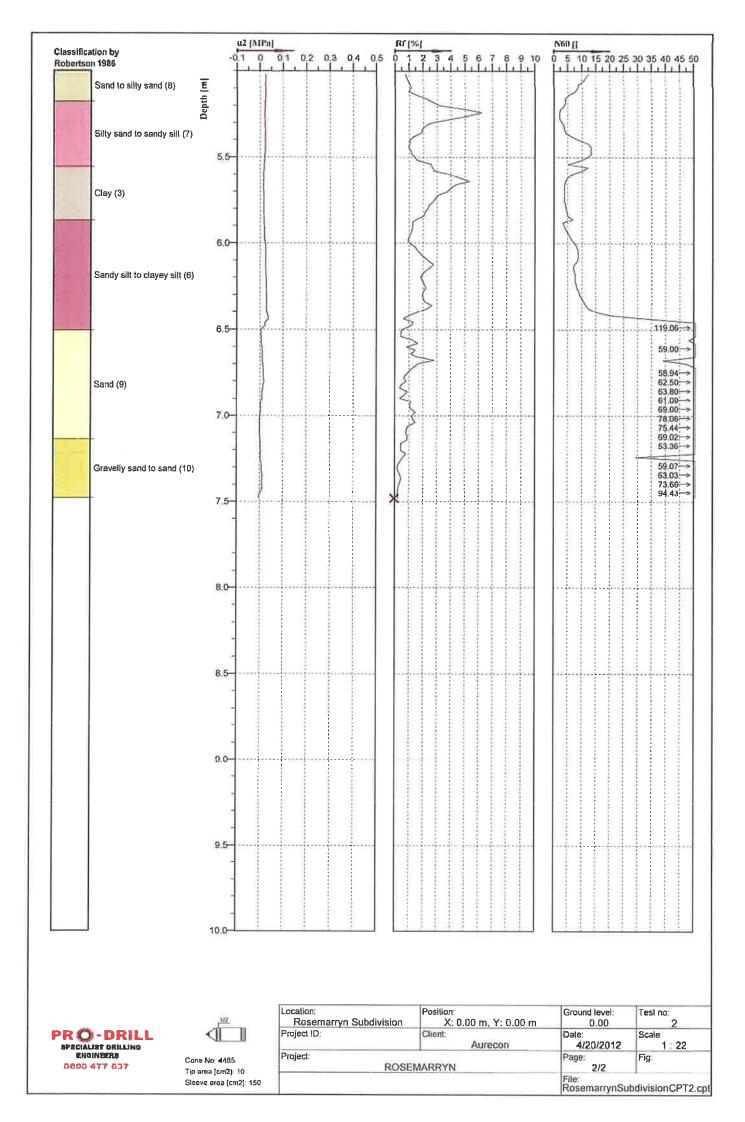


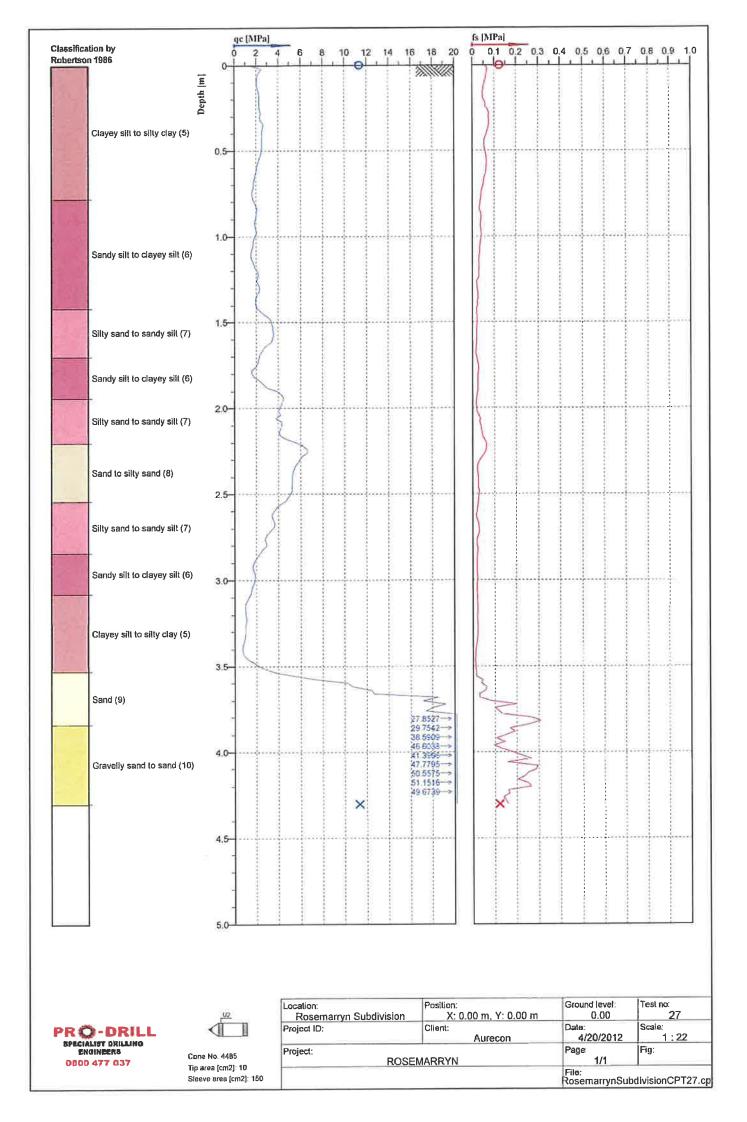


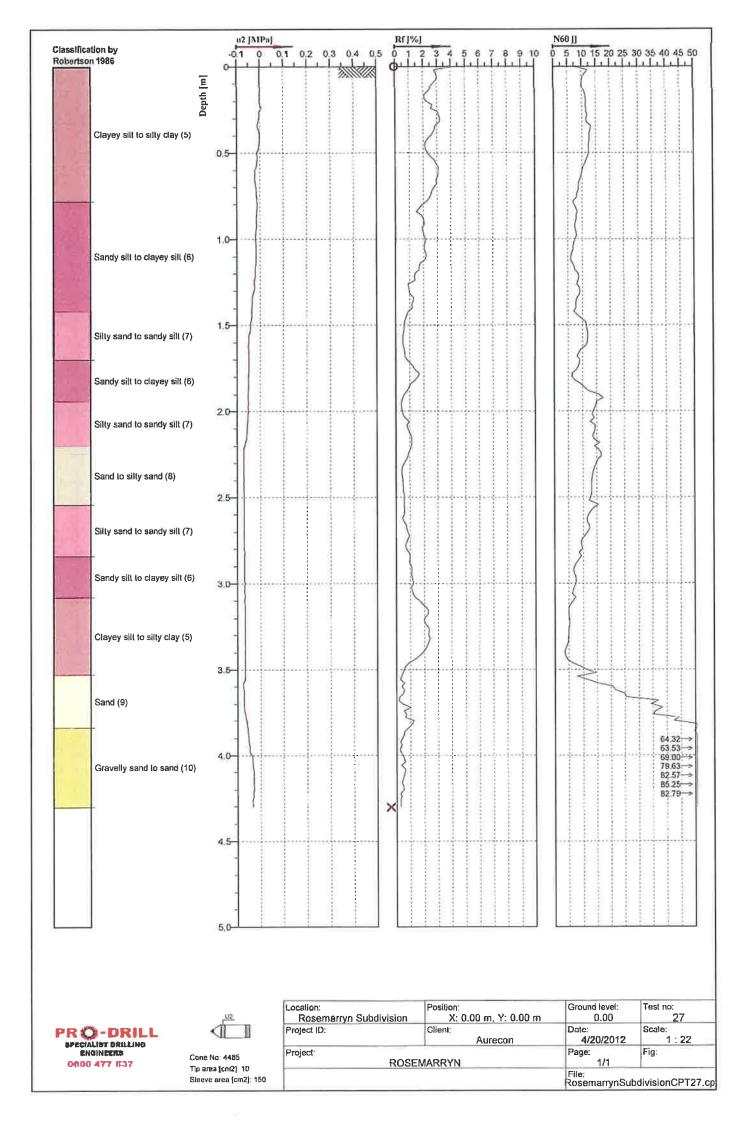






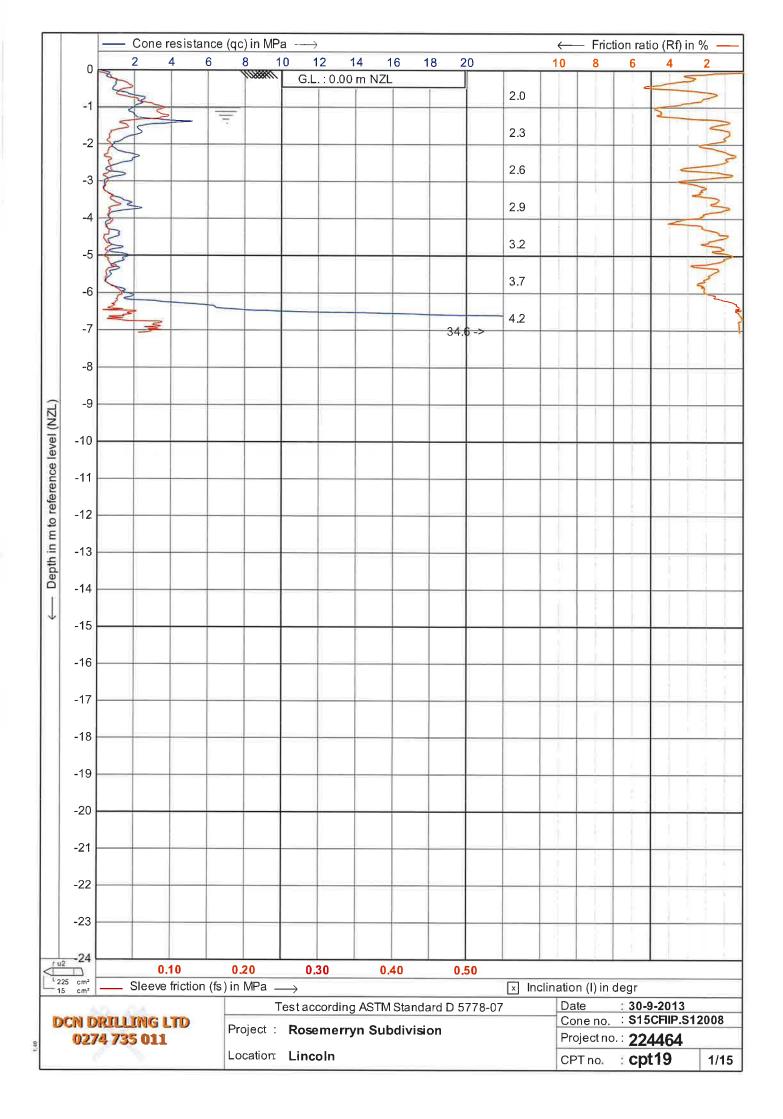


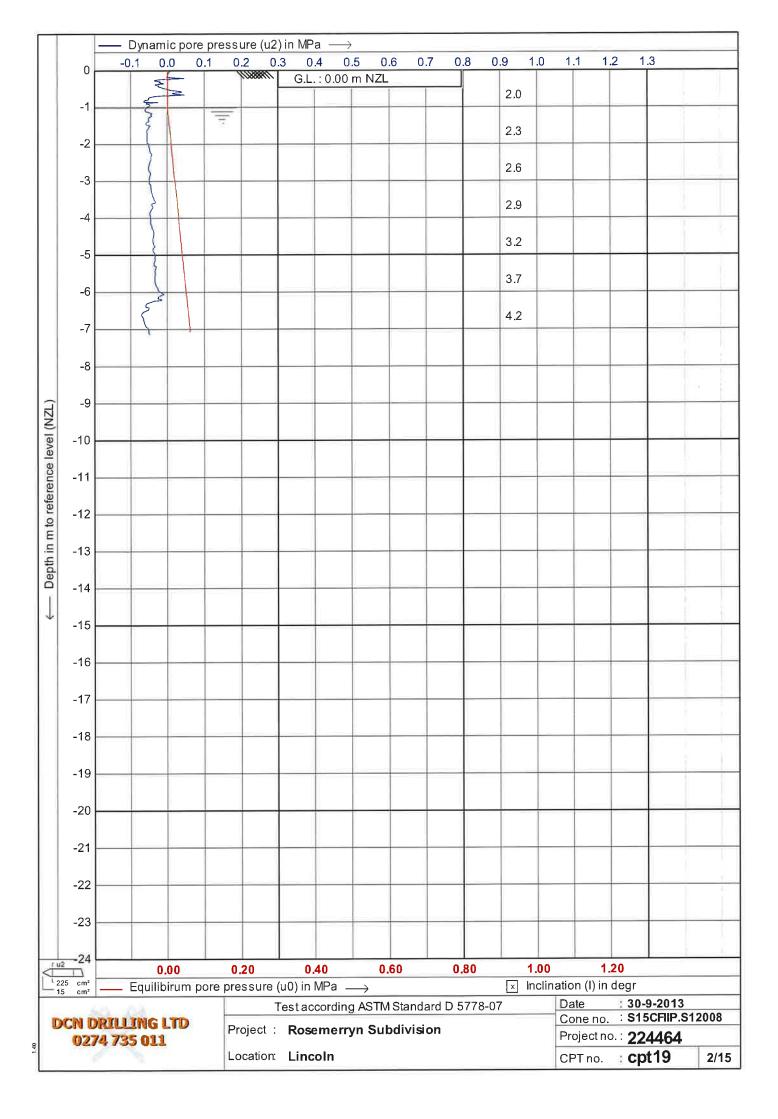


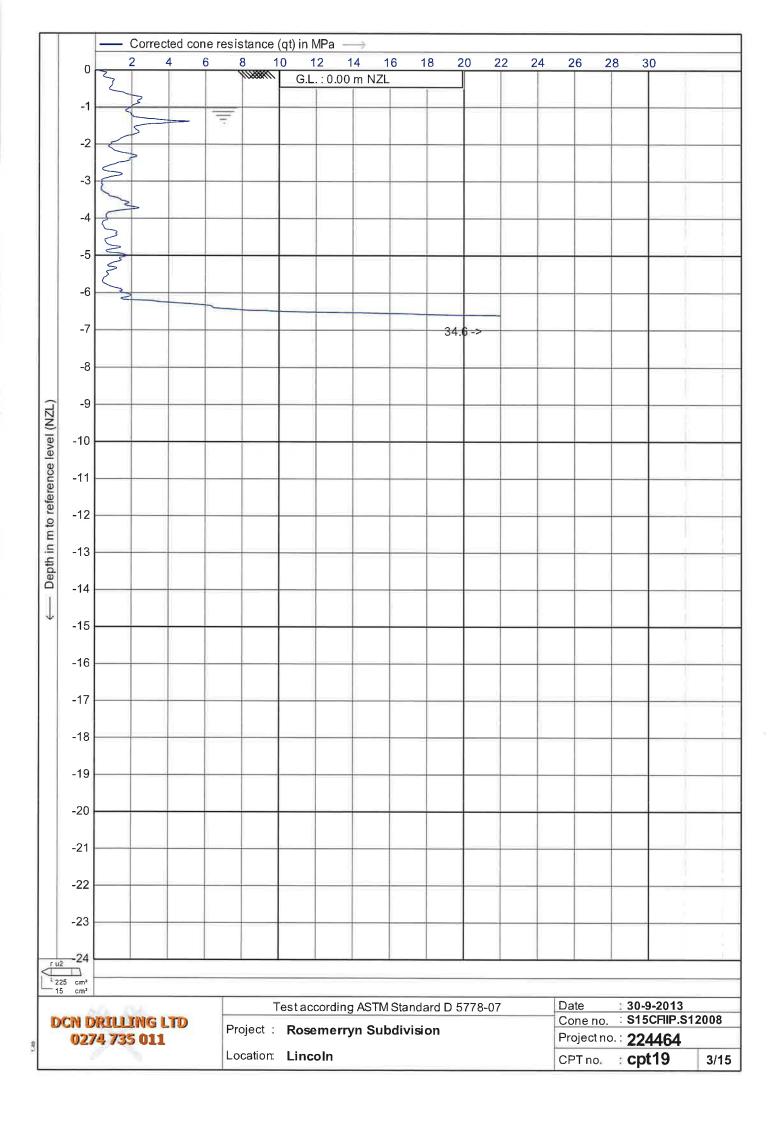


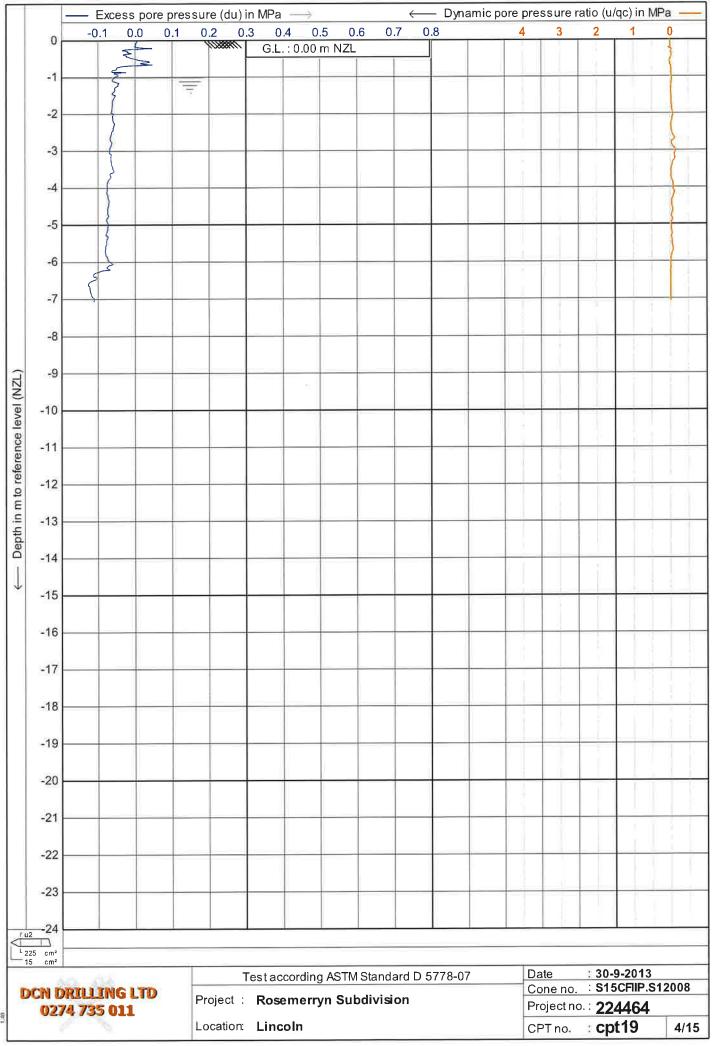
**TP01** aurecon Fulton Hogan Land Development Limited Client: Ausseon (New Zaul Unit 1, 150 Cavend PO BOX 1061 Christchurch B140 New Zaaland WWW.cu Project Name: Rosemerryn Farm Subdivision Location: Stage 7 to 15 Telephone: +64 3 385 0821 Facsimile: +64 3 379 6955 Project Reference: 224464 Sheet 1 of 1 at christchurch@ha Date Started: 27/04/2012 Date Completed: 27/04/2012 Logged by: RS Input by: MJF Checked by: RS **CO-ORDINATES N/A** TEST PIT INFORMATION Excavator Type: 8 Tonne Excavator Test Pil Dimensions: 1.5m x 3m Contractor: Skellys Limited Easting: Northing: 1557263 m 5166808 m Ground Level: 18 m Verified by: WD Pocket Penetrometer Tests Shear Vane Tests Water Level (m) Elevation (m) Graphic Log Depth (m) Sample Soil Description NY NY 1 SILT, minor sand, dark brown. Stiff, moist, low plasticity, sand is fine grained (TOPSOIL) 4 14 14 11 14 x x Sandy SILT; light brown. Stiff, moist, low plasticity. Sand is fine grained and x × × poorly graded (ALLUVIAL DEPOSITS). × 0.5 × x × × × × × × × × × × × × × 0.95m Becomes brown mottled grey. 17 1.0 × SAND with minor silt; brown mottled grey. Loosely packed, moist; sand is fine grained and poorly graded. 1.5 16 2.0 2.0m Becomes dark grey mottled orange brown. 2.2m Becomes with some silt. 2.5 SILT with some sand; dark grey. Moist, moderate plasticity; sand is fine × × grained. × T × × × × × x × × x 3.0 - 15 × × × × × × × × × × x × × × 3.5 x × × × × × × x × End of Test Pit at 3.9m (Maximum Extention of Excavator.) 14 4.0 4.5 Last Generated: 3/07/2012 11:26:21 a.m. Remarks: Groundwater at 2.7m

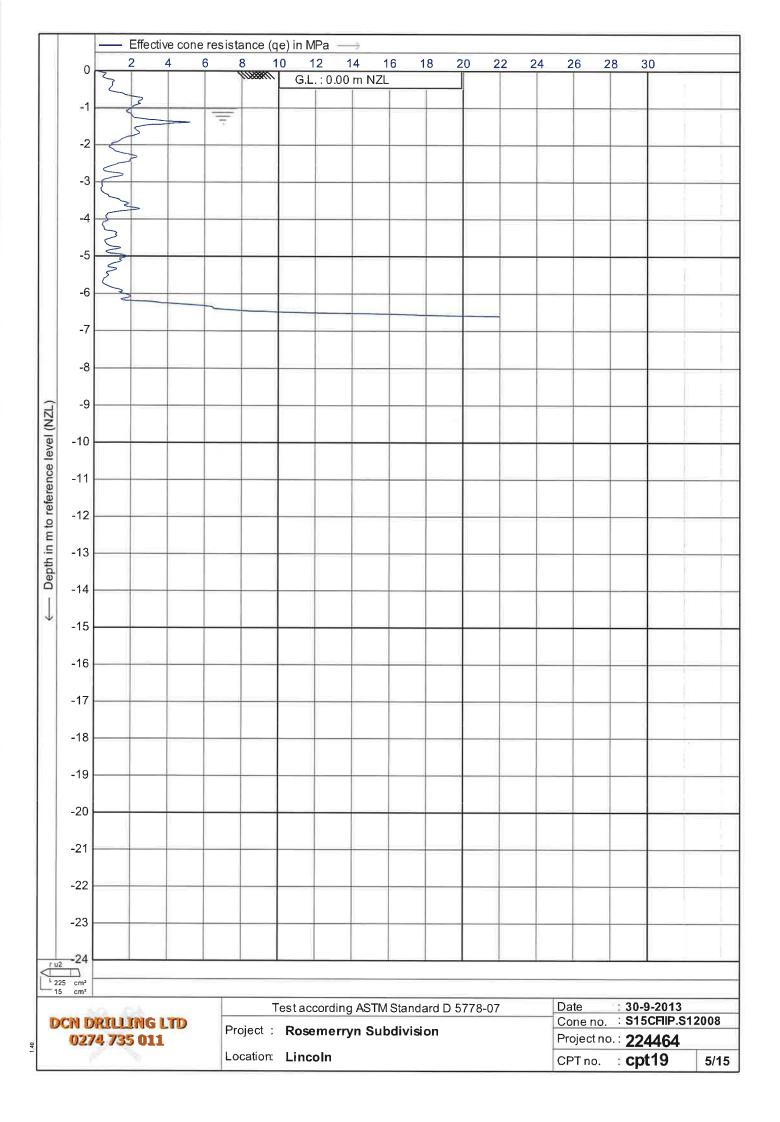
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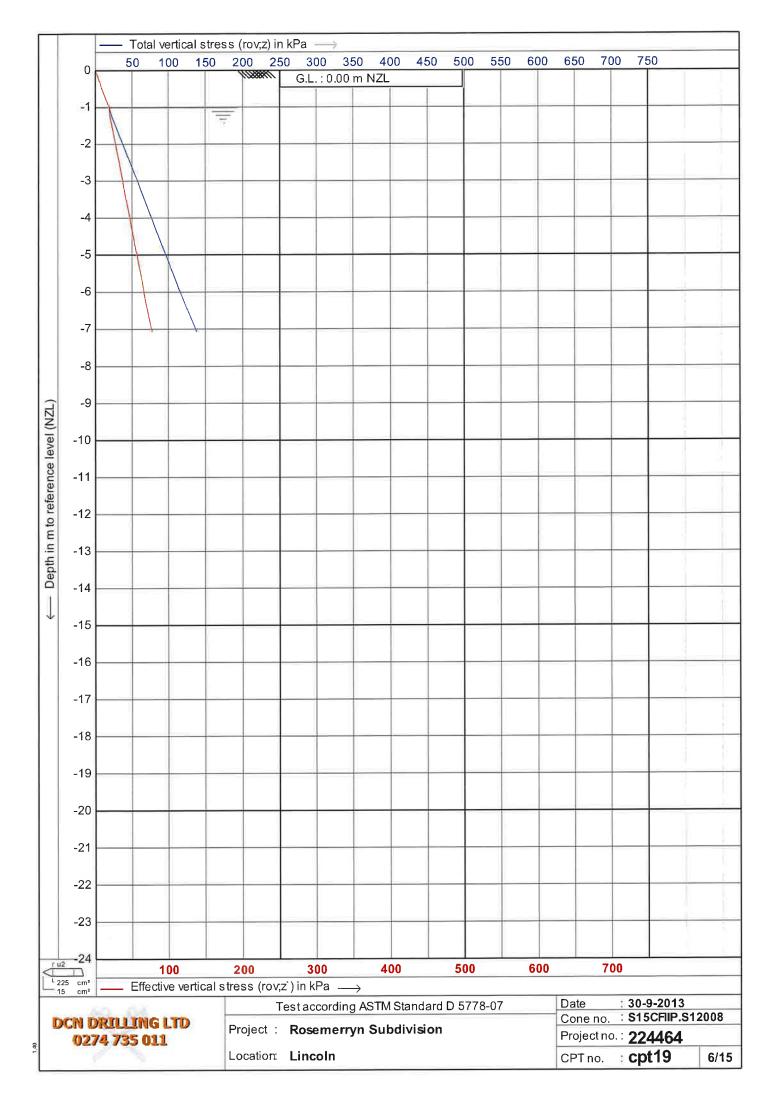


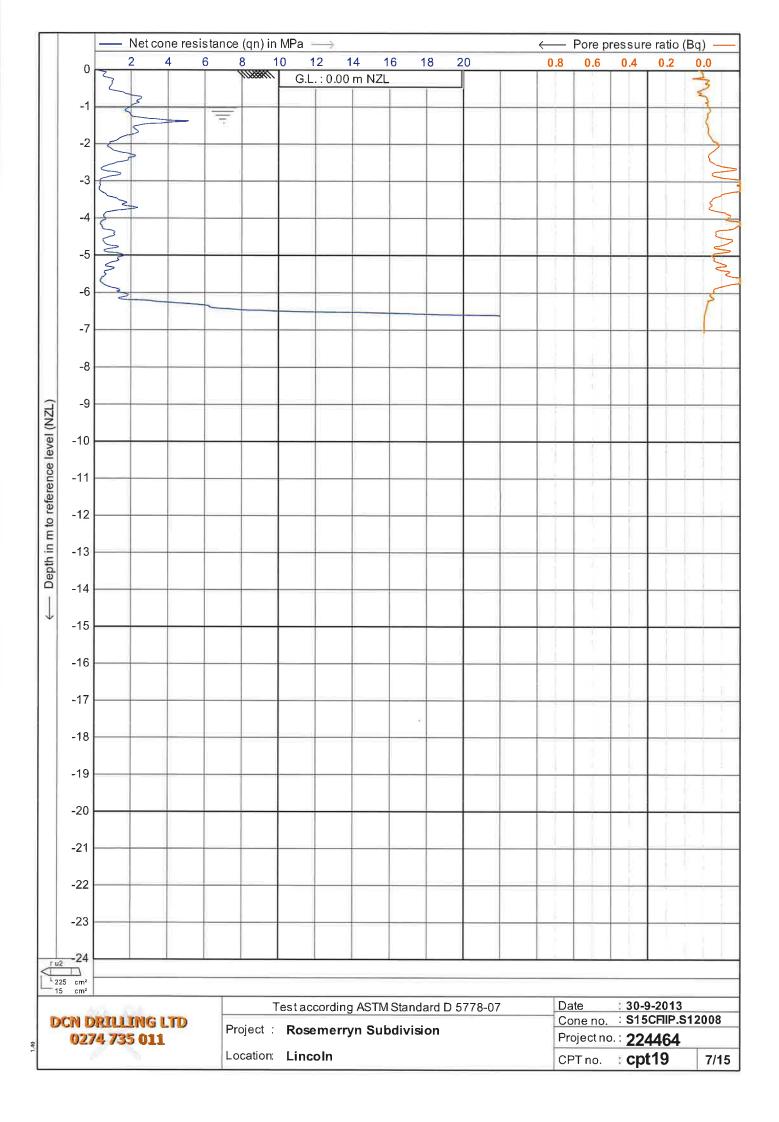


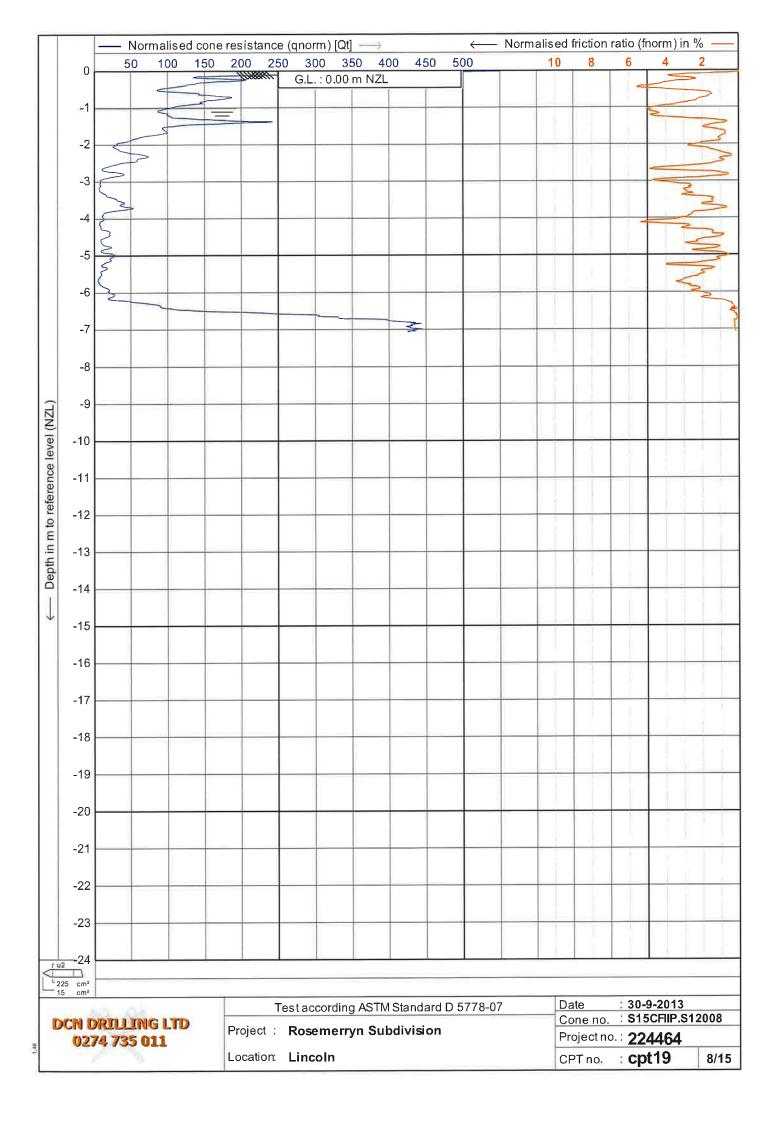


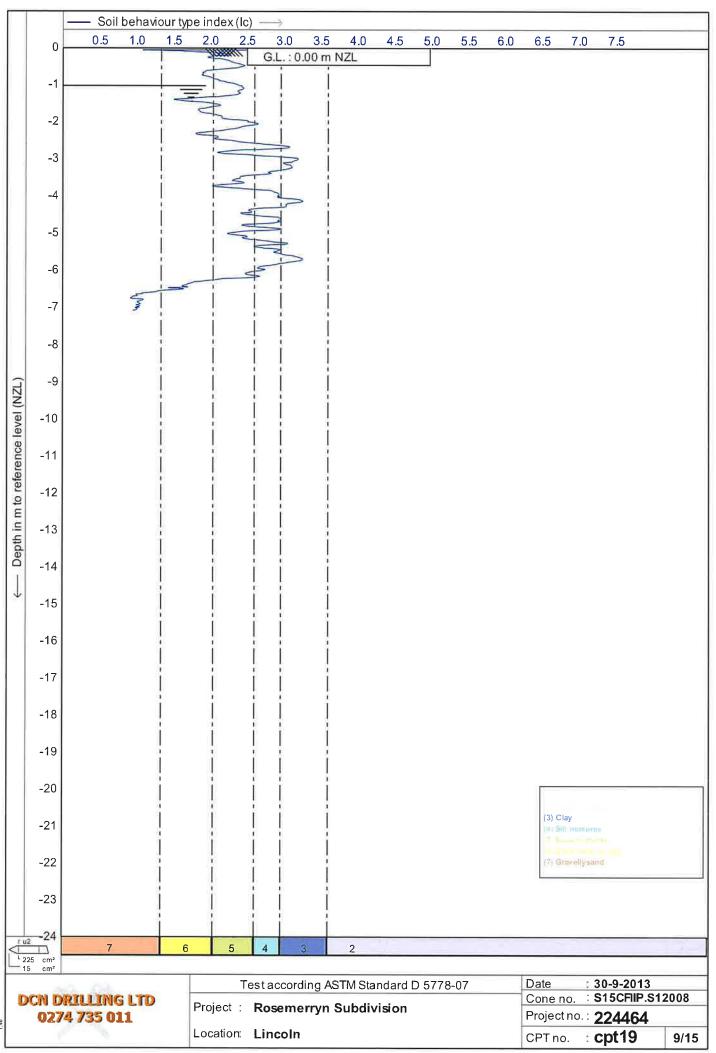




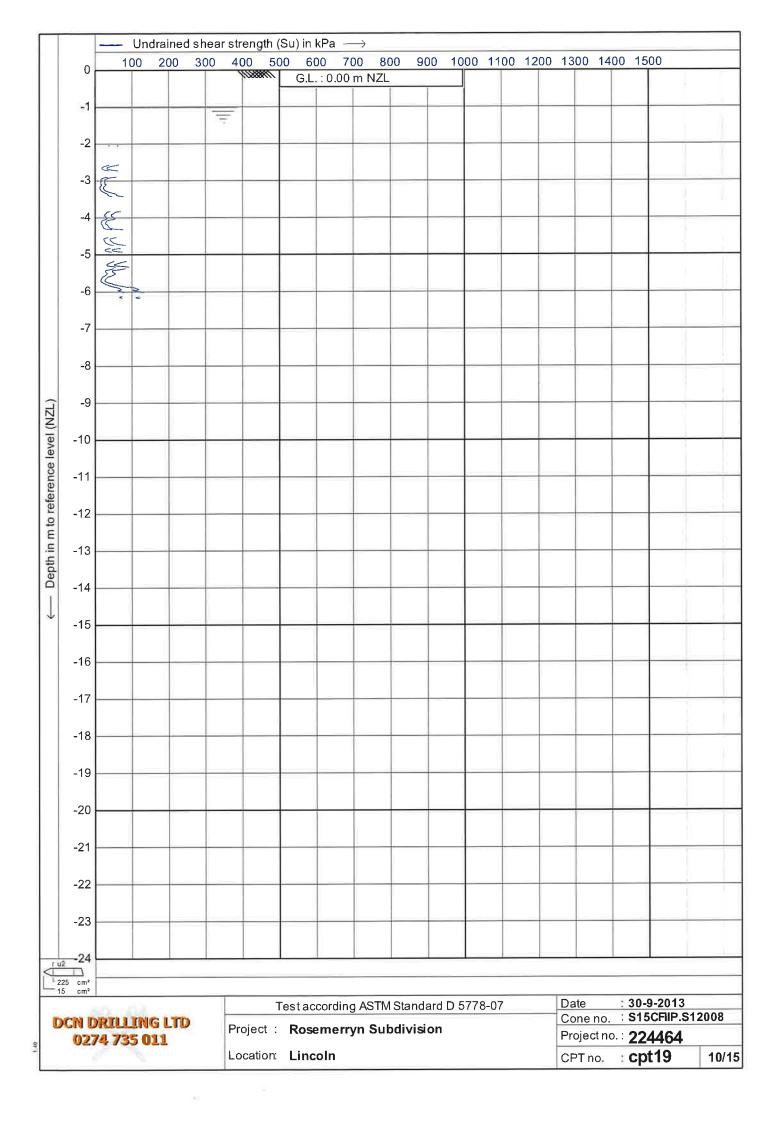


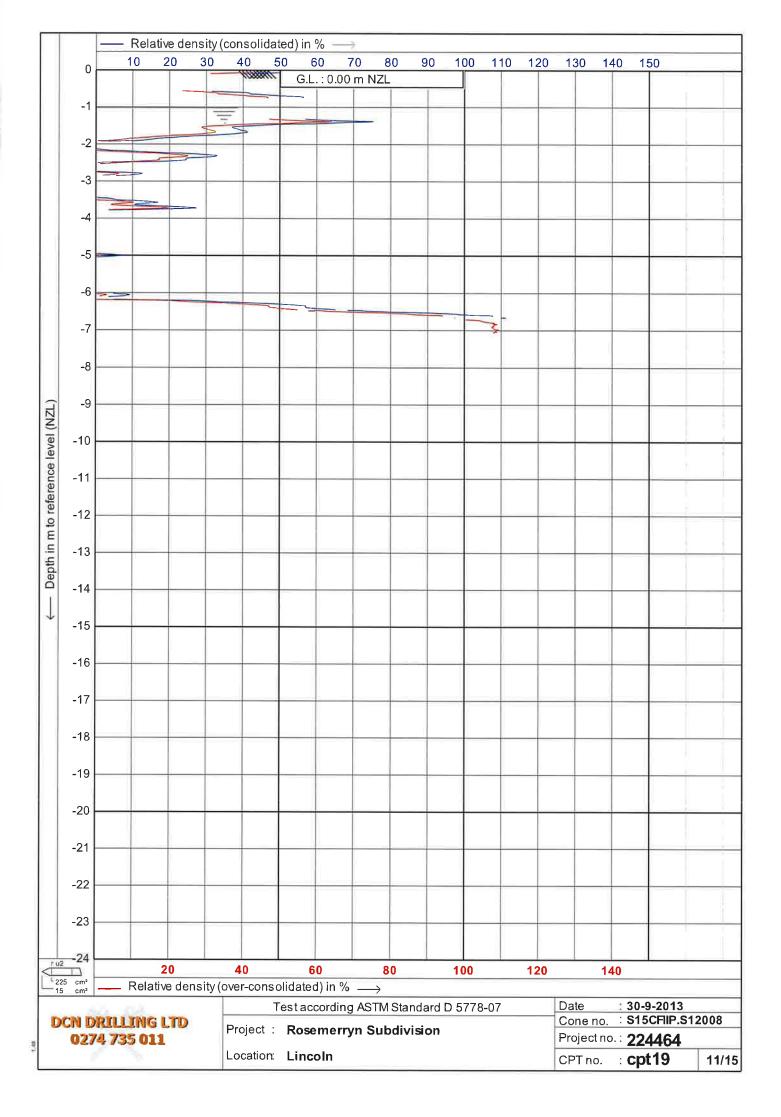


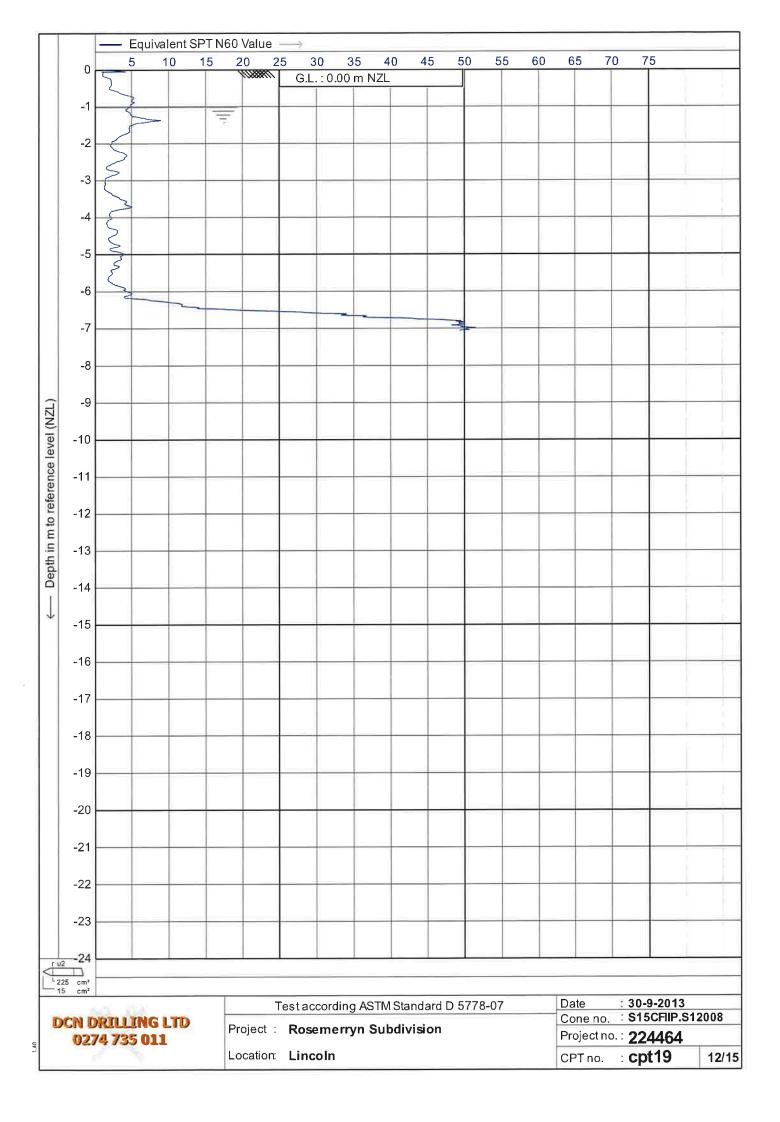


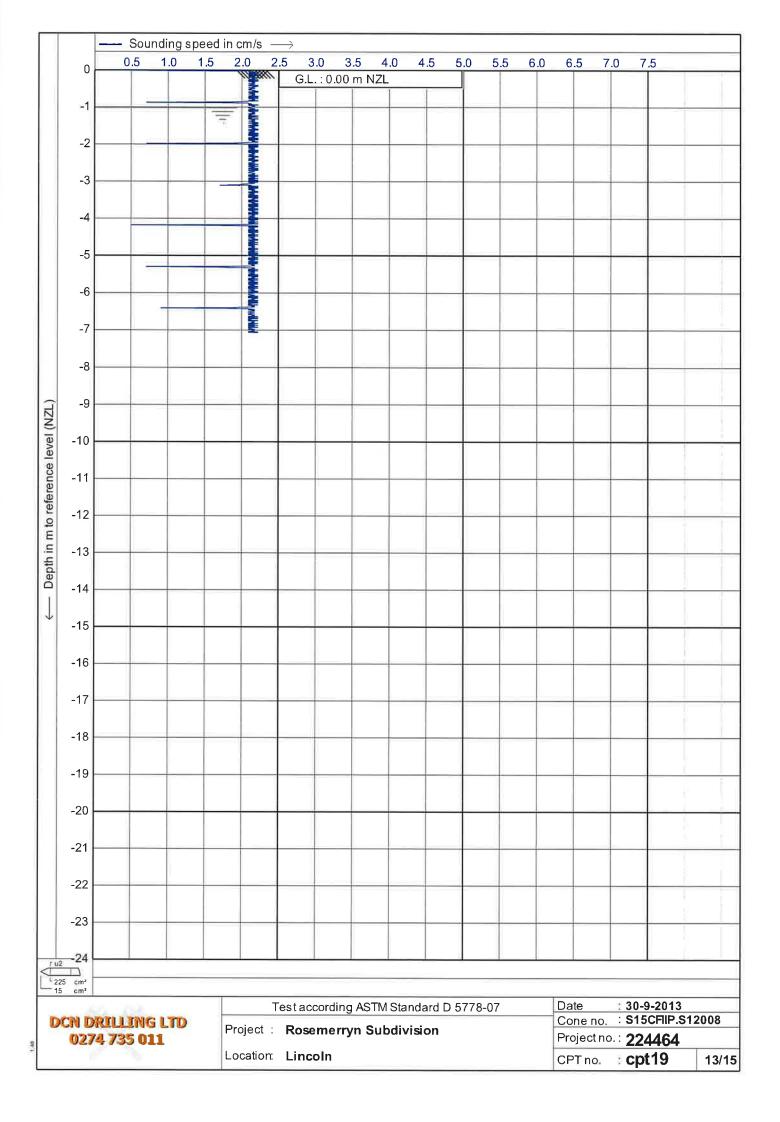


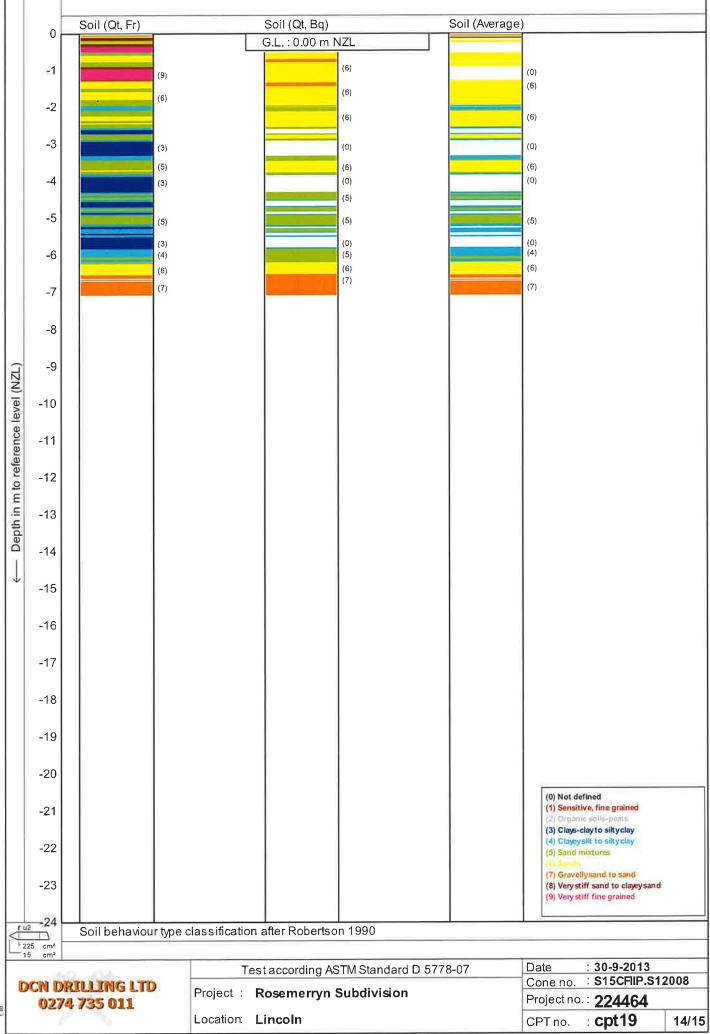
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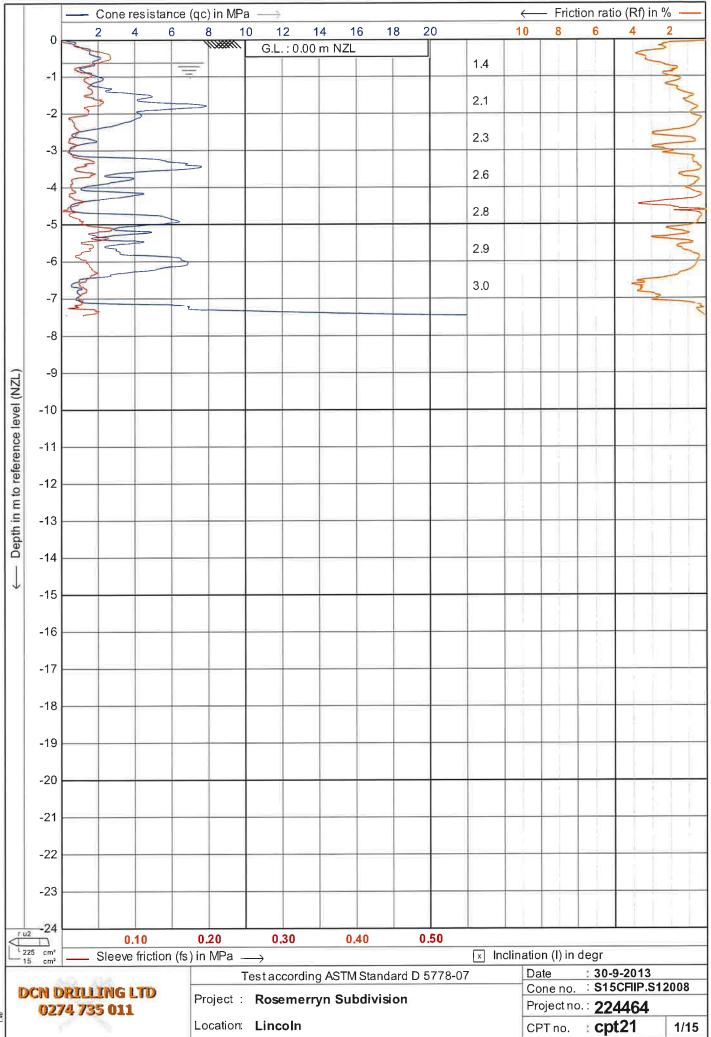


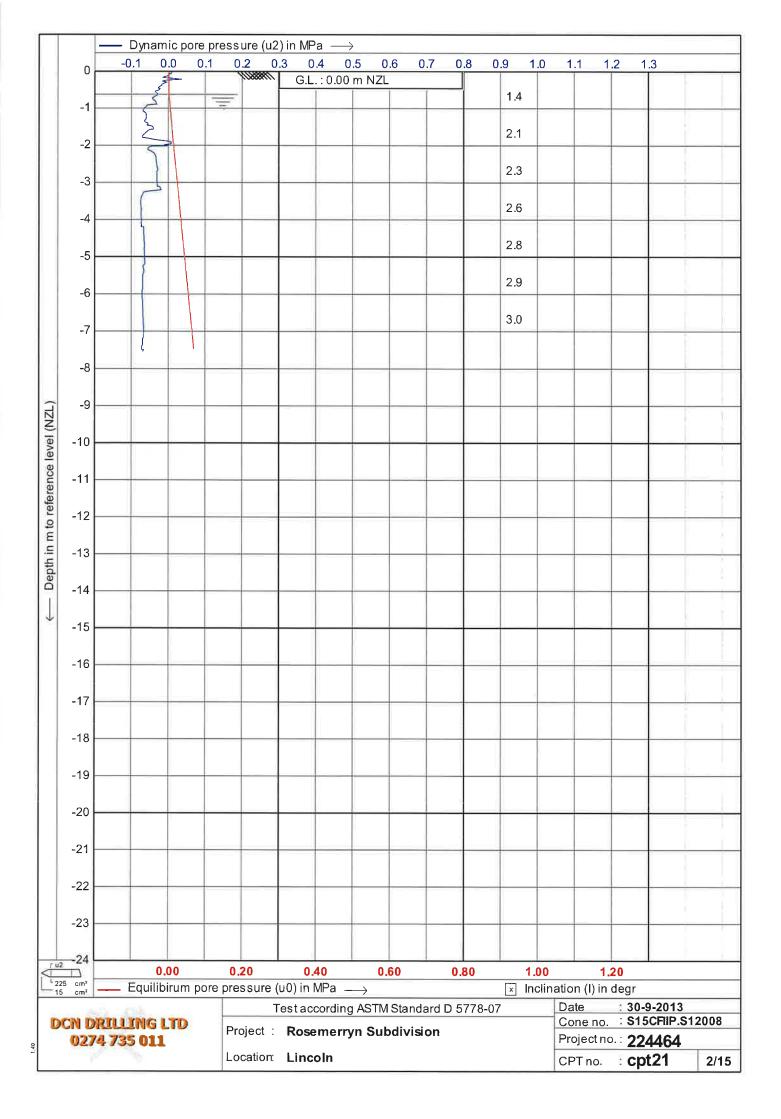


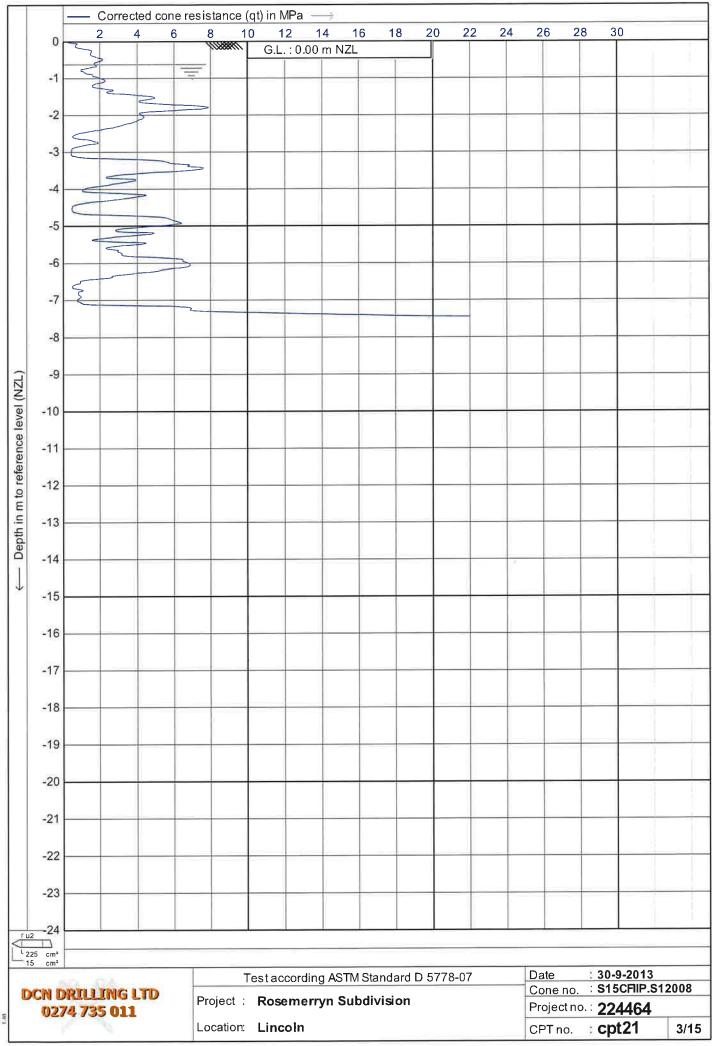


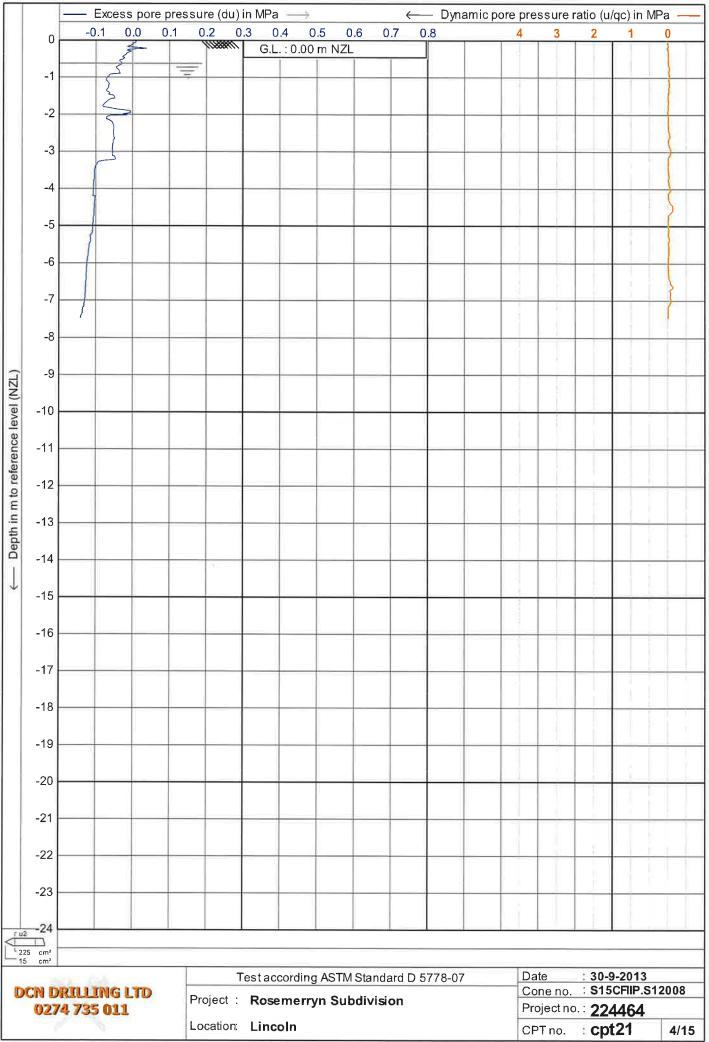


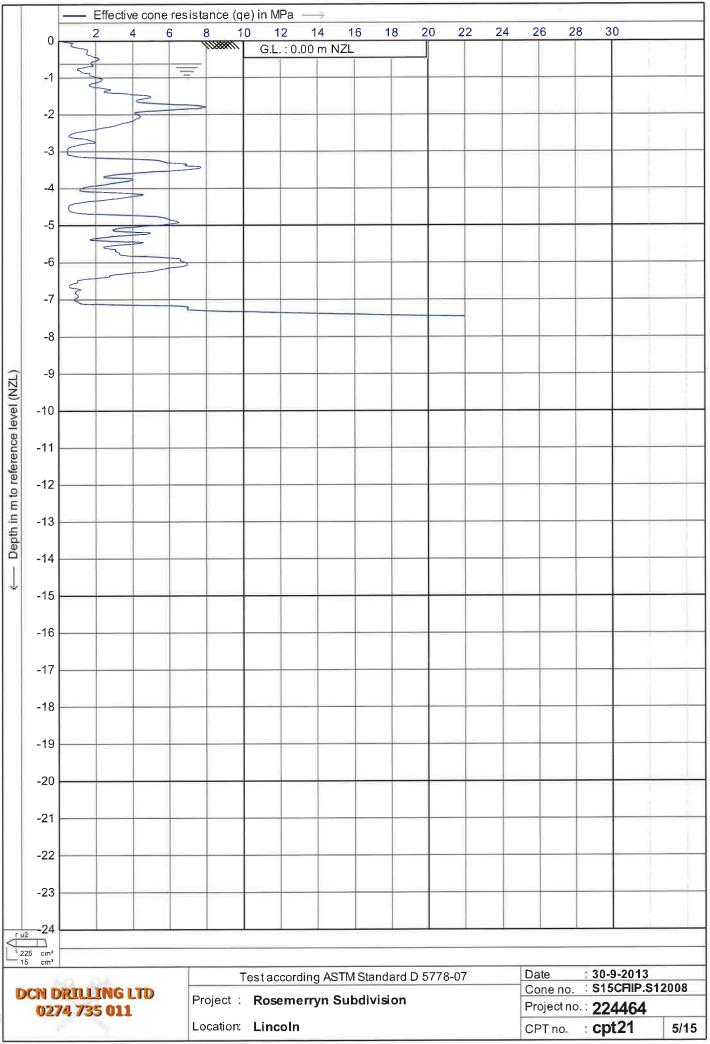
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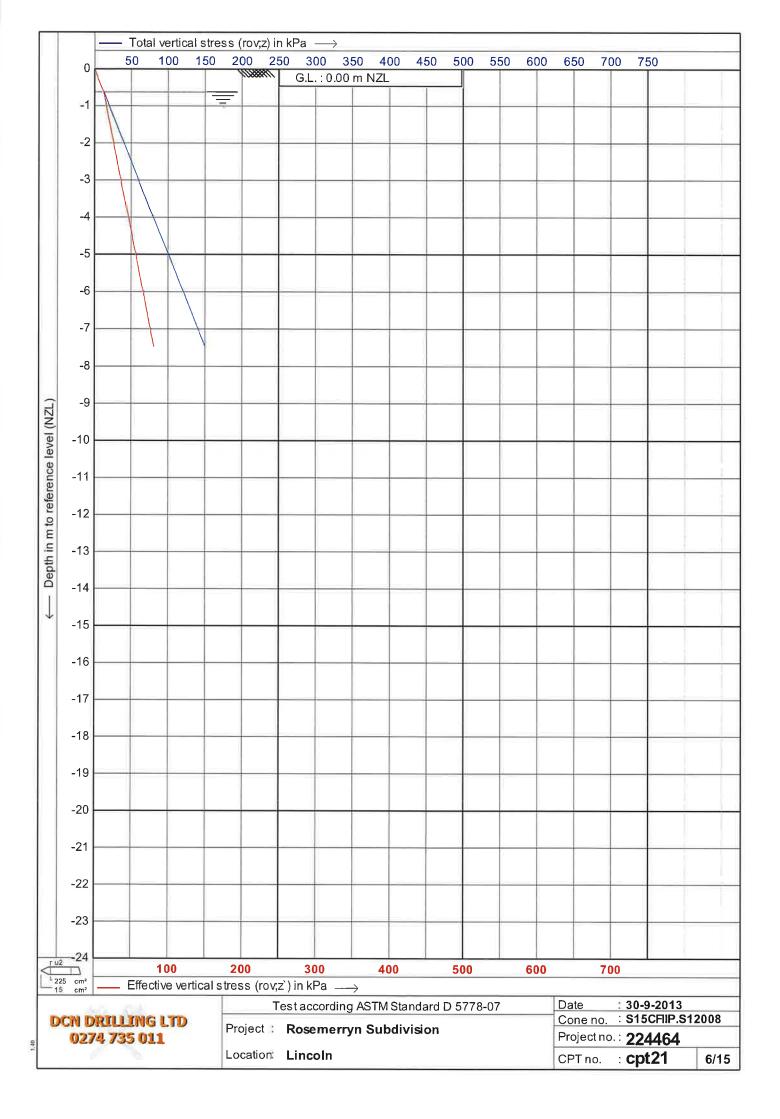


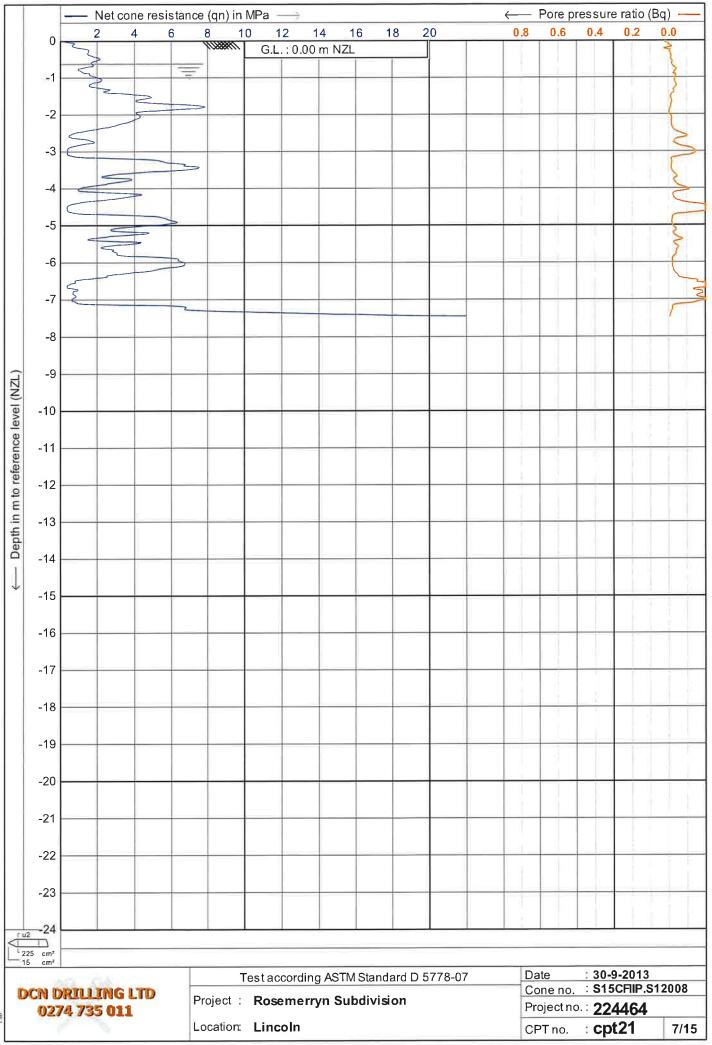


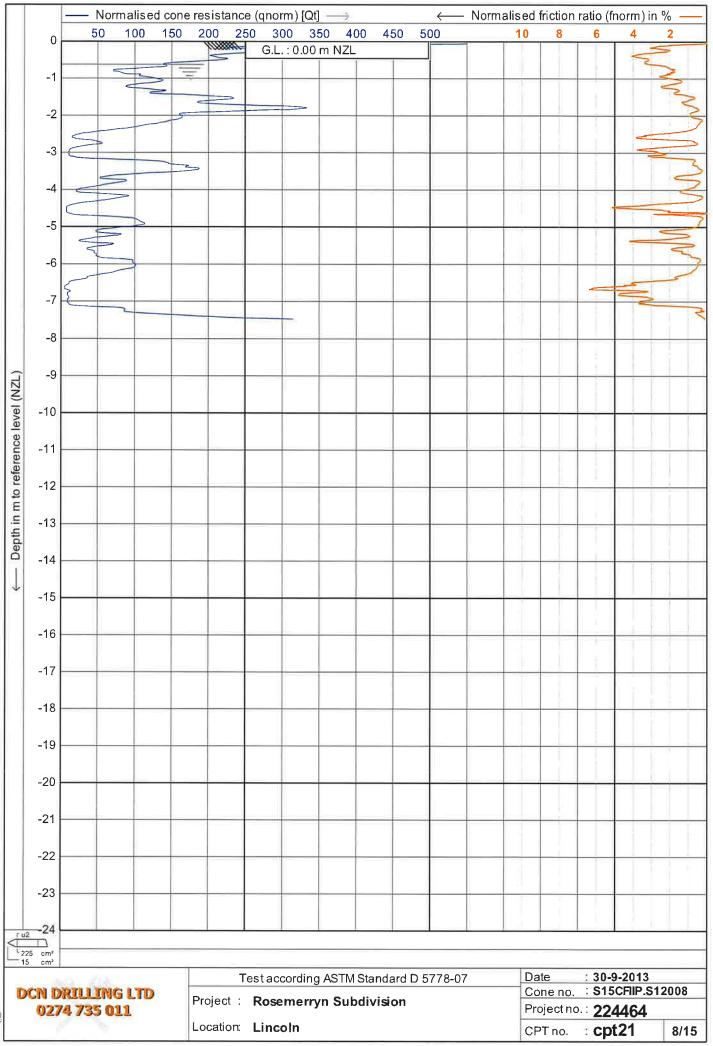


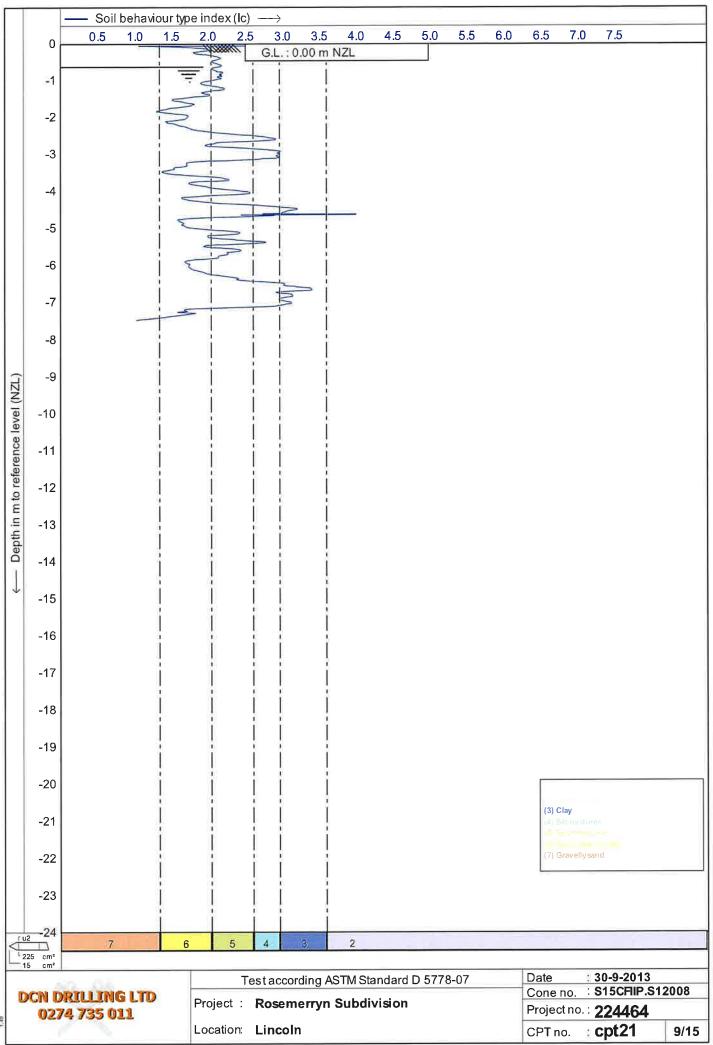


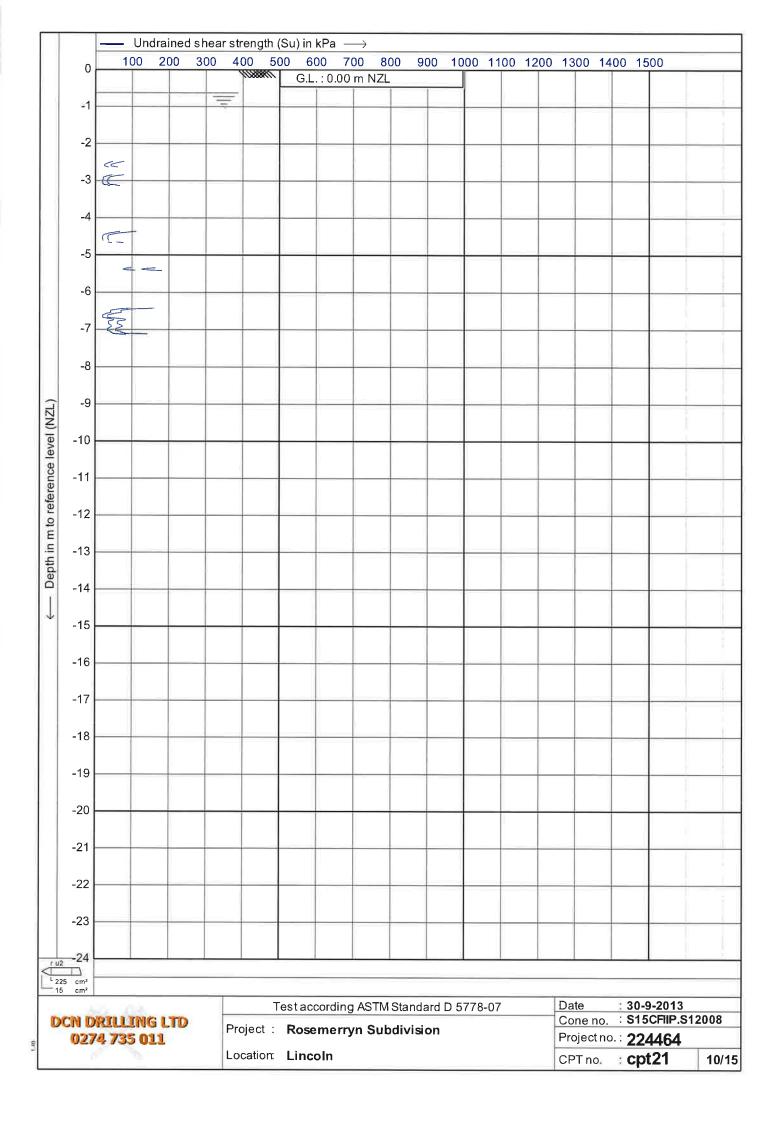


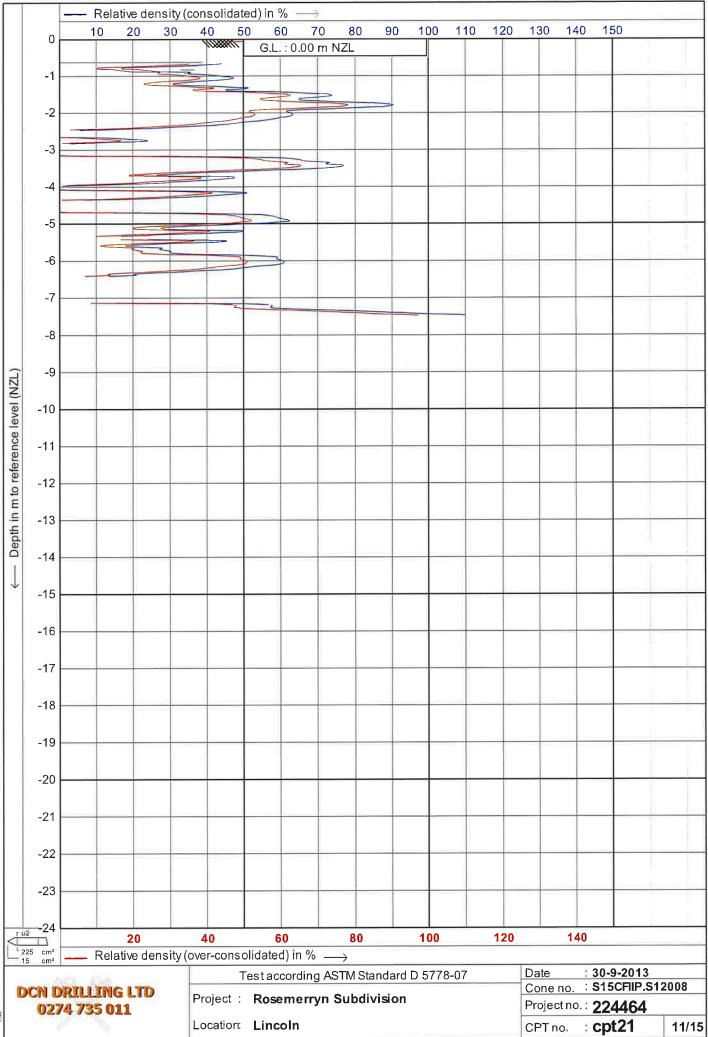


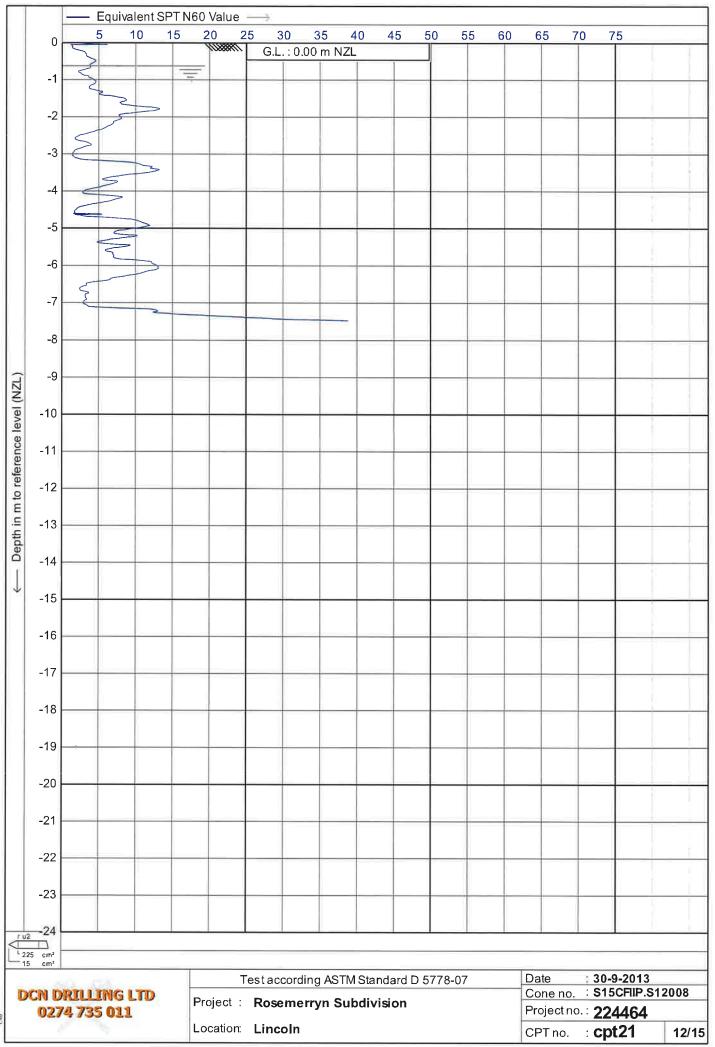




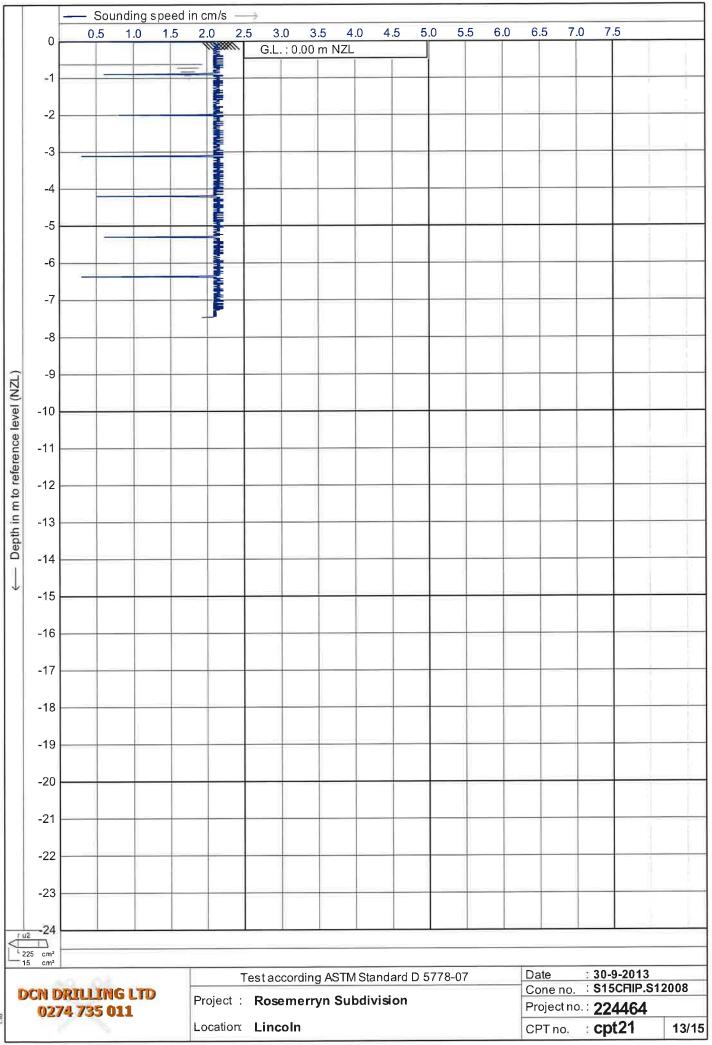


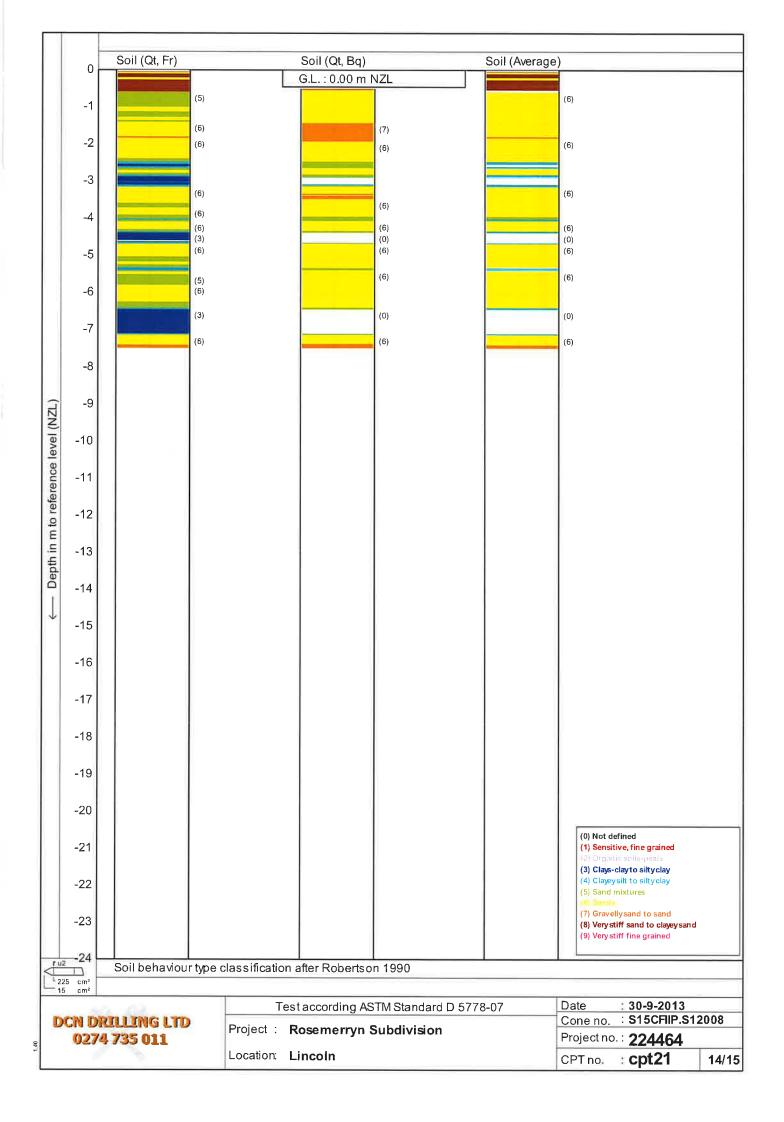


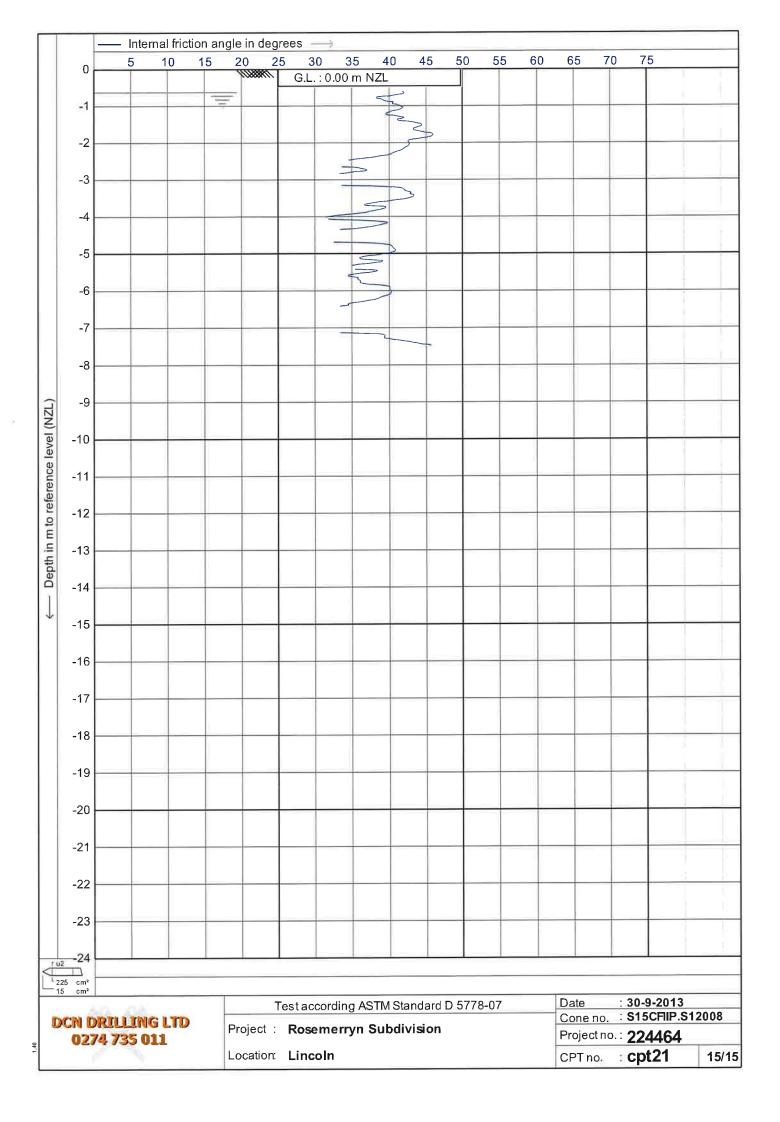


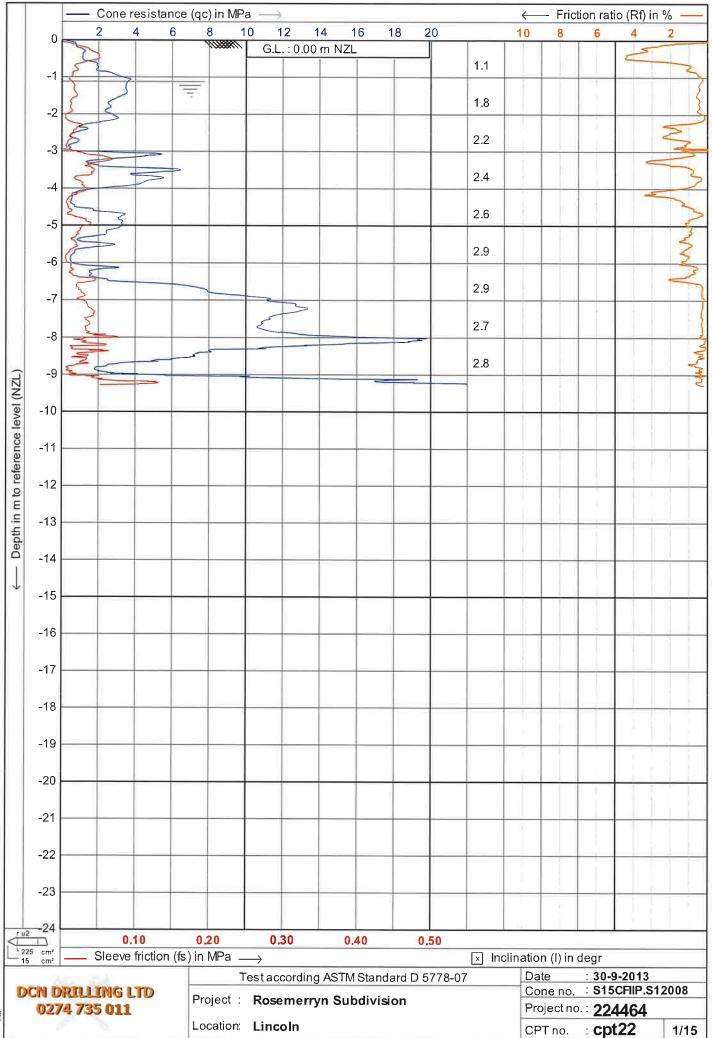


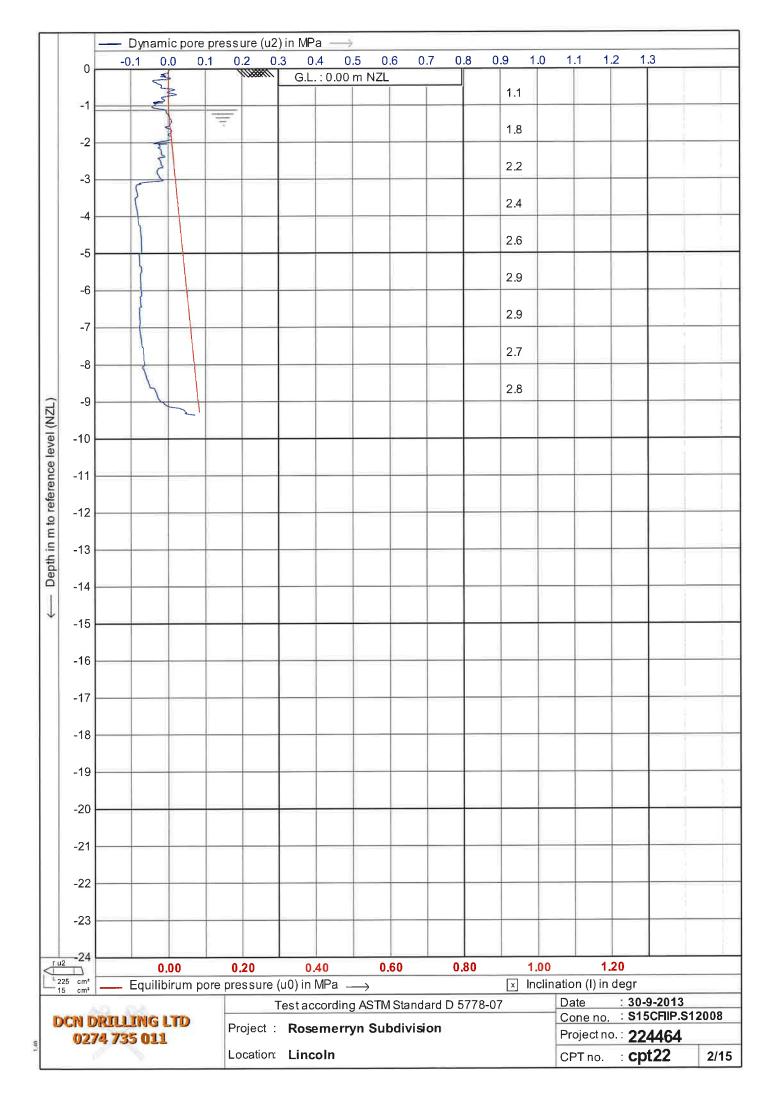
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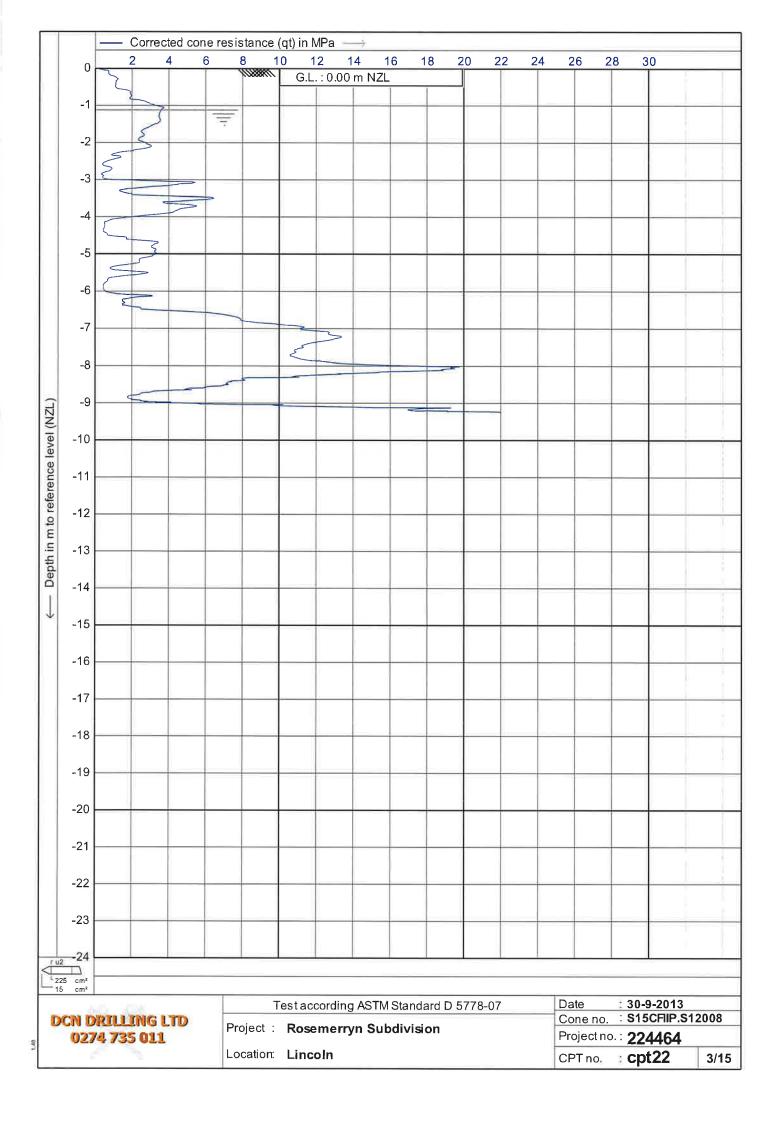


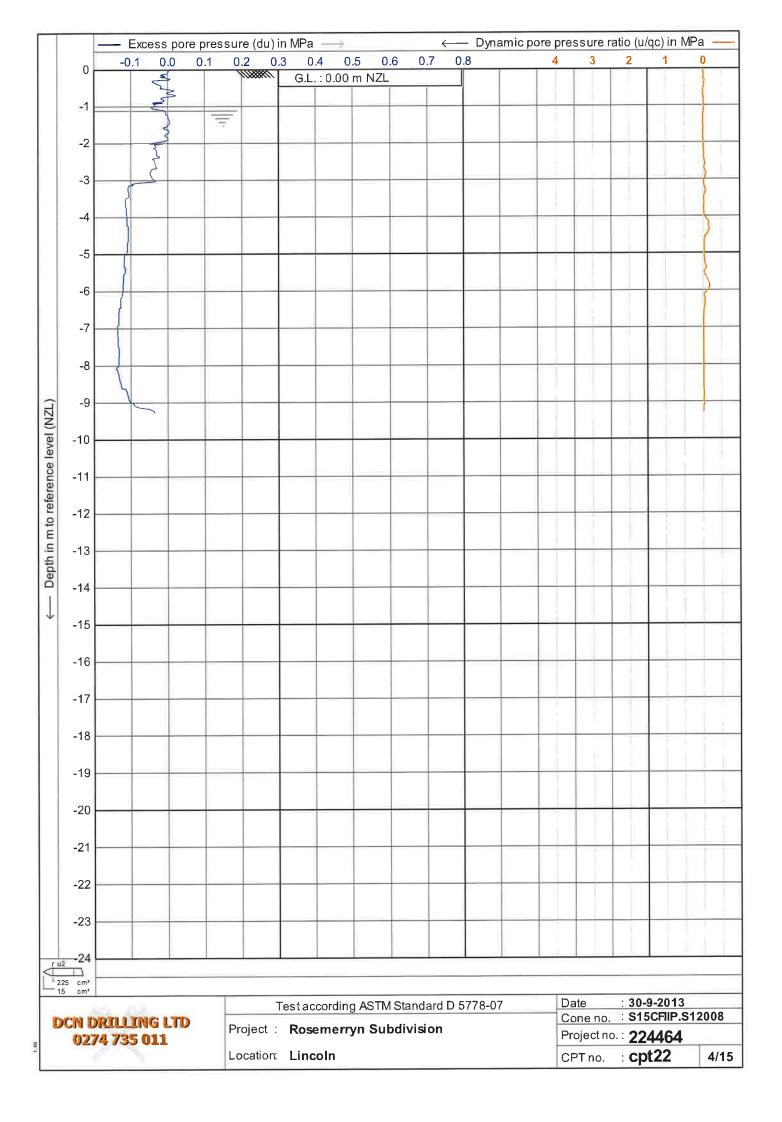


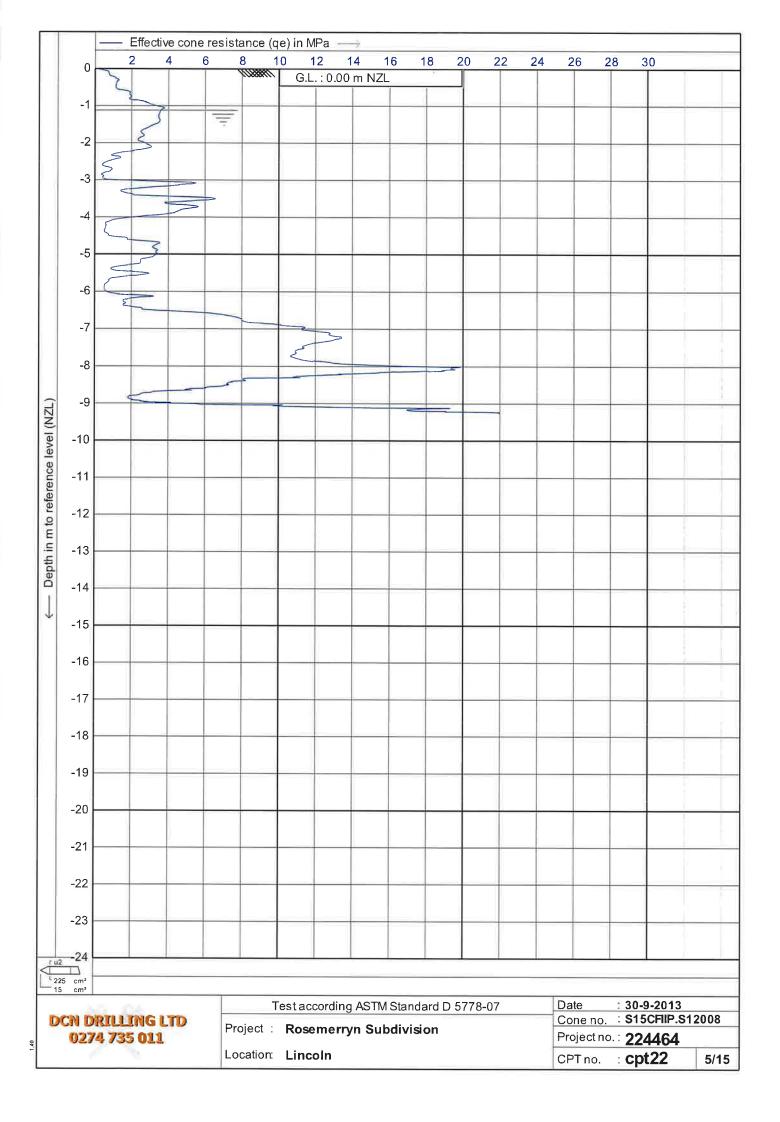


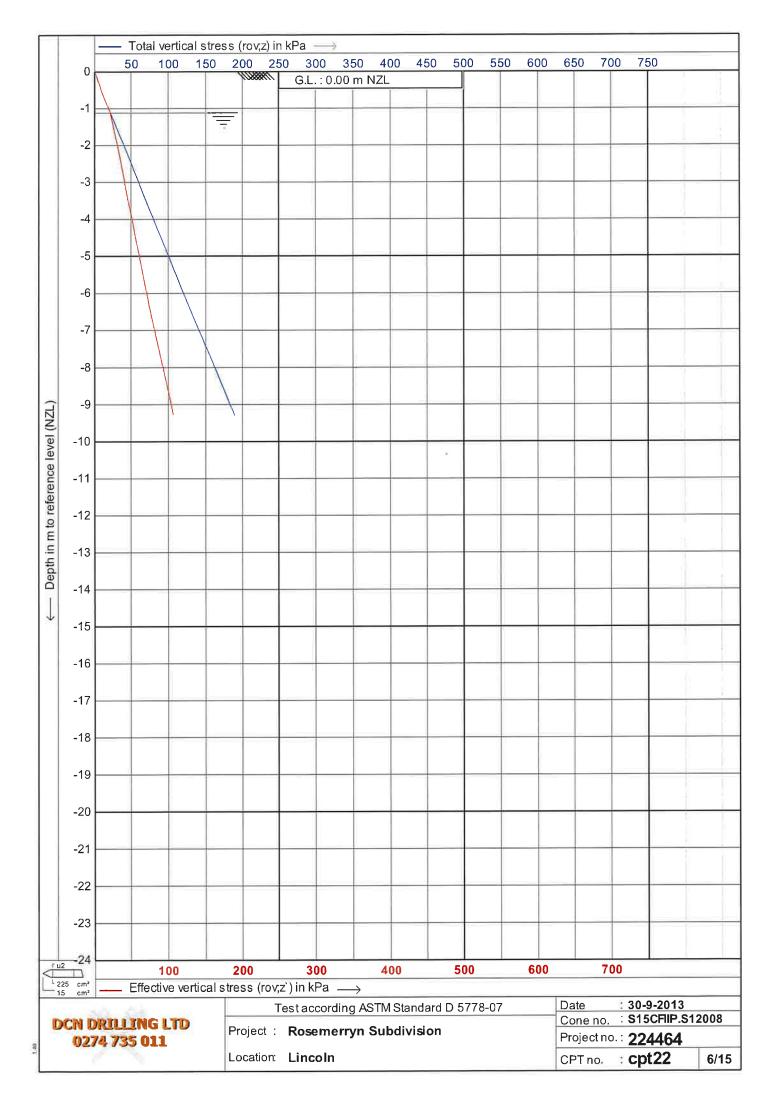


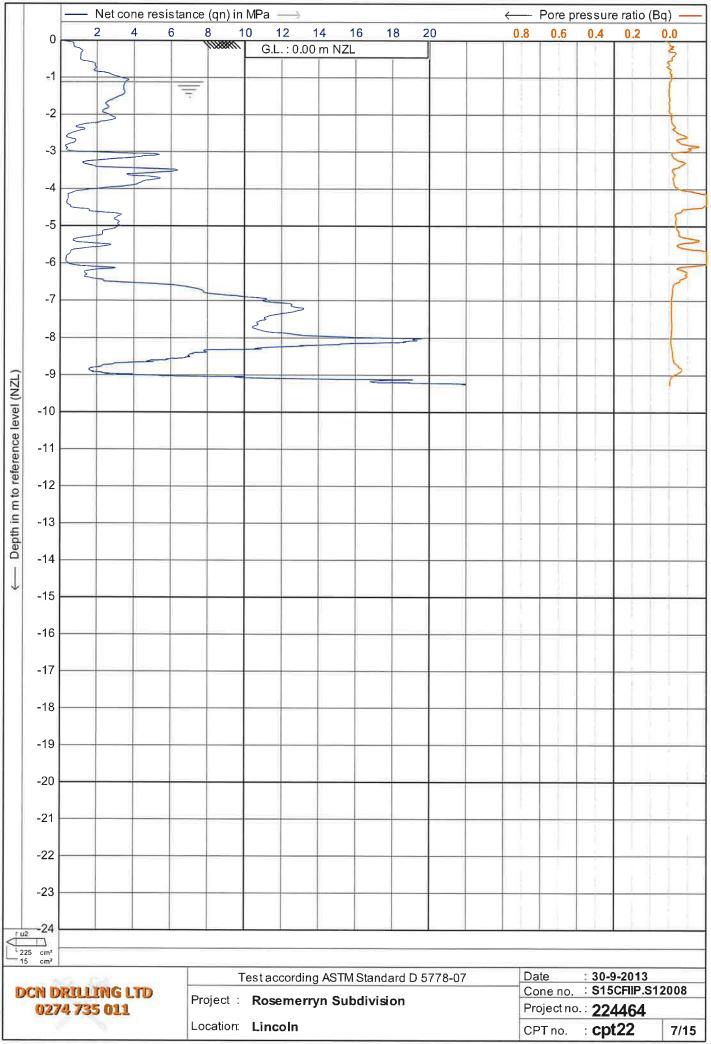


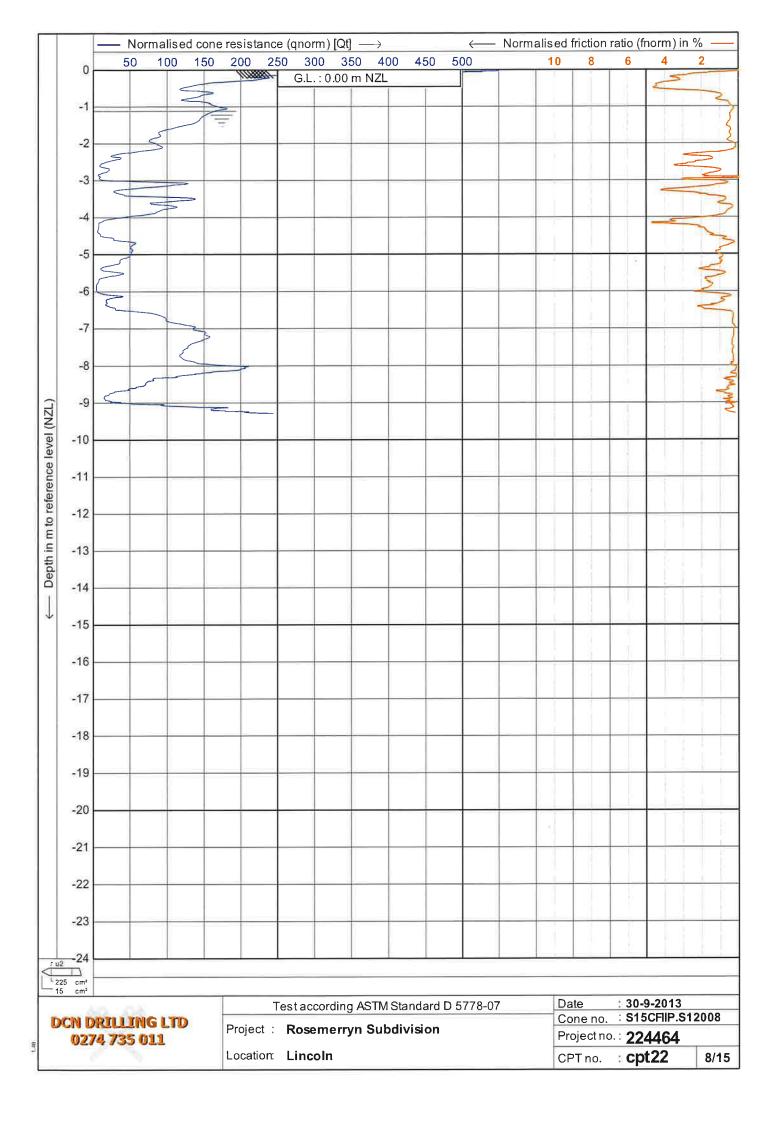


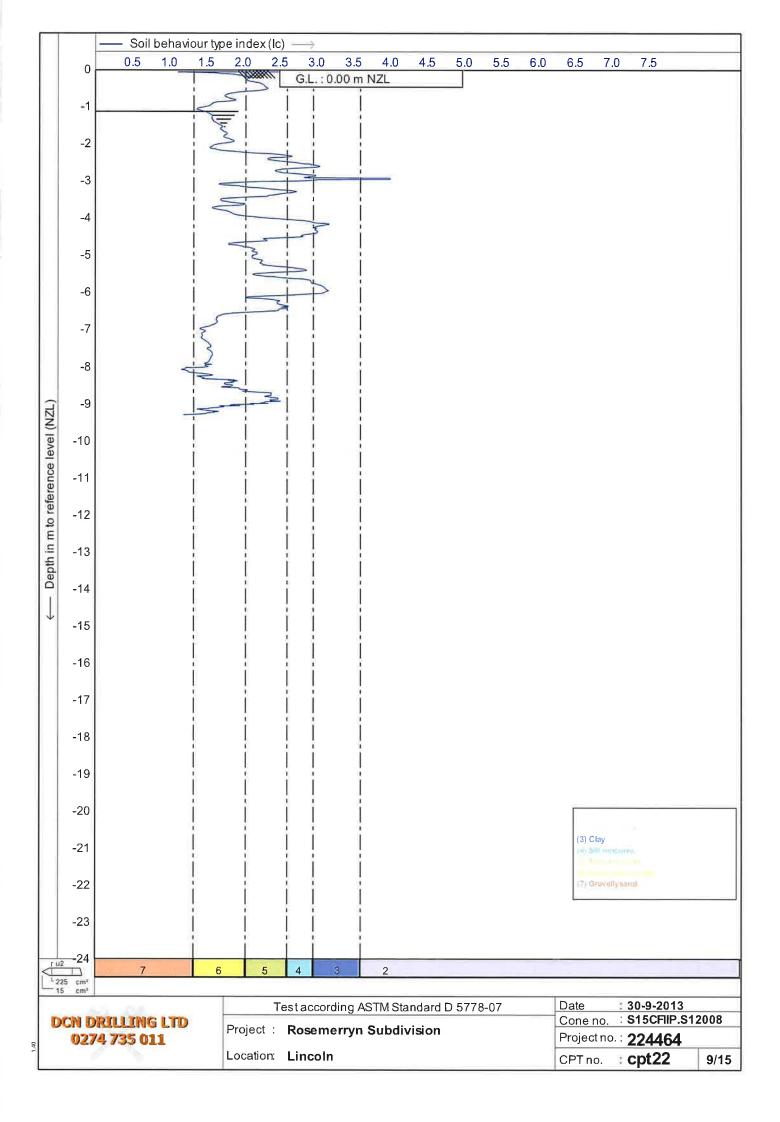


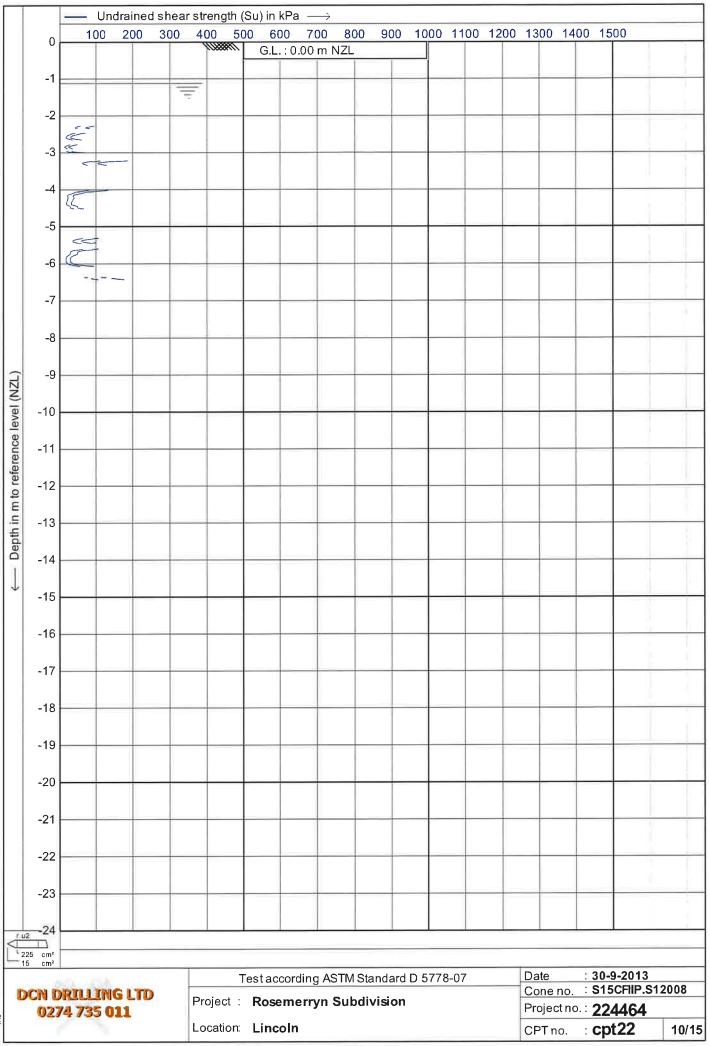


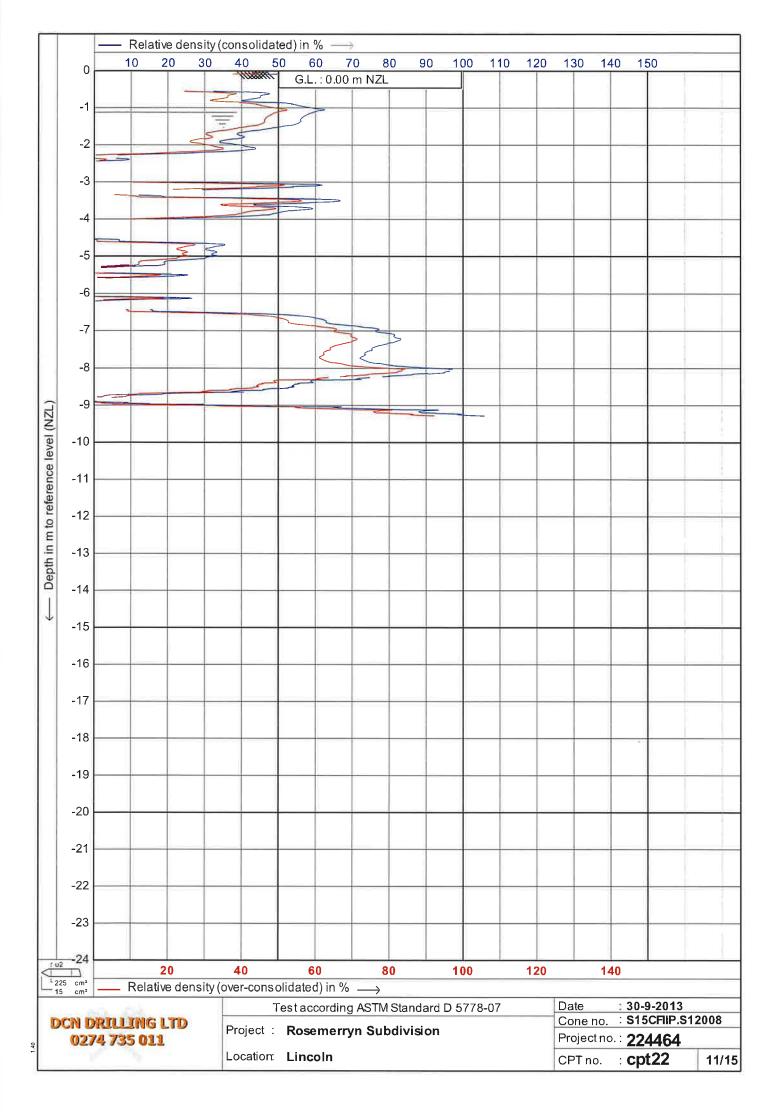


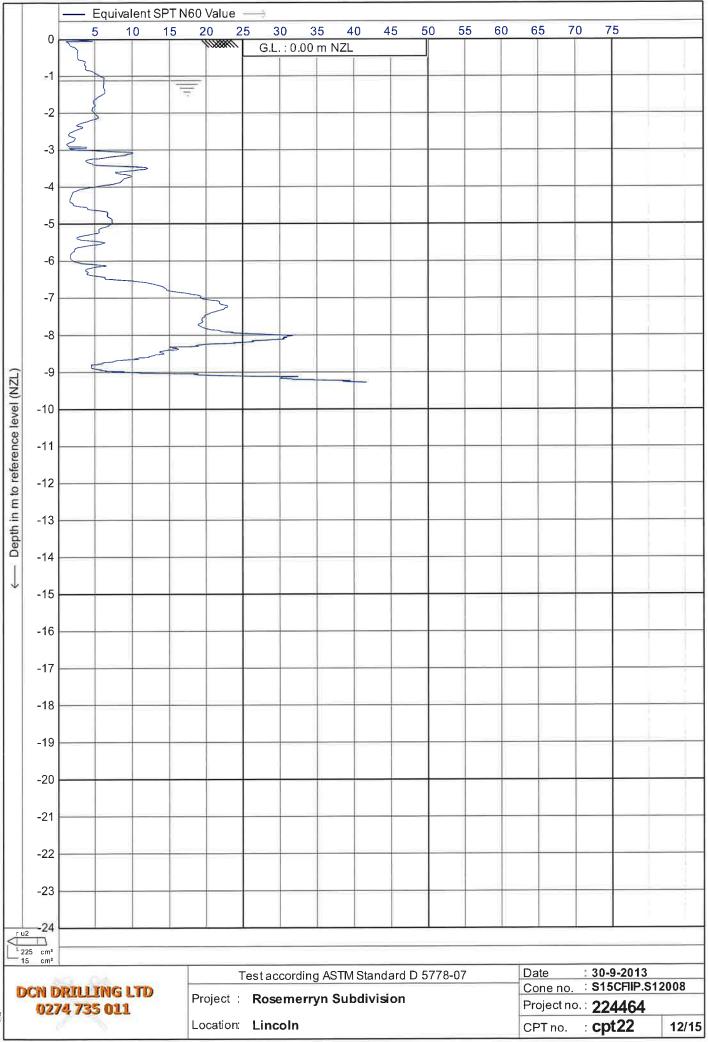


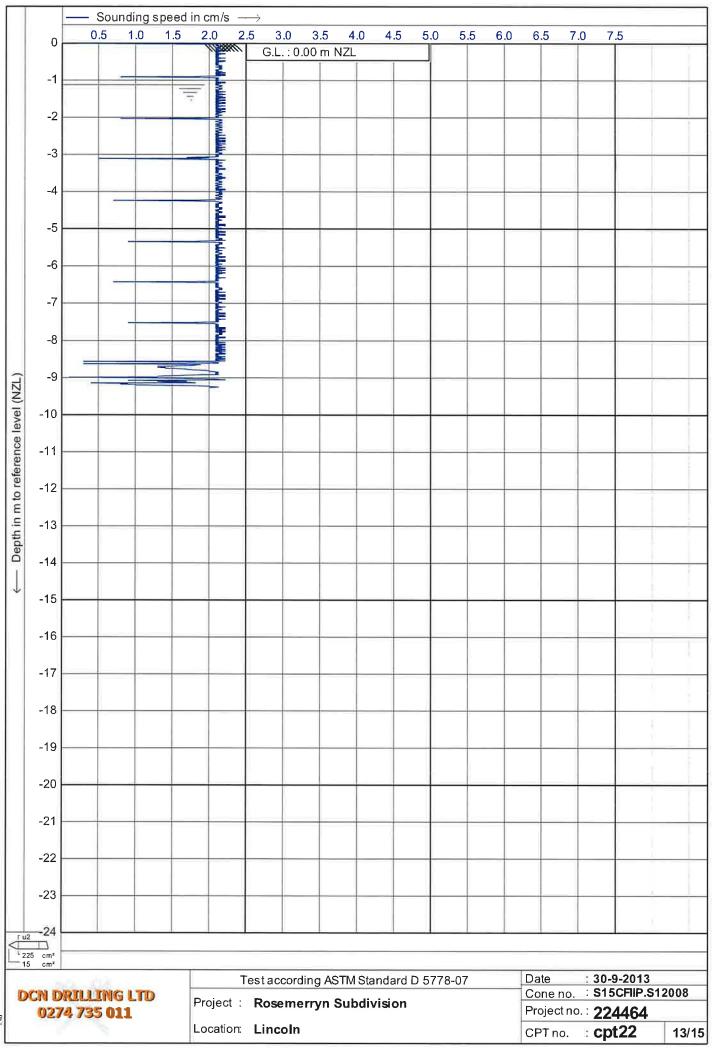


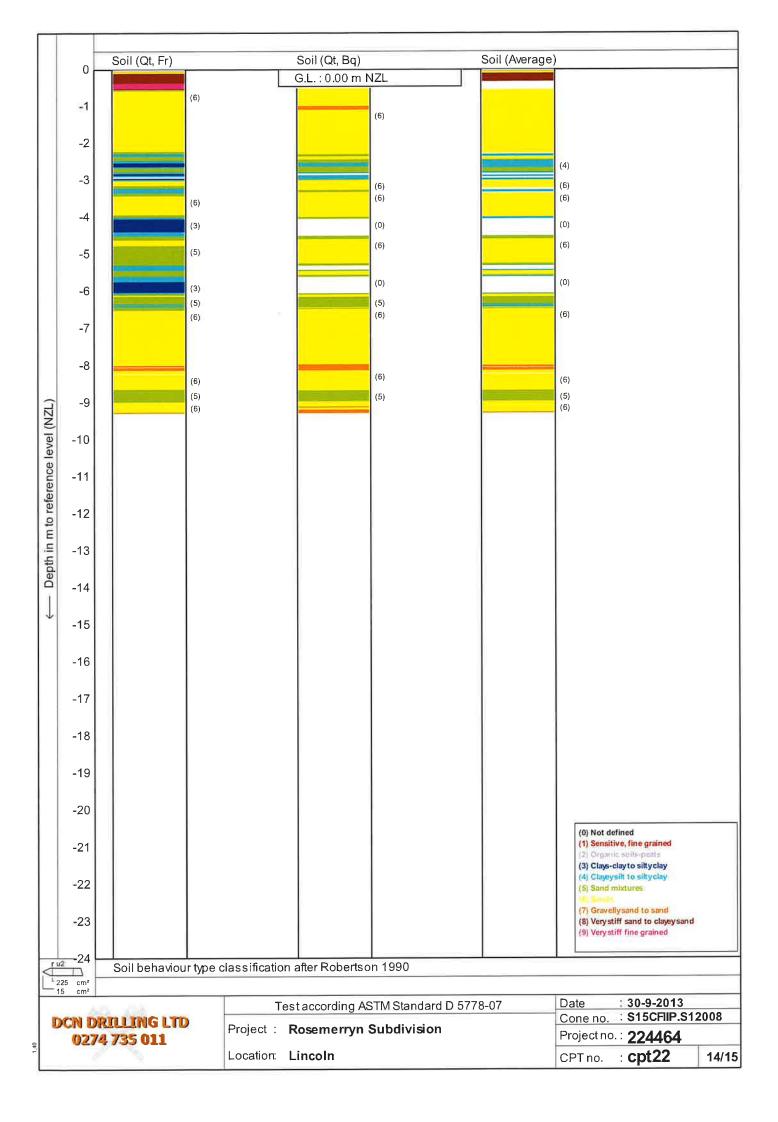


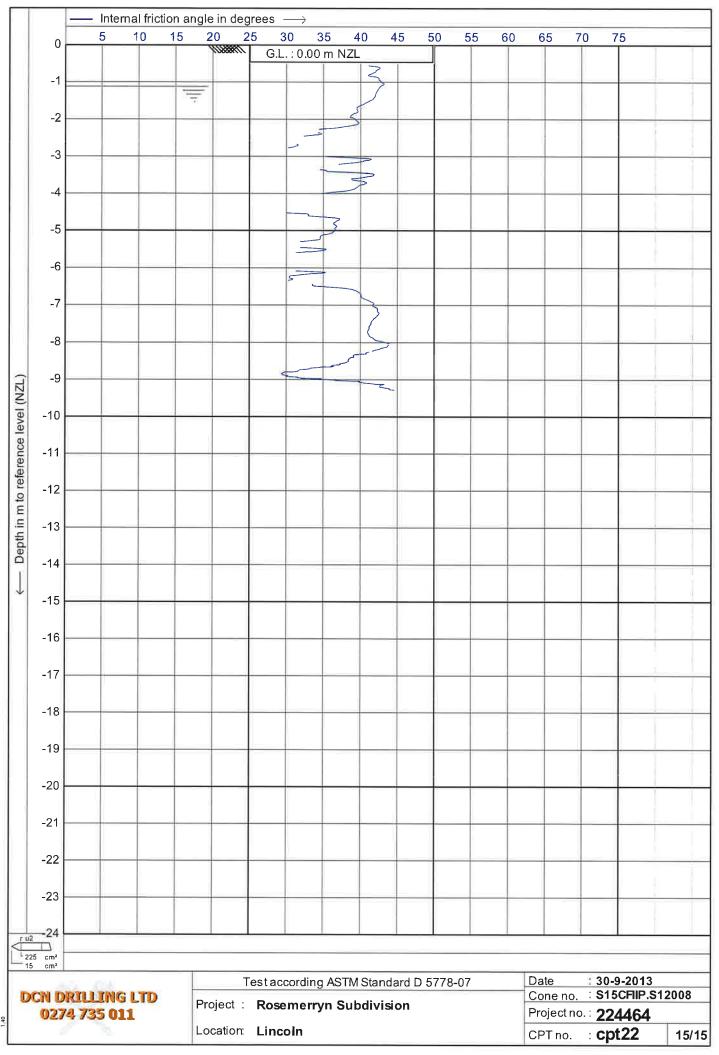












6	IUI	ſ		10		1		BC	RE	HOI	LE F	REC	ORI	HOLE NO.			BH102			
www.aurecongroup.com														PROJECT	NO.		224464			
PROJECT	Roser Linco		yn S	ubdi	Visi	on														
METHOD <b>DP</b>										DINATE	`	ſM)		SHEET	1	of	2			
MACHINE & NO. VTR 9700-D Truck									_	156021 516816				DATE from 22	/01/2015	to	22/01/2015			
FLUSHING MEDIUM Water							0	DRIENT		VERT	ICAL		GROUND-LEV	EL 4	+9.00	m RL				
Crame Progress Casing depth/size	Casing Casing depth/size depth/size depth/size Mater Total core Recovery % Recovery % R. O. D R. O. D R. Core Recovery %								mples	Reduced Level	0 0 Depth (m)	Legend		STRATA DESCRIPTION SUBORDINATE FRACTION, MAJOR FRACTION, MINOR FRACTION, STRUCTURE, STREMORTH, MOISTURE CONDITION GRADING, BEDDING, PLASTICITY, ETC (NZ GEOTECHNICAL SOCIETY - FIELD DESCRIPTION OF SOIL AND						
01/2015		$\square$	20				(26, 25,   24, 23, 15,	DT	- 1.52	+7.48	1.52		rootlet angula	ndy fine to coarse GRAVEL with some silt and trace tlets; greyish brown. Dry to moist, subrounded to jular; sand, fine to coarse. (Logged from sample bag)						
				N = + 69/262 mm	DT		+5.96	3.04		subrol	fine to coarse GF unded to angular, ad from sample b	o coarse GRAVEL; brownish grey. Dr l to angular, gap graded; sand, fine to m sample bag)								
			20				(3, 5, 5, 5, 6, 6) N = 22		- 3.04	+5.25	3.24		gravel 3.24m	elly fine to coarse SAND; greyish brown. Moist; I, fine to medium, rounded to subangular. In becomes sandy fine to medium GRAVEL. In becomes fine to coarse GRAVEL with minor sand						
			15				(1, 1, 1, 1 2, 2) N = 6	DT	- 4,56		4.56		SAND	; brown. Wet. (Lo	gged from	ı samp	ole bag)			
									(2, 4, 5, 4, 4, 7) N = 20	DT	- 6.08	+2.92 +2.80	6.08		suban 6.20m	fine to coarse Gl gular; sand, fine t becomes fine to inor sand; reddisl	o coarse. coarse Gl	RAVEI		
							(4, 7, 7, 5, 5, 4) N = 21	DT	- 7.60	+1.40	7.60	0000 000 000 000 000 000 000 00	- round Silty fi	o coarse GRAVEI ed to subangular; ne to coarse GRA . Dry, subrounded	sand, fine VEL with	e to co some	arse. sand; greyish			
			133				(5. 8, 8, 7, 12, 12) N = 39	DT	9 12	-0.12	9.12		Fine to reddis coarse	o coarse GRAVEI h grey. Dry, round a.	₋ with min ded to ang	or san gular; s	d; grey and and, medium to			
Small Dist		-	-			 Level sion P	acker Test		LOGGE	ED T.	PLUNK	ET	REMA	RKS dates and ground	level base	d on be	and held GPS			
SPT Liner Thin Wall	Sample		ple -	St	anda		etration Tes	t	DATE		/01/201		likely a	dates and ground iccurate to +/- 5m. dwater level not rea			na neu ora,			
U100 Undi	sturbed Sa	mple		å Pi	ezom	neter /	Standpipe Ti	p	CHEC	KED <u>B.</u>	SUCKL	ING		mmer energy ratio						
<ul> <li>Pocket Penetrometer Test</li> <li>Piston Sample</li> <li>In-situ Vane Shear Test</li> </ul>									DATE	05/	02/201	5								

Aurecon New Zealand Ltd, Unit 1, 150 Cavendish Road, Casebrook, Christchurch. Tel: +64 3 366 0821 Fax: +64 3 379 6955 christchurch@aurecongroup.com

aurecon								BC	BOREHOLE RECORD							HOLE NO.			BH102	
		aurecon.	igrou	p.cor	n											PROJ	ECT NO	D.,		224464
PR	PROJECT Rosemerryn Subdivision Lincoln																			
ME	THOD	DP								CO-ORDINATES (NZTM) SH							:	2	of	2
МА	CHINE &	s no. '	VTR	970	0-D <sup>-</sup>	Fruc	:k			E 1560211							22/01	/2015	to	22/01/2015
FLU	FLUSHING MEDIUM Water															OUND-I	LEVEL	+	9.00	m RL
Drilling Progress	Prigling Progress Casing depth/size depth/size Recovery % Recovery								ガンジョン         ゴミ         の         の         (NZ           Type         Ref         Depth         10.00						STRATA DESCRIPTION UBORDINATE FRACTION, MAJOR FRACTION, COLOUR, STRUCTURE, STRENGTH, MOISTURE CONDITION GRADING, BEDDING, PLASTICITY, ETC (NZ GEOTECHNICAL SOCIETY - FIELD DESCRIPTION OF SOIL AND ROCK)					
22/01/20									D	г			0000 000 0000							
								(3,3,6 4,4) N = 19	. 5.								22/	01/201	5	t 10.64m, on th reached.
	mall Distur arge Distur				- Wa Im			acker Tes	t	LOGG	ED <u>T</u> .	PLUNK	ET	REMAR		and gree	und leve	based	on ha	nd beld GPS
j si	PT Liner Sa nin Wall Un	mple		ple	_		rd Pen bility	etration T Test	est	DATE		)/01/201		likely ac	rindates and ground level based on hand held GPS, y accurate to +/- 5m. undwater level not recorded.					
N N	100 Undist ocket Pene			ŧ.	_			Standpipe	Tip	CHEC	KED <b>B</b> .	SUCKL	ING	SPT har						
Pi Pi										DATE	_05	5/02/201	5							

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aurecon								BC	RE	HOI	LE F	REC	ORI	D	HOLE NO.	BH103		
	www.		group.com		visi										PROJECT NO.	224464		
PROJ	ECT	Lincol	-							_								
METH	IOD	DP						(				ΓM)		SH	EET 1	of <b>2</b>		
MACHINE & NO. VTR 9700-D Truck									_	156005 516772				DA	TE from 28/01/2015	to <b>28/01/2015</b>		
FLUSHING MEDIUM Water							(	DRIENT	TATION	VERT	ICAL		GROUND-LEVEL +9.00 m RL					
Progress	Progress Progress Adapth/size Adapth/size Adater Total core Recovery % Solid core Index Recovery %								mples	Reduced Level	00.0 (m)	Legend		STRATA DESCRIPTION SUBORDINATE FRACTION, MAJOR FRACTION, MINOR FRACTION, C STRUCTURE, STRENGTH, MOISTURE CONDITION GRADING, BEDDING, PLASTICITY, ETC. (NZ GEOTECHNICAL SOCIETY - FIELD DESCRIPTION OF SOIL AND )				
01/2015			15					DT	Ref Depth 0,00			* * * * * * * * * * * * * * * * * * *	Mix of SILT with minor sand and trace rootlets; dark brown. Dry, low plasticity; sand, fine to medium. (TOPSOIL) and; SILT with some sand; light brown mottled orange. Dry, low plasticity; sand, fine to medium. (Logged from sample bag)					
		1	2				(1, 1, 2, 2, 1, 2) N = 7		- 1.52	+7.48 +7.40 +7.00 +8.90	- 1.52 - 2.00 - 2.00 - 2.98	× × × × ×	fine to 1.60m	med beco	; greyish brown. Stiff, w ium. omes silty fine to mediur brown. Fibrous, saturat	n SAND; grey. Wet.		
								DT		+6.30	- 2.70	× × × × × ×	Peaty peat, SILT V	ty SILT; greyish brown. Firm, saturated, low plasticity t, fibrous. I with some sand and trace organics; grey. Firm to wet, low plasticity; organics are fibrous.				
			45				(4, 8, 7, 7, 6, 6) N = 26	рт	- 3.04	+5.75	- 3.25	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	Silty fi Grave fine to 3.25rr	ine to elly fin coar	medium SAND; brown. e to coarse SAND; grey se, subrounded to suba omes Sandy fine to coar	Wet. ish brown. Wet; grav ngular.		
			6				(4, 7, 12, 11, 9, 8) N = 40	-1	- 4,56	+4.44 +4.20	4.56 4.80	000	Fine t	I, fine	rse SAND with minor gr to medium, subrounded	i to angular.		
							,	DT				000000000000000000000000000000000000000	subro	undeo	to coarse GRAVEL; gre d to angular; sand, fine t 5m reddish brown.			
			8				(8, 13, 10, 7, 6, 5)   N = 28		- 6.08	+2.92 +2.75 +2.60 +2.45	6.08 - 6.25 - 6.40 - 6.55	0000	Sandy subro Fine t	y fine undeo o coa	rse SAND; brown. Wet. to medium GRAVEL; gr d to angular; sand, fine t rse GRAVEL; grey. Wet	o coarse.		
									- 7.60	+1.40	7.60	0.000 0.00 0000	subro	y fine undeo	to coarse GRAVEL; gre d to angular; sand, fine t			
			1000				(8, 12, 13, 12, 12, 14) N = 51	DT		+1.10 +0.90 +0.70	7.90 8.10 8.30	°0 - °0	7.90m	n beco med	rse SAND; brown. Wet. omes gravelly fine to coa ium, rounded to subang rse GRAVEL with minor	ular.		
			45				(3, 11, 13, 13, 12, 10)		- 9.12	+0.50	8.50		Subro No sa Sandy subro	undeo imple y fine	d to subangular; sand, fi recieved. to coarse GRAVEL; gre d to angular; sand, fine t	ne to coarse, yish brown. Wet,		
							↓ N = 48	DT					9.50m	ı - 9.5	i5m white.			
		bed Sam			ater L			1				1.aa	REMA	RKS				
-	e Distur Liner Sa	bed Samj Imple	ole 				acker Test etration Test			ED <u>T.</u>					and ground level based ( ate to +/- 5m.	on hand held GPS,		
			Sample	-		bility 1			DATE		01/201				er level recorded at 2.0m.			
U100 Undisturbed Sample 🛔 📩 Piezometer / Standpipe Tip									I CHECK	KED <b>B.</b>	SUCKI	ING	SPT h	amme	r energy ratio 79%.			

 Piston Sample
 In-situ Vane Shear Test
 DATE
 05/02/2015

 Aurecon New Zealand Ltd, Unit 1, 150 Cavendish Road, Casebrook, Christchurch. Tel: +64 3 366 0821 Fax: +64 3 379 6955 christchurch@aurecongroup.com

aurecon	BOREHOLE RECORD	HOLE NO. BH103									
www.aurecongroup.com		PROJECT NO. <b>224464</b>									
PROJECT Rosemerryn Subdivision Lincoln											
METHOD <b>DP</b>		HEET 2 of 2									
MACHINE & NO. VTR 9700-D Truck	E 1560056	ATE from 28/01/2015 to 28/01/2015									
FLUSHING MEDIUM Water		ROUND-LEVEL +9.00 m RL									
Progress Progress Casing Casin	S Samples Depth C C C C C C C C C C C C C C C C C C C	STRATA DESCRIPTION SUBORDINATE FRACTION. MAJOR FRACTION, MINOR FRACTION, COLOUR, STRUCTURE, STREMESTH, MOISTURE CONDITION GRADING, BEDDING, PLASTICITY, ETC. (NZ GEOTECHNICAL SOCIETY - FIELD DESCRIPTION OF SOIL AND ROCK)									
45											
	End (13, 4) (13, 4) (14, 4) (1	of Dynamic probe sampling at 10.64m, on 28/01/2015 rmination Reason: Target depth reached.									
Small Disturbed Sample     Small Disturbed Sample     Large Disturbed Sample     SPT Liner Sample     Standard Penetration	st LOGGED <u>T. PLUNKET</u> Coorindate	S es and ground level based on hand held GPS, rate to +/- 5m.									
Thin Wall Undisturbed Sample 🛓 Permeability Test	DATE <u>29/01/2015</u> Groundwat	rate to +/- 5m. ter level recorded at 2.0m.									
U100 Undisturbed Sample	GHECKED B. SOCKEING	SPT hammer energy ratio 79%.									

Aurecon New Zealand Ltd, Unit 1, 150 Cavendish Road, Casebrook, Christchurch. Tel: +64 3 366 0821 Fax: +64 3 379 6955 christchurch@aurecongroup.com

## January 2015

24

MASW Investigation: Rosemerryn Farm Lincoln

Report prepared for Aurecon



## Southern Geophysical Ltd

3/28 Tanya St, Bromley, Christchurch 8062

03 384 4302

www.southerngeophysical.com

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Data collected and report prepared by: Christian Rüegg, Geophysicist Rebecca Gilbert, Geologist Michael Finnemore, Senior Geophysicist

#### **Table of Contents**

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2×	



**SGL JOB 1103** 

#### Summary:

A series of nine MASW (Multi-channel Analysis of Surface Waves) lines were surveyed at Rosemerryn Farm near Lincoln on January 15<sup>th</sup> and January 16<sup>th</sup>, 2015. The survey was designed to image variations in shear-wave velocities to a maximum depth of 25 m. The MASW data was of good quality. The material in the first 5 m below ground is of low shear-velocity across much of the site (100 m/s to 150 m/s), with a jump to 200 m/s at around 5 m depth, generally increasing to over 500 m/s between 15 m and 20 m depth.

#### Methodology:

MASW is a geophysical technique that uses the dispersive nature of surface waves to determine a model of the shear wave velocity versus depth of the subsurface.

The MASW data was collected with a 24 channel seismic array. The geophone spacing was 1 m and the seismic source was an accelerated weight drop (AWD). The source offset from the nearest receiver was kept constant at 10 m for the MASW Lines. Recording parameters for the MASW survey were set with a 0.25 ms sample interval, 1.5 s record length, 24 dB gains, and an electric trigger system. MASW points were collected at 10 m intervals along the lines.

The field records were processed using the Kansas Geological Survey software package SurfSeis4 ©. The geometry was set according to the survey parameters and the dispersion curves were generated and edited. The inversions were run using a 10 layer variable depth model.

#### **Results:**

The output shear-wave velocity data is included as a series of CSV files (supplementary to this report). The velocity data was interpolated into 2D MASW profiles for the MASW lines

A total of nine MASW lines were surveyed at the site (Figure 1). The MASW data was generally of good quality, although ambient noise from wind did affect a number of shot records.

#### **Conclusions:**

The MASW results provide a model of Vs values across the Rosemerryn Farm site to a depth between 20 m and 25 m (Figures 2 to 7). The near surface material, to a depth of 4 m, is of relatively low velocity (<100 m/s to 180 m/s). This low velocity layer seems to be laterally continuous across much of the site, with the exception of the northern part of the site. MASW Lines 03, 04, and the first 45 m of Line 05 show higher velocity material in the near surface. Correlation with borehole information would allow changes in shear-wave velocity at gravel and other geological interfaces to be determined.

3 | Page

#### **Disclaimer:**

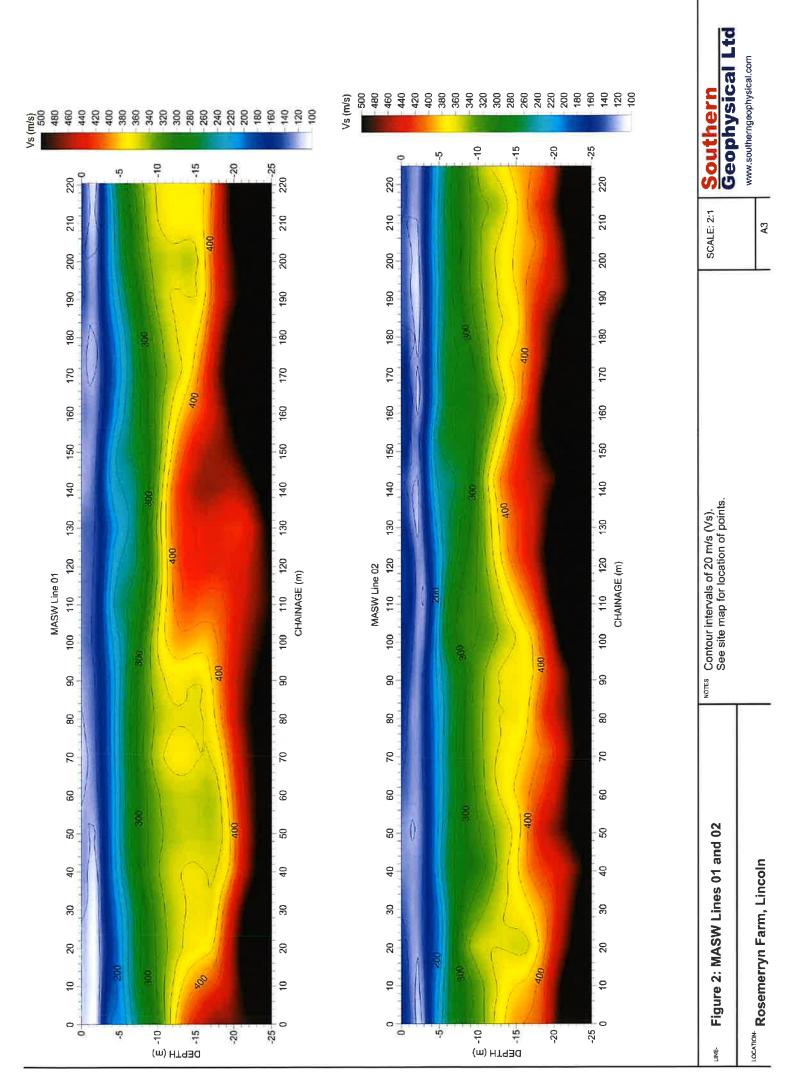
This document has been provided by Southern Geophysical Ltd subject to the following:

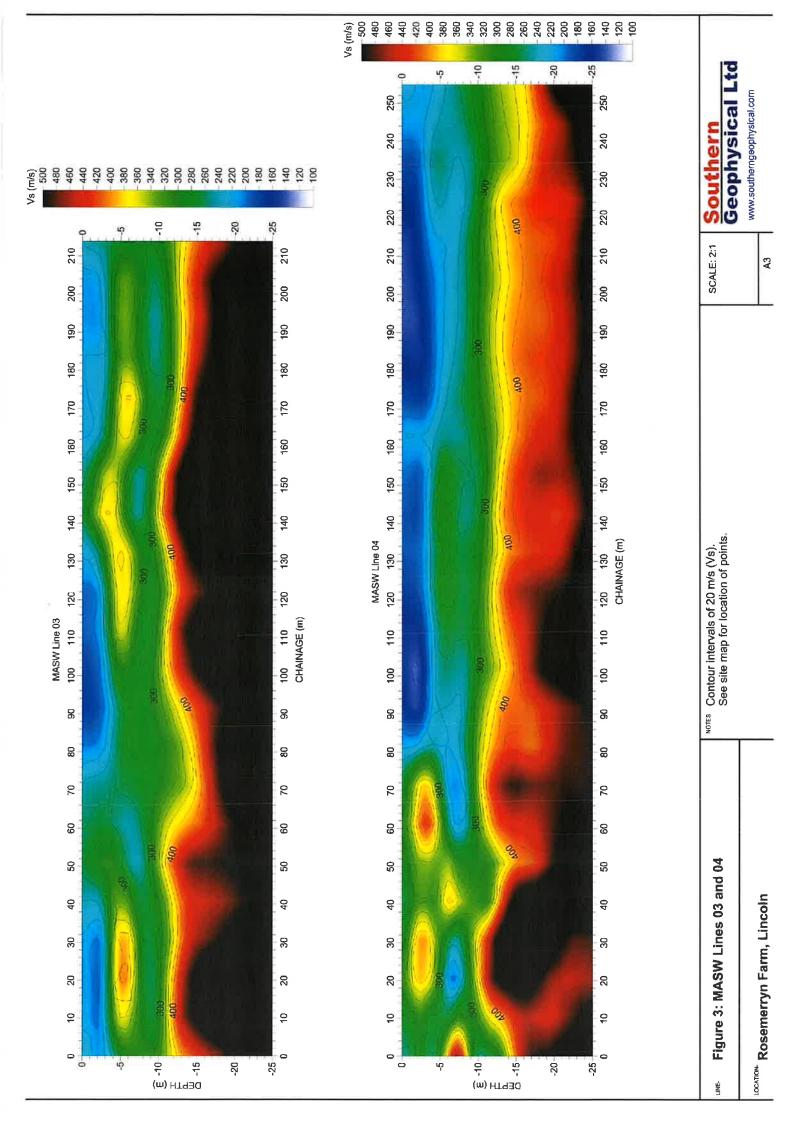
Non-invasive geophysical testing has limitations and is not a complete source of testing. Often there is a need to couple non-invasive methods with invasive testing methods, such as drilling, especially in cases where the non-invasive testing indicates anomalies.

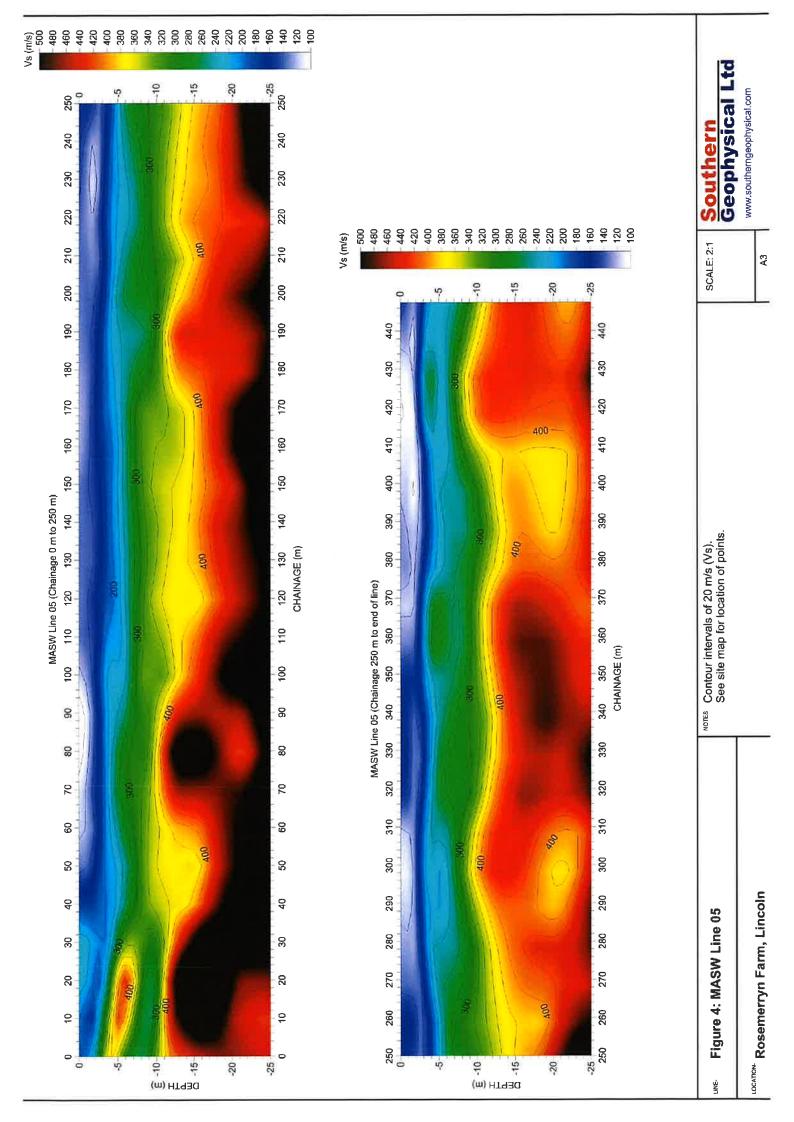
This document has been prepared for the particular purpose outlined in the project proposal and no responsibility is accepted for the use of this document, in whole or in part, in other contexts or for any other purpose. Southern Geophysical Ltd did not perform a complete assessment of all possible conditions or circumstances that may exist at the site. Conditions may exist which were undetectable given the limited nature of the enquiry Southern Geophysical Ltd was retained to undertake with respect to the site. Variations in conditions often occur between investigatory locations, and there may be special conditions pertaining to the site which have not been revealed by the investigation and which have not therefore been taken into account. Accordingly, additional studies and actions may be required by the client.

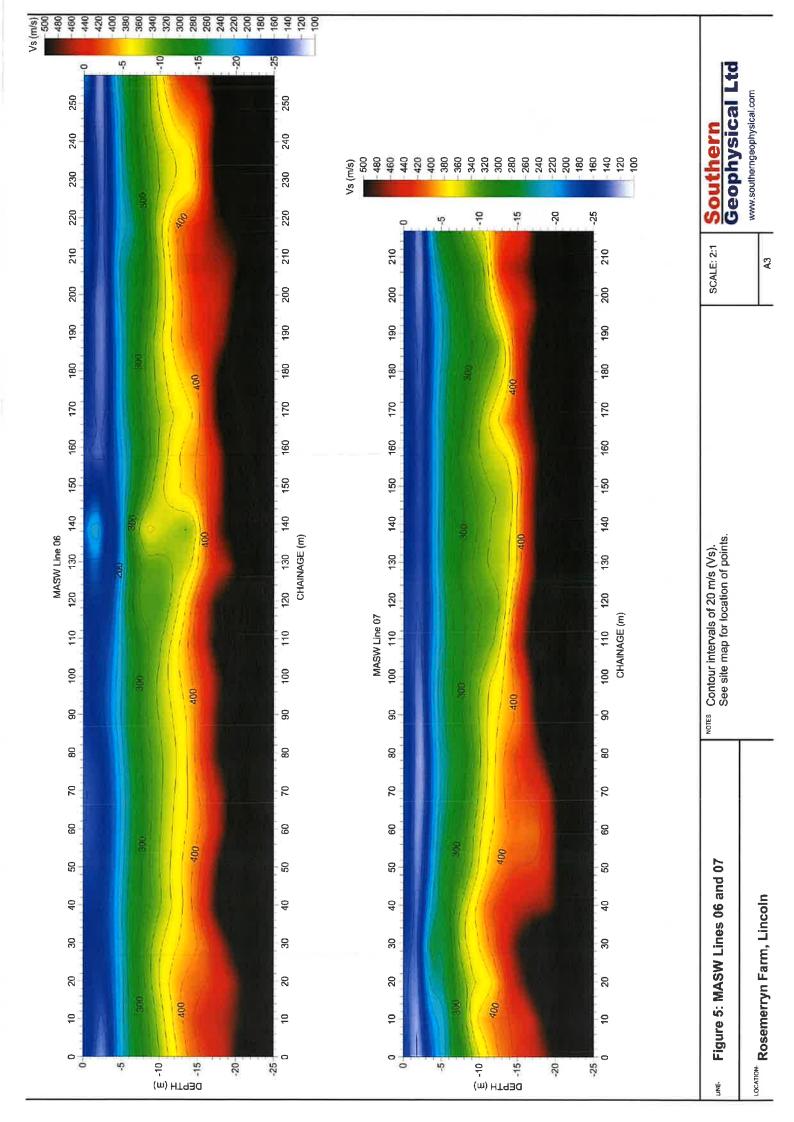
We collected our data and based our report on information which was collected at a specific point in time. The passage of time affects the information and assessment provided by Southern Geophysical Ltd. It is understood that the services provided allowed Southern Geophysical Ltd to form no more than an opinion of the actual conditions of the site at the time the site was visited and cannot be used to assess the effect of any subsequent changes for whatever reason. Where data is supplied by the client or other sources, including where previous site investigation data have been used, it has been assumed that the information is correct. No responsibility is accepted by Southern Geophysical Ltd for incomplete or inaccurate data supplied by others. This document is provided for sole use by the client and is confidential to that client and its professional advisers. No responsibility whatsoever for the contents of this document will be accepted to any person other than the client. Any use which a third party makes of this document, or any reliance on or decisions to be made based on it, is the responsibility of such third parties. Southern Geophysical Ltd accepts no responsibility for damages, if any, suffered by any third party as a result of decisions made or actions based on this document.

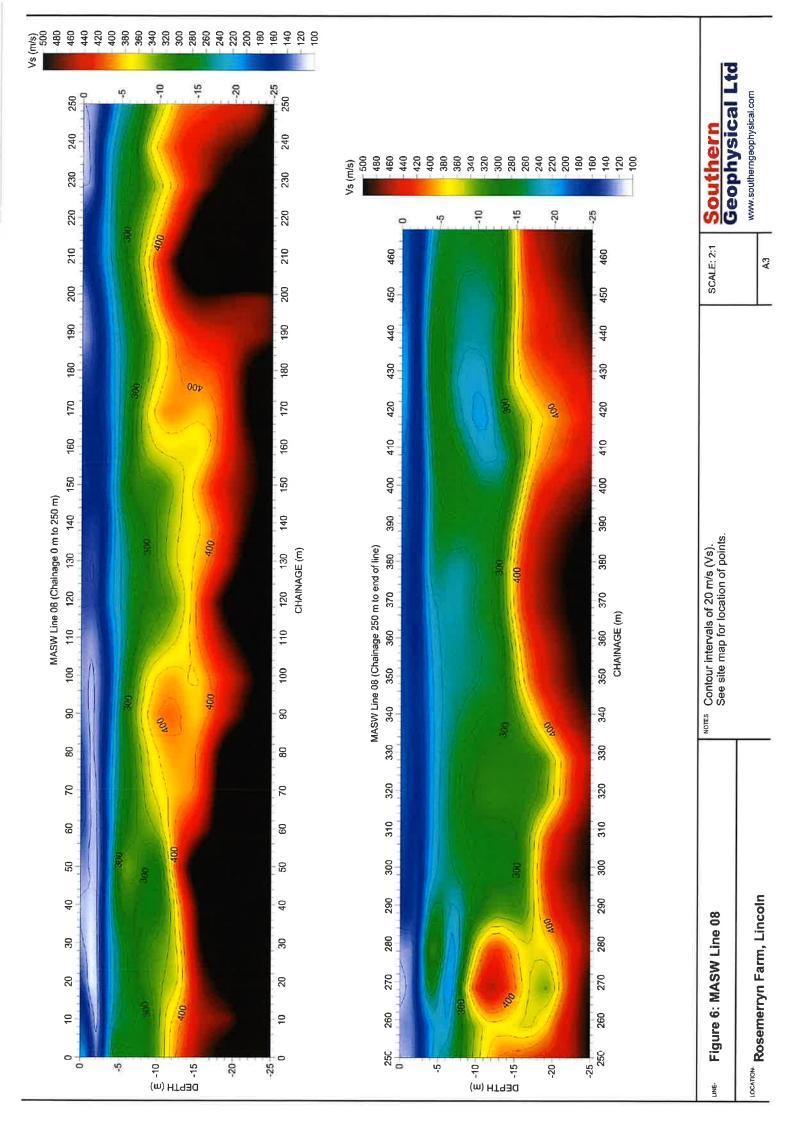


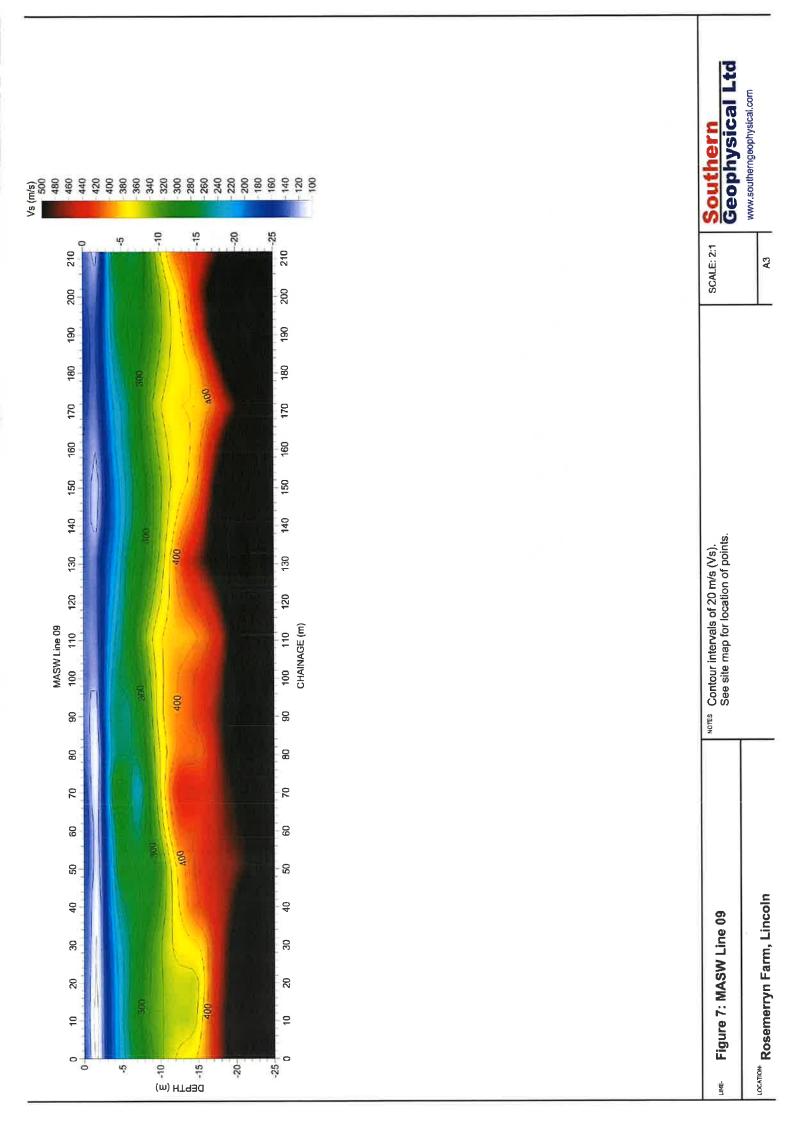












# 2018 CPT Logs

### CONE PENETRATION TEST (CPT) REPORT

### McMILLAN Drilling

**Client: Aurecon NZ Ltd** 

Location: Rosemerryn Ellesmere Road, Lincoln

Printed: 22/05/2018

M	MILLANDrilling	CONE		TRATI	ON 7	TEST		Job:		17414	
	Name: Rosemerryn Client: Aurecon NZ L cation: Ellesmere Ro	td			-	Hole Depth Elevation	ı (m):		No	CPTu201 orth (m): 5168 ast (m): 1560 Grid: NZTM	164.36 168.76
		RAW DATA						IOUR TYPE MALISED)	ESTIN	ATED PARA	METERS
Predrill	Tip Resistance (MPa)	Friction Ratio (%)	Pore Pressure (kPa)	Inclination (Degrees)	Scale	SBT	SB	T Description (filtered)	Dr (%)	Su (kPa)	Neo
Ţ,		- N H H M D N B B	- 0 - 200 - 400 - 600 - 800	5 10 15					- 20 - 40 - 80		- 10 - 20 - 30 - 40
			<ul> <li>International Activities and a structure of a structure o structure o structure o struct</li></ul>	a the state of the	1		lo san	ixtures: clayey silt &			
					3		sand Sands silly s	e sand to gravelly 5: clean sands to ands e sand to gravelly		<ul> <li>W w block is in the state</li> <li>Web work work work in the state</li> </ul>	$\langle$
EOH: 3	.84m		<pre>interface in the interface inte</pre>	a it with a first of the set of t	6				<ul> <li>a contractionation and a second s</li></ul>	Il politicionalizatione manageneratione a constructione manageneratione fait franches supporte politicaria a constructione a constructione a constructione a constructione a to access to indicate a constructione a constructione and constructione a to access to indicate a constructione a constructione and constructione a to access the indicate a constructione access and constructione a constructione a constructione access and constructione a constructione access and constructione access and constructione access a constructione access and constructione access ac	
Cor Tip R Loca	Operator: R. Wyllie Rig: Geomil Pa ne Reference: 170302 ne Area Ratio: 0.75 Cone Type: I-CFXYP2 Resistance (MPa) Initial: al Friction (MPa) Initial: ( Pressure (KPa) Initial: (	W 0-15 1.3707 -0.0114	Date: 22// Predrill: 0.00 ater Level: 1.70 Collapse: 2.30 Final: 1.38 Final: -0.0120 Final: -0.005	0 0 0 8	Incl	ive Refusal Tip: ✔ Gauge: inometer: Other: net Depth:		O       Undefined         O       Undefined         Sensitive f       grained         O       Clay - orgation         O       Clays: clay         Silt mixture       silt & silty of	ine- anic soil / to silty es: clayey	<ul> <li>F) - Robertson</li> <li>Sand mixtu sand to sand</li> <li>Sands: cle to silty san</li> <li>Dense san</li> <li>gravelly sa</li> <li>Stiff sand t sand</li> <li>Stiff fine-gr</li> </ul>	rres: silty ndy silt an sands ds d to nd o clayey
Dat geotec Testing carefu any of	s & Limitations a shown on this report has be chnical soil and design param g for Geotechnical Engineerin Jly reviewed by the user, Bot the geotechnical soil and de riew, The user should be fully	eters using methods g, 4th Edition, The ir th McMillan Drilling L sign parameters sho	published in P. K nterpretations are td & Geroc Solution wn and does not	Robertson a presented onl ions Ltd do no assume any li	nd K.L. Ca ly as a guid t warranty iability for a	bal (2010), Gui le for geotechn the correctness any use of the r	de to ( ical us s or the esults	Cone Penetration e, and should be e applicability of in any design or	Hole D		3.84

M	MILLANDrilling	CON		TRATI		EST	Job:		17414	
	Name: Rosemerry					Hole Depth	CPT No.:		CPTu202	
-	Client: Aurecon NZ cation: Ellesmere	Z Ltd			195	Elevation	n (m): 2.04 n (m): 0.00 ntum: Ground		orth (m): 51680 East (m): 15604 Grid: NZTM	49.46
		RAW DAT	Ą				EHAVIOUR TYPE NORMALISED)	ESTI	MATED PARA	METERS
Predrill	Tip Resistance (MPa)	Friction Ratio (%)	Pore Pressure (kPa)	Inclination (Degrees)	Scale	SBT	SBT Description (filtered)	Dr (%)	Su (kPa)	N <sub>60</sub>
	20 40 30 50 <u>10</u>		- 0 - 200 - 400 - 600 - 800	5 15				- 20 - 60	B0 -150 -200 -350 -350 -350	- 10 - 30 - 40
		3					Silt mixtures: clayey silt & silty clay	1		
		5					Sand mixtures: silty sand			1
		ξ			- 1 -		to sandy silt	L.		-
	A CONTRACT	\$								
-	~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	2		$\mathbf{x}$			Sands: clean sands to silty sands			
	2	5	1. F 5.		_ 2 _				as dib a	1
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	<b>Operator:</b> R. Wyllie <b>Rig:</b> Geomil		Date: 22/ Predrill: 0.0		Effect	ive Refusal Tip: ✔	Soil Behaviour	Type (SB	T) - Robertson 5 Sand mixtu	
	ne Reference: 151125		Vater Level: 1.6	0		Gauge:	Sensitive fi	ne-	Sand to san	n sands
Cor	ne Area Ratio: 0.75 Cone Type: I-CFXYF	P20-10	Collapse: 1.7		Incli	nometer: Other:	grained 2 Clay - orga	nic soil	to silty sand Dense sand gravelly sar	d to
	esistance (MPa) Initia al Friction (MPa) Initia		Final: 2.1001 Final: 0.02				Clays: clay clay	to silty	8 Stiff sand to sand	
	e Pressure (KPa) Initia		Final: -0.004	3	Targ	et Depth:	Silt mixture silt & silty d		9 Stiff fine-gra	ained
Notes	s & Limitations							Remark		
geotec	a shown on this report has hnical soil and design para	ameters using method	s published in P. K	. Robertson and	d K.L. Cat	al (2010), Gui	de to Cone Penetration	Effective	Refusal	
carefu	g for Geotechnical Enginee Illy reviewed by the user, f the geotechnical soil and	Both McMillan Drilling	Ltd & Geroc Soluti	ions Ltd do not	warranty t	he correctness	s or the applicability of	Hole D	epth (m):	2,04
	iew. The user should be fu								Sheet 1 of 1	

	CONE		TDATI		ECT		Job:		17414	
McMILLAN Drilling	CONE		IKAH		E31		CPT No.:		CPTu203	
Name: Rosemerryn Client: Aurecon NZ I Location: Ellesmere R					Hole Depti Elevation Di		00		orth (m): 51680 ast (m): 15601 Grid: NZTM	168.56
	RAW DATA					EHAVIO -NORMA	UR TYPE LISED)	ESTI		METERS
Tip Resistance (MPa)	Friction Ratio (%)	Pore Pressure (kPa)	Inclination (Degrees)	Scale	SBT		escription Itered)	Dr (%)	Su (kPa)	N <sub>60</sub>
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	C M		and the second se	2		Sand mix to sandy	tures: silty sand silt			
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Operator: R. Wyllie		Date: 22/0	05/2018	E Effect	ive Refusal	Soi	l Behaviour	Type (SB <sup>-</sup>	T) - Robertson	et al. 1
Rig: Geomil Pa	anther 100	Predrill: 0.00		_11601	Tip: ,	-	Undefined		5 Sand mixtu sand to sat	res: silty
Cone Reference: 151125 Cone Area Ratio: 0.75 Cone Type: I-CFXYP2 Resistance (MPa) Initial:	20-10 1.9945	ater Level: 1.50 Collapse: 1.70 Final: 2.0254	0	Incli	Gauge: nometer: Other:		Sensitive fil grained Clay - orga Clays: clay clay	nic soil	<ul> <li>6 Sands: cleat to silty san</li> <li>7 Dense san gravelly sa</li> <li>8 Stiff sand to sand</li> </ul>	ds d to nd
ocal Friction (MPa) Initial: ore Pressure (KPa) Initial:		Final: 0.0197 Final: 0.0015		Targ	et Depth:		Silt mixture silt & silty c		9 Stiff fine-gr	ained
tes & Limitations								Remarks	5	
Data shown on this report has b stechnical soil and design param	neters using methods	published in P. K	, Robertson ar	nd K.L. Cal	oal (2010), Gu	ide to Cor	ne Penetration	Effective	Refusal	
sting for Geotechnical Engineeri refully reviewed by the user. Bo	ng, 4th Edition. The ir oth McMillan Drilling L	terpretations are td & Geroc Soluti	presented only ions Ltd do not	y as a guid warranty f	e for geotechr he correctnes	nical use, is or the a	and should be pplicability of	Hole D	epth (m):	4.30
ny of the geotechnical soil and de review. The user should be full	esign parameters sho y aware of the technic	wn and does not ques and limitatio	assume any lia ons of any meth	ability for a hod used to	ny use of the derive data :	results in shown in t	any design or his report		Sheet 1 of 1	I

McMillan Drilling	CONF		TRATI		FST		Job:		17414	
							CPT No.:		CPTu204	
Name: Rosemerry Client: Aurecon N2 Location: Ellesmere	Z Ltd				Hole Depth Elevatior Da		.00		orth (m): 51679 ast (m): 15602 Grid: NZTM	278.93
	RAW DATA			11.14			OUR TYPE ALISED)	ESTIN	ATED PARA	METERS
Tip Resistance (MPa)	Friction Ratio (%)	Pore Pressure (kPa)	Inclination (Degrees)	Scale	SBT		Description filtered)	Dr (%)	Su (kPa)	N <sub>60</sub>
		- 0 - 200 - 400 - 600 - 600	1 1 1 1 2 2					- 20 - 40 - 80	- 50 - 100 - 150 - 200 - 350 - 350	10 - 20 - 40
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Operator: R. Wylli Rig: Geomil Cone Reference: 170302 Cone Area Ratio: 0.75 Cone Type: I-CFXYI Tip Resistance (MPa) Initia Local Friction (MPa) Initia Pore Pressure (KPa) Initia	Panther 100 W P20-15 il: 1.3563 il: -0,0114	Date: 22/0 Predrill: 0.00 ater Level: 1.40 Collapse: 2.40 Final: 1.3881 Final: -0.0132 Final: -0.0017	))))	Incli	ve Refusal Tip: ✔ Gauge: nometer: Other: et Depth:		<ul> <li>il Behaviour</li> <li>Undefined</li> <li>Sensitive fi grained</li> <li>Clay - orga</li> <li>Clays: clay</li> <li>Clays: clay</li> <li>Silt mixture silt &amp; silty compared</li> </ul>	ne- Inic soil to silty s: clayey clay	<ol> <li>Robertson</li> <li>Sand mixtu sand to sar</li> <li>Sands: cleat to silty sand</li> <li>Dense sand gravelly sard</li> <li>Stiff sand to sand</li> <li>Stiff fine-grave</li> </ol>	res: silty ady silt an sands ds d to nd o clayey
Notes & Limitations Data shown on this report has geotechnical soil and design par Testing for Geotechnical Enginee carefully reviewed by the user, any of the geotechnical soil and review, The user should be f	ameters using methods ering, 4th Edition. The ir Both McMillan Drilling L design parameters sho	published in P. K. Iterpretations are td & Geroc Solution wn and does not a	Robertson ar presented only ons Ltd do not assume any lia	nd K.L. Cat y as a guid warranty t ability for a	eal (2010), Gui e for geotechn he correctness ny use of the r	de to Co ical use, s or the esults ir	ne Penetration and should be applicability of any design or	Hole De	Refusal P <b>pth (m):</b> Sheet 1 of 1	3.34

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	CONF	DENE			TEGT		Job:		17414	
McMILLAN Drilling	CONE	PENE	TRATIC		E91		CPT No.:		CPTu205	
Name: Rosemerryn Client: Aurecon NZ Location: Ellesmere R	Ltd				Hole Depth Elevation Da	ı (m):			rth (m): 51679 ast (m): 15601 Grid: NZTM	31.90
	RAW DATA						IOUR TYPE MALISED)	ESTIM		METERS
Tip Resistance (MPa)	Friction Ratio (%)	Pore Pressure (kPa)	Inclination (Degrees)	Scale	SBT	SB	T Description (filtered)	Dr (%)	Su (kPa)	N <sub>60</sub>
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EQH: 6.6m	- And			- 6		silty s	s: clean sands to			<
				- 7 -				100-100 V		
Operator: R. Wyllie Rig: Geomil P Cone Reference: 160925 Cone Area Ratio: 0.75 Cone Type: I-CFXYP Tip Resistance (MPa) Initial Local Friction (MPa) Initial Pore Pressure (KPa) Initial Pore Pressure (KPa) Initial Notes & Limitations Data shown on this report has geotechnical soil and design para Testing for Geotechnical Engineer carefully reviewed by the user. B any of the geotechnical soil and do review. The user should be ful	2anther 100 W 20-15 : -1.4917 : 0.0198	Date: 22/ Predrill: 0.0 ater Level: 1.8 Collapse: 4.0 Final: -1.395 Final: 0.011 Final: 0.003	0 60 00	Inci	ive Refusal Tip: Gauge: inometer: Other: get Depth:		O       Undefined         O       Undefined         I       Sensitive f         grained       Image: Clay - organised         Clay - organised       Image: Clay - organised         Clay - organised       Image: Clay - organised         Image: Clay - organised       Image: Clay - organis         Image: Clay - organ	ine- anic soil / to silty es: clayey	<ul> <li>F) - Robertson</li> <li>Sand mixtu sand to said</li> <li>Sands: cleito silty san</li> <li>Dense san</li> <li>gravelly sa</li> <li>Stiff sand tisand</li> <li>Stiff fine-gravelise</li> </ul>	rres: silty ndy silt an sands ds d to nd o clayey
Notes & Limitations Data shown on this report has geotechnical soil and design paral	meters using methods.	published in P. F	K Robertson and	K.L. Ca	bal (2010), Gu	ide to	Cone Penetration	Remarks Effective		
Testing for Geotechnical Engineer carefully reviewed by the user. B	ing, 4th Edition: The ir oth McMillan Drilling L	terpretations are td & Geroc Solut	e presented only a tions Ltd do not w	as a guic /arranty	le for geotechr the correctnes	nical us is or th	se, and should be le applicability of	Hole D	epth (m):	6.60
any of the geotechnical soil and d review. The user should be ful	lesign parameters sho	wn and does not	t assume any liab	nity for a	any use of the	results	s in any design or		Sheet 1 of 1	

	Millan Drilling	CONF		ΤΡΛΤΙ		TEST		Job:		17414	
				INAU		LJI		CPT No.:		CPTu206	5
Lo	Name: Rosemerry Client: Aurecon NZ ocation: Ellesmere I	Z Ltd				Hole Depth Elevation Da	(m): (			orth (m): 51679 ast (m): 15603 Grid: NZTM	386.70
		RAW DATA						OUR TYPE ALISED)	ESTIN	ATED PARA	METERS
Predrill	Tip Resistance (MPa)	Friction Ratio (%)	Pore Pressure (kPa)	Inclination (Degrees)	Scale	SBT		Description filtered)	Dr (%)	Sư (kPa)	N 60
▼	- 10 - 20 - 50 - 50	-~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	- 0 -200 -400 -600 -800	- 10 - 15					- 50 - 60 - 80	- 50 - 100 - 150 - 200 - 350 - 350	- 10 - 20 - 40
		Non and a second	<ul> <li>A second sec second second sec</li></ul>		na na hanna hanna han 1 1			lay to silty clay ixtures: silty sand y silt	S S	(a) A statement of the statement of t	and a second sec
					2	al palar Maria	Sands: silty sar	clean sands lo Ids			
	M						sand	and to gravelly and to gravelly		A second	~
EOH: 2	2.95m Operator: R. Wyllie		Date: 22/0	5/2019	3	ve Refusal	So	il Behaviour		) - Robertson	et al. 1986
Cor Tip F Loc Pore	Rig: Geomil F one Reference: 160925 ne Area Ratio: 0.75 Cone Type: I-CFXYP Resistance (MPa) Initial cal Friction (MPa) Initial e Pressure (KPa) Initial s & Limitations	Panther 100 W: 220-15 I: -1.4662 I: 0.0218 I: 0.0072	Predrill: 0.00 ater Level: 1.40 Collapse: 1.60 Final: -1.4953 Final: 0.0114 Final: -0.0002		Incli Targe	Tip: ✔ Gauge: nometer: Other: et Depth:		<ul> <li>Undefined</li> <li>Sensitive fill grained</li> <li>Clay - orgal</li> <li>Clays: clay clay</li> <li>Silt mixture silt &amp; silty c</li> </ul>	ne- [ nic soil [ to silty [ s: clayey lay [ Remarks	<ul> <li>5 Sand mixtu sand to san</li> <li>6 Sands: cleat to silty sand</li> <li>7 Dense sand</li> <li>8 Stiff sand to sand</li> <li>9 Stiff fine-graves</li> </ul>	res: silty idy silt an sands is is d to nd o clayey
geoteo Testing carefi any of	ta shown on this report has chnical soil and design para g for Geotechnical Engineer ully reviewed by the user, B f the geotechnical soil and d view, The user should be fu	meters using methods ring, 4th Edition. The in Both McMillan Drilling Li design parameters show	published in P. K. terpretations are p td & Geroc Solutic wn and does not a	Robertson and presented only ons Ltd do not assume any lia	d K.L. Cab as a guide warranty the bility for ar	al (2010), Guid for geotechnic ne correctness ny use of the re	e to Co cal use, or the a	ne Penetration and should be applicability of any design or	Effective F	Refusal p <b>th (m):</b> Sheet 1 of 1	2.95

Mexalization         CONE PENETRATION TEST           Corr         Name: Rosemerryn         Corr         Name: Rosemerryn         Corr         Name: Rosemerryn         Corr         Name: Rosemerryn         Sold Berkavour         Name: Rosemerryn         Sold Berkavour         Sold Berkavour         Berkavour         Sold			CON				TEST		Job:		17414	
Client: Aureon N2 Ltd       Elevation (m): 0.00       Beak Lincoin         RAW DATA       Solid Echaviour TYPE       Estimate PRAMETERS         RAW DATA       Solid Echaviour TYPE       Estimate PRAMETERS         Non-Accommandation       Control of the provide the sequence of the provi	<b>'</b>	MCMILLAN Drilling	CON	EPENE	IRAII		E91		CPT No.:		CPTu207	,
NAW UA IA         (NON-NORMALISED)         Es limited precision in the second se	L	Client: Aurecon NZ	Ltd				Elevatio	n (m):	0.00		ast (m): 15602	206.99
Bestiance (MS-0)         Return (MS-0)         Retur			RAW DAT	A						ESTIN	ATED PARA	METERS
Operator: R. Wyllio       Date: 22/05/2018         Reg: Georni Parther 100       Date: 22/05/2018         Cone Roference: 17/03/2       Collage: 3.47         Cone Roference: 17/03/2       Collage: 3.47         Cone Roference: 17/03/2       Collage: 3.47         Cone Roference: 17/03/2       Final: -0.0123         Pressure (KPa) Initial: 0.0031       Final: -0.0123         Processure (KPa) Initial: 0.0031       Final: -0.0123         Pressure (KPa) Initial: 0.0031       Final: -0.0123 <th>Predrill</th> <th>Resistance</th> <th>Ratio</th> <th>Pressure</th> <th></th> <th>Scale</th> <th>SBT</th> <th>SB</th> <th></th> <th></th> <th>(kPa)</th> <th>N<sub>60</sub></th>	Predrill	Resistance	Ratio	Pressure		Scale	SBT	SB			(kPa)	N <sub>60</sub>
Operator: R. Wylie       Bard: dam sands to granty         EQH: 4.21m	V			- 0 - 200 - 400 - 600 - 800	1 1 1 2 2 2 1 2 1 2 1 2 1 2 1 2 1 2 1 2					20 60 80	- 50 - 150 - 250 - 250 - 350 - 350 - 350	10 20 30 40
EOH: 4.21m       4       Prevention of prevention o		>		and a state the desired of the state of the		1						
Operator: R. Wyllie       Date: 22/05/2018       Effective Refusal       Soil Behaviour Type (SBT) - Robertson et al. 19         Rig: Geomil Panther 100       Predrill: 0.00       Tip:       Outlefined       Sand: class sand: sand sand sand sand sand sand sand sand	~		Am			3		silty s Dense	ands			
Operator: N: wynie       Date: 22/03/2010       Enterive Nertistin         Rig: Geomil Panther 100       Predrill: 0.00       Tip:       O       Undefined       Sand mixtures: silty sand to sandy silt         Cone Reference: 170302       Water Level: 1.80       Gauge:       Inclinometer:       Image: Sensitive fine-grained       Sand mixtures: silty sand to sandy silt         Cone Area Ratio: 0.75       Collapse: 3.40       Inclinometer:       Image: Sensitive fine-grained       Sand source       Sand source         Cone Type: I-CFXYP20-15       Final: 1.3779       Other:       Clay: clay to silty gravelly sand       Stiff sand to clayey sand       Stiff fine-grained       Stiff fine-grained       Stiff fine-grained       Stiff fine-grained         Notes & Limitations       Data shown on this report has been assessed to provide a basic interpretation in terms of Soil Behaviour Type (SBT) and various geotechnical soil and design parameters using methods published in P. K. Robertson and K.L. Cabal (2010), Guide to Cone Penetration       Remarks	EOH	ł: 4.21m		<ul> <li>All Specific Stription (Control of Section 1) and (Control of Section 1).</li> <li>All Section (Control of Section 1) of Res.</li> <li>All Section (Control of Section 1) of Res.</li> </ul>		6				Design of the second to the second s second second sec		- 2 Victoria Carvis and Carvis - The
Rig: Geomi Pantner 100       Predrif: 0.00       Tip:       O Undefined       S and to sandy silt         Cone Reference: 170302       Water Level: 1.80       Gauge:       Sensitive fine-       Sands: clean sands         Cone Area Ratio: 0.75       Collapse: 3.40       Inclinometer: ✓       Sensitive fine-       Sands: clean sands         Cone Type: I-CFXYP20-15       Other:       Clay - organic soil       To Dense sand to gravelly sand         Tip Resistance (MPa) Initial: 1.3756       Final: 1.3779       Clay: clay to silty       Stiff sand to clayey sand         Local Friction (MPa) Initial: -0.009       Final: -0.0123       Target Depth:       Silt mixtures: clayey silty clay       Stiff fine-grained         Notes & Limitations       Silt mixtures: clayey silty clay       Stiff fine-grained       Stiff fine-grained         Data shown on this report has been assessed to provide a basic interpretation in terms of Soil Behaviour Type (SBT) and various geotechnical soil and design parameters using methods published in P. K. Robertson and K.L. Cabal (2010), Guide to Cone Penetration       Effective Refusal						Effect		S		Type (SB1		
Data shown on this report has been assessed to provide a basic interpretation in terms of Soil Behaviour Type (SBT) and various Effective Refusal actechnical soil and design parameters using methods published in P. K. Robertson and K.L. Cabal (2010), Guide to Cone Penetration	( Tij L	Cone Reference: 170302 Cone Area Ratio: 0.75 Cone Type: I-CFXYF p Resistance (MPa) Initia .ocal Friction (MPa) Initia	P20-15 I: 1.3756 I: -0.009	Nater Level: 1.8 Collapse: 3.4 Final: 1.3779 Final: -0.012	0 0 1 3		Gauge: nometer: Other:	/	Sensitive fi grained Clay - orga Clays: clay clay Silt mixture	nic soil to silty s: clayey	<ul> <li>Sand to sail</li> <li>Sands: cleat</li> <li>to silty san</li> <li>Dense san</li> <li>gravelly sa</li> <li>Stiff sand t</li> <li>sand</li> </ul>	ndy silt an sands ds d to nd o clayey
deotechnical soil and design parameters using methods published in P. K. Robertson and K.L. Cabal (2010), Guide to Cone Penetration	No	otes & Limitations										
Testing for Costochnical Engineering, 4th Edition. The interpretations are precented only as a guide for gestechnical use, and should be	aec	ptechnical soil and design para	ameters using method	ls published in P. K	, Robertson a	nd K.L. Cal	oal (2010), Gu	ide to (	Cone Penetration	Effective	Refusal	
carefully reviewed by the user. Both McMillan Drilling Ltd & Geroc Solutions Ltd do not warranty the correctness or the applicability of Hole Depth (m): 4.21	Tes ca	sting for Geotechnical Enginee refully reviewed by the user.	ring, 4th Edition. The Both McMillan Drilling	interpretations are Ltd & Geroc Solut	presented onl ions Ltd do no	ly as a guid It warranty l	e for geotechr he correctnes	nical us s or the	e, and should be e applicability of	Hole D	epth (m):	4.21
any of the geotechnical soil and design parameters shown and does not assume any liability for any use of the results in any design or review. The user should be fully aware of the techniques and limitations of any method used to derive data shown in this report. Sheet 1 of 1	any										Sheet 1 of 1	

		CONF				TEOT		Job:		17414	
m	MILLAN Drilling	CONE	PENE	IRAII		E21		CPT No.:		CPTu208	;
Lo	Name: Rosemerry Client: Aurecon NZ cation: Ellesmere I	2 Ltd				Hole Depth Elevation Da		00		rth (m): 51677 ast (m): 15600 Grid: NZTM	069.52
		RAW DATA						UR TYPE LISED)	ESTIM		METERS
Predrill	Tip Resistance (MPa)	Friction Ratio (%)	Pore Pressure (kPa)	Inclination (Degrees)	Scale	SBT		escription Itered)	Dr (%)	Su (kPa)	N <sub>60</sub>
V	9 20 30 50 10 9 20 9 30 50 10		- 0 - 200 - 400 - 600 - 600	- 10 - 15		-00400raa			20 40 60	- 50 - 150 - 150 - 260 - 300 - 350	10 20 40
EOH: 4	.3m						Sand mix to sandy Sand mix to sandy Sands: cd silly sand Sand mix to sandy	tures: silty sand silt ean sands to s tures: silty sand silt ean sands to			
			<ol> <li>G. Male and G. Malakina M. Anderson I.</li> <li>T. Malakina M. Ma Malakina M. Malakina M. Ma Malakina M. Malakina M. Ma Malakina M. Malakina M. M</li></ol>		6				And the second s	Constraints and the second	and a substant of a state of a
Cor Tip F Loc	Operator: R. Wyllie Rig: Geomil I ne Reference: 160925 ne Area Ratio: 0.75 Cone Type: I-CFXYF Resistance (MPa) Initia al Friction (MPa) Initia e Pressure (KPa) Initia	Panther 100 Wa P20-15 I: -1.5601 I: 0.0173	Date: 22/0 Predrill: 0.00 ater Level: 1.20 Collapse: 1.50 Final: -1.4439 Final: 0.0116 Final: 0.0036	) ) )	Incli	ive Refusal Tip: ✔ Gauge: nometer: Other: et Depth:		<ul> <li>Undefined</li> <li>Sensitive fil grained</li> <li>Clay - orga</li> <li>Clays: clay</li> <li>clay</li> <li>Silt pricture</li> </ul>	ne- nic soil to silty s: clayey	<ul> <li>) - Robertson</li> <li>5 Sand mixtu sand to sar</li> <li>6 Sands: cleat to silty sand</li> <li>7 Dense sand gravelly sal</li> <li>8 Stiff sand to sand</li> <li>9 Stiff fine-graveling</li> </ul>	res: silty ady silt an sands ds d to nd o clayey
Dat geotec Testin carefi	s & Limitations la shown on this report has chnical soil and design para g for Geotechnical Enginee ully reviewed by the user. E	imeters using methods i ring, 4th Edition. The in Both McMillan Drilling L1	published in P. K. terpretations are d & Geroc Solutio	Robertson an presented only ons Ltd do not	id K.L. Cab / as a guide warranty ti	oal (2010), Gui e for geotechn he correctness	de to Cor ical use, s or the a	e Penetration and should be pplicability of	Remarks Effective F Hole De	Refusal pth (m):	4.30
	the geotechnical soil and view. The user should be fu									Sheet 1 of 1	

MAILLAN D-(Hing)       CONE PENETRATION TEST       OPT No.:       CPT 100:         Name: Rosemerryn Client: Arrow NZ Lui Location: Ellesmore Road, Lincoln       Hele begin (m): 3.83 Elwaten (m): 1500 Datum: Council       Morth (m): 670738.37 East (m): 1500310.40 Datum: Council       Estimate (m): 67078.37 East (m): 67078.37 East (m)	Alexer		001				ГЕСТ		Job:		17414	
Liceation (D): 0.0       Elevation (D): 0.0	M-MI	LIANDrilling	COI		IRAII		E91		CPT No.:		CPTu209	
NAW DA A         (NON-NORMALSED)         EDITION (EDITION CHARGE ERES)           Image: Process (Marging in the state of	Cli	ent: Aurecon NZ	Ltd				Elevation	n (m):	0.00		ast (m): 15603	318.04
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Corrector: R1, Wylle       Date: 2205/2018       Effective Refuse:       Sol Behaviour Type (SBT) - Roberts et al. 1986         Core Ary million: 105       Date: 2205/2018       Effective Refuse:       Sol Behaviour Type (SBT) - Roberts et al. 1986         Core Type: LCFXP22.10       Preserve: (Log Number 2)       Core ary million: (Log Number 2)       Sol Behaviour Type (SBT) - Roberts et al. 1986         Core Type: LCFXP22.10       Preserve: (Log Number 2)       Core are more in the magnet has been assessed to preserve do not are a guide to preserve for an display and are and made to preserve for an display and are and made to preserve and the magnet are and made to preserve and the made to preserve and the magnet are and made to preserve and the made to p	Predrill	Resistance	Ratio	Pressure		Scale	SBT	SB				N <sub>60</sub>
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Coperator: R. Wyllie       Bate: 22/05/2018       Effective Refuse         EGH: 3.63m       4       4         Big: Genril Panther 100       Date: 22/05/2018       Effective Refuse         Type Reference: 151125       Colleges: 2.70       Colleges: 2.70         Cone Reference: 151125       Colleges: 2.70       Colleges: 2.70         Type Resistance (MPa) Initial: 1.9897       Final: 0.0025       Target Depti:         Processore (MPa) Initial: 0.0041       Final: 0.0025       Target Depti:         Notes & Limitations       State Interpretation in terms of Soil Behaviour Type (SBT) and with terms days of the genetistic action and days parameters using methods would action and action matter so days as guide tor genetistical use and so sandy site in terpretation in terms of Soil Behaviour Type (SBT) and with terms days of the genetistical use and action terms of the genetistical use and action terms of the genetistical use and action terms and the genetistical use and action terms and the sandy site in terpretation in terms of the genetistical use and action terms and the use of the genetistical use and action terms and the use of the			and					silty c	ay		<ul> <li>The second second</li></ul>	
Operator: R. Wyllie       Date: 22/05/2018       Effective Refusal       Soil Behaviour Type (SBT) - Robertson et al. 1986         Rig: Geomil Panther 100       Predrill: 0.00       Tip: -       Image: Consection of the section of the secti			hand		NAME OF THE OTHER OF THE OTHER OF	3						
Coperation: N. wylife       Date: 22/00/2018       Enformet relation         Rig: Geomil Panther 100       Predrill: 0.00       Tip: ✓       Indiana       Sand mixtures: silty sand to sandy silt         Cone Reference: 151125       Water Level: 1.50       Gauge:       Sand: Sensitive fine-       Sand: Idea sands         Cone Area Ratio: 0.75       Collapse: 2.70       Inclinometer:       Sand: Idea sands       Sand: Idea sands         Cone Type: I-CFXYP20-10       Other:       Clay: organic soil       Sand: Sensitive fine-       Sand: Idea sands       Sand: Idea sands         Local Friction (MPa) Initial: 1.9897       Final: 1.9199       Clay: Idea       Stiff sand to clayey sand         Local Friction (MPa) Initial: 0.024       Final: 0.02       Target Depth:       Stiff silt mixtures: clayey silt & silty clay       Stiff fine-grained         Notes & Limitations       Data shown on this report has been assessed to provide a basic interpretation in terms of Soil Behaviour Type (SBT) and various geotechnical soil and design parameters using methods published in P. K. Robertson and K.L. Cabal (2010), Guide to Cone Penetration as and should be carefully reviewed by the user. Both McMillan Drilling Ltd & Geroc Solutions Ltd do not warranty the correctness or the applicability of any of the ceetechnical soil and design parameters shown and does not assume any liability for any use of the results in any design or       Hole Depth (m):       3.63         Mote oegotechnical soil and design parameters shown and does not assume a	EØH: 3.63n	n S			<u> </u>						1	
Coperation: N. wylife       Date: 22/00/2018       Enformet relation         Rig: Geomil Panther 100       Predrill: 0.00       Tip: ✓       Indiana       Sand mixtures: silty sand to sandy silt         Cone Reference: 151125       Water Level: 1.50       Gauge:       Sand: Sensitive fine-       Sand: Idea sands         Cone Area Ratio: 0.75       Collapse: 2.70       Inclinometer:       Sand: Idea sands       Sand: Idea sands         Cone Type: I-CFXYP20-10       Other:       Clay: organic soil       Sand: Sensitive fine-       Sand: Idea sands       Sand: Idea sands         Local Friction (MPa) Initial: 1.9897       Final: 1.9199       Clay: Idea       Stiff sand to clayey sand         Local Friction (MPa) Initial: 0.024       Final: 0.02       Target Depth:       Stiff silt mixtures: clayey silt & silty clay       Stiff fine-grained         Notes & Limitations       Data shown on this report has been assessed to provide a basic interpretation in terms of Soil Behaviour Type (SBT) and various geotechnical soil and design parameters using methods published in P. K. Robertson and K.L. Cabal (2010), Guide to Cone Penetration as and should be carefully reviewed by the user. Both McMillan Drilling Ltd & Geroc Solutions Ltd do not warranty the correctness or the applicability of any of the ceetechnical soil and design parameters shown and does not assume any liability for any use of the results in any design or       Hole Depth (m):       3.63         Mote oegotechnical soil and design parameters shown and does not assume a						4	and the second s			<ul> <li>A. A. A. ROMANNESS, AND AND ADDRESS OF A DESCRIPTION OF A DES</li></ul>		Statut Management (Franken)
Coperation: N. wylife       Date: 22/00/2018       Enformet relation         Rig: Geomil Panther 100       Predrill: 0.00       Tip: ✓       Indiana       Sand mixtures: silty sand to sandy silt         Cone Reference: 151125       Water Level: 1.50       Gauge:       Sand: Sensitive fine-       Sand: Idea sands         Cone Area Ratio: 0.75       Collapse: 2.70       Inclinometer:       Sand: Idea sands       Sand: Idea sands         Cone Type: I-CFXYP20-10       Other:       Clay: organic soil       Sand: Sensitive fine-       Sand: Idea sands       Sand: Idea sands         Local Friction (MPa) Initial: 1.9897       Final: 1.9199       Clay: Idea       Stiff sand to clayey sand         Local Friction (MPa) Initial: 0.024       Final: 0.02       Target Depth:       Stiff silt mixtures: clayey silt & silty clay       Stiff fine-grained         Notes & Limitations       Data shown on this report has been assessed to provide a basic interpretation in terms of Soil Behaviour Type (SBT) and various geotechnical soil and design parameters using methods published in P. K. Robertson and K.L. Cabal (2010), Guide to Cone Penetration as and should be carefully reviewed by the user. Both McMillan Drilling Ltd & Geroc Solutions Ltd do not warranty the correctness or the applicability of any of the ceetechnical soil and design parameters shown and does not assume any liability for any use of the results in any design or       Hole Depth (m):       3.63         Mote oegotechnical soil and design parameters shown and does not assume a					an and a second s	6				and communication of the second secon	A DE LE DE L	na na mangalan na mangalan na
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McMillan Drilling	CONF		ΤΡΛΤΙ		ЕСТ		Job:		17414	
							CPT No.:		CPTu210	
Name: Rosemerryn Client: Aurecon NZ Location: Ellesmere R	Ltd				Hole Depti Elevation Da		00	r	lorth (m): 51677 East (m): 15601 Grid: NZTM	131.44
	RAW DATA					EHAVIOI -NORMA	UR TYPE LISED)	EST	IMATED PARA	VIETER
Tip Resistance (MPa)	Friction Ratio (%)	Pore Pressure (kPa)	Inclination (Degrees)	Scale	SBT		escription tered)	Dr (%)	Su (kPa)	N <sub>60</sub>
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				- 7	1.4453.45 B			AND IN CONTRACTOR	<ul> <li>A state of the sta</li></ul>	F 255 M 95/1154215
Operator: R. Wyllie Pig: Goomil Pi	anthor 100	Date: 22/0		Effectiv	e Refusal		-0	Type (SE	BT) - Robertson	
Rig: Geomil Pa Cone Reference: 170302 Cone Area Ratio: 0.75 Cone Type: I-CFXYP2 Tip Resistance (MPa) Initial: Local Friction (MPa) Initial: Pore Pressure (KPa) Initial:	<b>W</b> : 20-15 1 <u>.</u> 3671 -0.0117	Predrill: 0.00 ater Level: 1.10 Collapse: 2.40 Final: 1.4049 Final: -0.0165 Final: 0.0195	5		Tip: ✔ Gauge: ometer: Other: t Depth:	0	Sensitive fil grained Clay - orga Clays: clay clay	nic soil to silty s: clavey	5 Sand mixtu sand to san 6 to silty sanc 7 Dense sand gravelly sar 8 Stiff sand to sand 9 Stiff fine-gra	ndy silt an sands ds d to nd o clayey
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esting for Geotechnical Engineerin carefully reviewed by the user. Bo	ng, 4th Edition. The in oth McMillan Drilling Li	terpretations are td & Geroc Solution	presented only a ons Ltd do not w	as a guide varrantv the	for geotechn e correctnes:	ical use, a s or the ap	nd should be	Hole I	Depth (m):	4.15
ny of the geotechnical soil and de review. The user should be full	esign parameters show	wn and does not a	assume any liab	oility for any	y use of the r	esults in a	iny design or		Sheet 1 of 1	

	001				LOT		Job:		17414	
McMILLAN Drilling	CON	E PENE	IKAII		E91		CPT No.:		CPTu211	
Name: Rosemerry Client: Aurecon N Location: Ellesmere	Z Ltd				Hole Depth Elevatior Da	n (m):			orth (m): 51676 East (m): 15602 Grid: NZTM	251.75
	RAW DAT	Ą					IOUR TYPE MALISED)	ESTI	MATED PARA	METERS
Tip Resistance (MPa)	Friction Ratio (%)	Pore Pressure (kPa)	Inclination (Degrees)	Scale	SBT	SB1	T Description (filtered)	Dr (%)	Su (kPa)	Nõõ
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EOH: 3:3m				- 1		Silt mi silty cl	mixtures: silty sand			
		Television (		7 —						
	ie	Date: 18/	05/2018	Effecti	ve Refusal	s	oil Behaviour	Type (SB	T) - Robertsor	ı et al. 198
Operator: R. Wyll Rig: Geomil Cone Reference: 170302 Cone Area Ratio: 0.75 Cone Type: I-CFXY Tip Resistance (MPa) Initi Local Friction (MPa) Initi Pore Pressure (KPa) Initi	Panther 100 2 V 7P20-15 al: 1.3397 al: -0.0133	Predrill: 0.0 Vater Level: 0.7 Collapse: 0.8 Final: 1.4119 Final: -0.014 Final: 0.0127	0 0 0 8	Incli	Tip: v Gauge: nometer: Other: et Depth:		<ul> <li>Undefined</li> <li>Sensitive figrained</li> <li>Clay - orga</li> <li>Clays: clay</li> <li>clay</li> <li>silt mixture</li> <li>silt &amp; silty orga</li> </ul>	ine- inic soil r to silty es: clayey	<ul> <li>5 Sand mixtus sand to said sand to said sands: cle to silty sand</li> <li>7 Dense san gravelly saa</li> <li>8 Stiff sand to sand</li> <li>9 Stiff fine-gravelly said to sand</li> </ul>	ures: silty ndy silt an sands ds id to ind o clayey
Notes & Limitations	as been assessed to pr	ovide a basic inter	pretation in tern	ns of Soil E	Sehaviour Typ	be (SBT	) and various	Remark Effective	<b>s</b> e Refusal	
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any of the geotechnical soil and	Both MCMIIIan Drilling design parameters sh fully aware of the techr	iown and does not		wandity t	IC CONCOUNTES	เม บา แปล	> applicability Of		- F 1)*	

McMillan Drilling	CONE		TRATI		EST		Job:		17414	
Name: Rosemerry Client: Aurecon NZ Location: Ellesmere	Z Ltd				Hole Depth Elevation Da		.00	Ne	CPTu212 orth (m): 51676 East (m): 1560 Grid: NZTM	607.43 109.60
	RAW DATA						OUR TYPE ALISED)	ESTI		METERS
Tip Resistance (MPa)	Friction Ratio (%)	Pore Pressure (kPa)	Inclination (Degrees)	Scale	SBT		Description filtered)	Dr (%)	Su (kPa)	N <sub>60</sub>
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		<ul> <li>All Andrew Martin Die Franklichen Weissenschlung und Weissen</li> <li>All Andrew Martin Die Franklichen Weissenschlung und Weissen</li> </ul>				silty clay Sand m to sandy	ixtures: silty sand / silt ixtures: silty sand	}	A second of the second se	
EQH: 3,48m	Man			2			ixtures: silty sand			
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Operator: R. Wyllie Rig: Geomil I Cone Reference: 160925 Cone Area Ratio: 0.75 Cone Type: I-CFXYF Tip Resistance (MPa) Initia Local Friction (MPa) Initia Pore Pressure (KPa) Initia	Panther 100 Wa P20-15 I: 2.0645 I: 0.0225	Date: 18/0 Predrill: 0.00 ater Level: 1.60 Collapse: 2.20 Final: 1.814 Final: 0.021 Final: 0.005	) )	Incli	ve Refusal Tip: ✔ Gauge: nometer: Other: et Depth:		<ul> <li>I Behaviour</li> <li>Undefined</li> <li>Sensitive figrained</li> <li>Clay - orga</li> <li>Clays: clay</li> <li>Clays: clay</li> <li>Silt mixture silt &amp; silty clay</li> </ul>	ne- nic soil to silty s: clayey	<ol> <li>F) - Robertson</li> <li>Sand mixtu sand to sar</li> <li>Sands: cleat to silty sand</li> <li>Dense sand</li> <li>gravelly sar</li> <li>Stiff sand to sand</li> <li>Stiff fine-gravelly</li> </ol>	res: silty ady silt an sands ds d to d to ad o clayey
Notes & Limitations Data shown on this report has geotechnical soil and design para Testing for Geotechnical Enginee carefully reviewed by the user. B any of the geotechnical soil and review. The user should be fu	ameters using methods p rring, 4th Edition. The in Both McMillan Drilling Lt design parameters show	oublished in P <sub>1</sub> K. terpretations are d & Geroc Solution vn and does not a	. Robertson and presented only ons Ltd do not assume any lia	d K.L. Cab as a guide warranty th bility for a	al (2010), Guid of or geotechni ne correctness ny use of the re	de to Co cal use, or the a esults in	ne Penetration and should be applicability of any design or	Remarks Effective Hole D		3.48

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	McMILLAN Drilling			FENE			LJI		CPT No.:		CPTu213	
	Name: Rosemerry Client: Aurecon Na Location: Ellesmere	Z Ltd	oln				Hole Depth Elevation Da	n (m):			rth (m): 51675 ast (m): 15600 Grid: NZTM	)20.37
		RAW	DATA						IOUR TYPE WALISED)	ESTIM	ESTIMATED PARAMETERS	
Predrill	Tip Resistance (MPa)	Frictio Ratio (%)	0	Pore Pressure (kPa)	Inclination (Degrees)	Scale	SBT	SB	Γ Description (filtered)	Dr (%)	Su (kPa)	N <sub>60</sub>
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EC	0H: 6.96m		11		1	- 7						
μ	_		ai sil h			<u>t</u>			oil Behaviour	Type (SBT	) - Robertson	et al. 1986
•	Operator: R. Wyll Rig: Geomil Cone Reference: 151125 Cone Area Ratio: 0.75 Cone Type: I-CFXY Tip Resistance (MPa) Initia Local Friction (MPa) Initia	Panther 100 P20-10 al: 2.0674 al: 0.0212	Wate C F F	Date: 18/0 Predrill: 0.00 er Level: 1.60 ollapse: 2.80 Final: 1.9701 Final: 0.0193 Final: 0.0008	)	Incli	ive Refusal Tip: v Gauge: inometer: Other: et Depth:		<ul> <li>Undefined</li> <li>Sensitive fi grained</li> <li>Clay - orga</li> <li>Clays: clay clay</li> <li>Silt mixture silt &amp; silty clay</li> </ul>	ne- nic soil [ to silty [ es: clayey [	<ol> <li>Sand mixtu</li> <li>Sand to sai</li> <li>Sands: cleator</li> <li>to silty san</li> <li>Dense san</li> <li>gravelly sa</li> <li>Stiff sand t</li> <li>Stiff fine-gr</li> </ol>	nres: silty andy silt an sands ds d to nd o clayey
	otes & Limitations Data shown on this report ha eotechnical soil and design par	is been assesse rameters using n	d to provide	e a basic interp blished in P. K	pretation in terr Robertson an	ms of Soil nd K.L. Cal	Behaviour Typ bal (2010). Gu	pe (SBI	) and various Cone Penetration	Remarks Effective F	Refusal	
Te	esting for Geotechnical Engine arefully reviewed by the user.	ering, 4th Editior Both McMillan [	n. The inter Drilling Ltd &	pretations are & Geroc Soluti	presented only ons Ltd do not	y as a guid warranty 1	e for geotechr the correctnes	nical us is or the	e, and should be e applicability of		pth (m):	6.96
a	ny of the geotechnical soil and review. The user should be	l design parame fully aware of the	ters shown e technique	and does not es and limitatio	assume any lia ns of any meth	ability for a nod used to	ny use of the o derive data s	results shown	in any design or in this report		Sheet 1 of 1	

McMillan Drilling	CONE	PENE	ΤΟΛΤΙ		TEQT		Job:		17414	
MANULLANDIMING	CONE				EST		CPT No.:	_	CPTu214	
Name: Rosemerryr Client: Aurecon NZ Location: Ellesmere F	Ltd				Hole Depth Elevatior Da	n (m):			<b>th (m):</b> 51675 ist (m): 15602 Grid: NZTM	201.51
	RAW DATA						IOUR TYPE MALISED)	ESTIMATED PARAMETERS		METERS
Tip Resistance (MPa)	Friction Ratio (%)	Pore Pressure (kPa)	Inclination (Degrees)	Scale	SBT	SB1	۲ Description (filtered)	Dr (%)	Su (kPa)	N <sub>60</sub>
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	$\left\{ \right.$					Silt mi silty cl	nixtures: silty sand	}	<ul> <li>A state of the sta</li></ul>	
	3		V			silty cl	xtures: clayey silt & ay clay to silty clay	1		ft.
	S	10 - 10 - 10 - 10 - 10 - 10 - 10 - 10 -		2		Sand i to san	nixtures: silty sand dy silt			
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				5		silty sa	xtures: clayey silt &	}	<ul> <li>A state sta</li></ul>	}
	M						clay to silty clay		{	
EOH: 6.65m				7						
Operator: R. Wyllie Rig: Geomil F Cone Reference: 151125 Cone Area Ratio: 0.75 Cone Type: I-CFXYP Tip Resistance (MPa) Initial Local Friction (MPa) Initial Pore Pressure (KPa) Initial	20-10 20-10 : 2.0319 : 0.0189	Date: 18/0 Predrill: 0.00 ater Level: 1.50 Collapse: 2.60 Final: 2.0591 Final: 0.0194 Final: 0.0033	)	Incli	ive Refusal Tip: ✔ Gauge: nometer: Other: et Depth:		oil Behaviour Undefined Sensitive fi grained Clay - orga Clays: clay clay Silt mixture silt & silty c	ne- nic soil to silty s: clayey	<ul> <li>Robertson</li> <li>Sand mixtu sand to sar</li> <li>Sands: cleat to silty sand</li> <li>Dense sand gravelly sar</li> <li>Stiff sand to sand</li> <li>Stiff fine-grave</li> </ul>	res: silty ady silt an sands ds d to nd o clayey
Notes & Limitations Data shown on this report has geotechnical soil and design para Tacting for Contechnical Engineers	meters using methods p	oublished in P. K.	Robertson an	d K.L. Cab	oal (2010), Gui	de to C	one Penetration	Remarks Effective R	efusal	
Testing for Geotechnical Engineer carefully reviewed by the user. B any of the geotechnical soil and d review. The user should be ful	oth McMillan Drilling Lt lesign parameters shov	d & Geroc Solution	ons Ltd do not assume any lia	warranty t ibility for a	he correctness ny use of the r	s or the esults	applicability of in any design or	Hole De	<b>pth (m):</b> Sheet 1 of 1	6.65

Memillan Drilling	CON			TEST		Job:		17414	
						CPT No.:		CPTu215	
Name: Rosemerry Client: Aurecon N2 Location: Ellesmere	Z Ltd			Hole Depti Elevation Da	n (m):			rth (m): 51673 ast (m): 15601 Grid: NZTM	11.23
	RAW DAT	<b>A</b>				IOUR TYPE MALISED)	ESTIMATED PARAMETERS		
Tip Resistance (MPa)	Friction Ratio (%)	Proceiliro	clination Degrees) ອ ບັນ	SBT		۲ Description (filtered)	Dr (%)	Su (kPa)	N <sub>60</sub>
	g -NW4NGreen	- 0 - 200 - 600 - 900	ν <del>6</del> <del>6</del>	-NUARUO-BO			- 20 - 40 - 60 - 80	- 150 - 150	3 30
					Silt mb silty cla	xtures: clayey silt & ay	$\left\{ \right.$		
			- 1 -		Sand r to sand	mixtures: silty sand dy sill	}		
	3		T		Sill mis silty cla	xtures: clayey silt & ay	{		{
			2 -		Sand r to sand	mixtures: silty sand dy silt			
	<pre>}</pre>		3		Silt mi: silty cli	xtures: clayey silt & ay	in solution of the second s		
	8				Sand r to san	mixtures: silty sand dy silt			
	Z		4		Silt mi: silty cli	xtures: clayey silt & ay	\ \ }		<pre>}</pre>
	5	an The F	5		Silt mi: silty cla	xtures: clayey silt & ay			
(					Silt mi silty cl	xtures: clayey silt & ay	(		< {
			6.		Sands silty sa	s: clean sands to ands			Z
9H: 7.04m			<u>,                                     </u>						
Operator: R. Wyll Rig: Geomil Cone Reference: 160925 Cone Area Ratio: 0.75 Cone Type: I-CFXY Tip Resistance (MPa) Initia Local Friction (MPa) Initia Pore Pressure (KPa) Initia	Panther 100 P20-15 al: 1.3107 al: 0,0272	Date: 18/05/2 Predrill: 0.00 Vater Level: 1.70 Collapse: 3.30 Final: 2.0432 Final: 0.02 Final: 0.003	Ir	ective Refusal Tip: • Gauge: aclinometer: Other: arget Depth:		oil Behaviour O Undefined Sensitive fi grained Clay - orga Clays: clay clay Silt mixture silt & silty c	ne-	<ul> <li>) - Robertson</li> <li>5 Sand mixtu sand to sar</li> <li>6 to silty sand</li> <li>7 Dense san</li> <li>9 Stiff fine-gr</li> </ul>	rres: silty ndy silt an sands ds d to nd o clayey
lotes & Limitations							Remarks		
Data shown on this report ha eotechnical soil and design par esting for Geotechnical Engine	rameters using method	s published in P. K. Ro	bertson and K.L.	Cabal (2010), Gu	ide to C	Cone Penetration	Effective F	Refusal	
esting for Geotechnical Engine carefully reviewed by the user. any of the geotechnical soil and	Both McMillan Drilling	Ltd & Geroc Solutions	Ltd do not warran	ity the correctnes	s or the	e applicability of	Hole De	epth (m):	7.04
review. The user should be	fully aware of the techr	niques and limitations of	of any method use	d to derive data	shown i	in this report.		Sheet 1 of 1	

#### **TEST DETAIL**

PointID:	CPTu201		
Sounding:	201		
-	Operator: R. Wyllie	Date: 22/05/2018	Effective Refusal
	Cone Reference: 170302	Predrill: 0.00	Tip: 🗸
	Cone Area Ratio: 0.75	Water Level: 1.70	Gauge:
	Cone Type: I-CFXYP20-15	<b>Collapse:</b> 2,30	Inclinometer:
	Tip Resistance (MPa) Initial: 1.3707	Final: 1.38	Other:
	Local Friction (MPa) Initial: -0.0114	Final: -0.0128	
	Pore Pressure (kPa) Initial: 0.0029	Final: -0.0051	Target Depth:
PointID:	CPTu202		
Sounding:	202		
	Operator: R. Wyllie	Date: 22/05/2018	Effective Refusal
	Cone Reference: 151125	Predrill: 0.00	Tip: 🗸
	Cone Area Ratio: 0.75	Water Level: 1.60	Gauge:
	Cone Type: I-CFXYP20-10	<b>Collapse:</b> 1.70	Inclinometer: Other:
	Tip Resistance (MPa) Initial: 1.985	Final: 2.1001	
	Local Friction (MPa) Initial: 0.0236	Final: 0.02	
	Pore Pressure (kPa) Initial: 0.0039	Final: -0.0043	Target Depth:
PointID:	CPTu203		
Sounding:	203		
	Operator: R. Wyllie	Date: 22/05/2018	Effective Refusal
	Cone Reference: 151125	Predrill: 0.00	Tip: 🖌
	Cone Area Ratio: 0.75	Water Level: 1.50	Gauge:
	Cone Type: I-CFXYP20-10	Collapse: 1.70	Inclinometer:
			Other:
	Tip Resistance (MPa) Initial: 1.9945	Final: 2.0254	
	Local Friction (MPa) Initial: 0.0235	Final: 0.0197	
	Pore Pressure (kPa) Initial: 0.0075	<b>Final</b> : 0.0015	Target Depth:
PointID:	CPTu204		
Sounding:	204		
	Operator: R. Wyllie	Date: 22/05/2018	Effective Refusal
	Cone Reference: 170302	Predrill: 0.00	Tip: 🗸
	Cone Area Ratio: 0.75	Water Level: 1.40	Gauge:
	Cone Type: I-CFXYP20-15	Collapse: 2.40	Inclinometer: Other:
	Tip Resistance (MPa) Initial: 1.3563	Final: 1.3881	0.101
	Local Friction (MPa) Initial: -0.0114	Final: -0.0132	
	Pore Pressure (kPa) Initial: 0.0072	Final: -0.0017	Target Depth:
PointID:	CPTu205		
Sounding:	205		
	Operator: R. Wyllie	Date: 22/05/2018	Effective Refusal
	Cone Reference: 160925	Predrill: 0.00	Tip:
			<b>0</b>
	Cone Area Ratio: 0.75	Water Level: 1.80	Gauge:
	Cone Area Ratio: 0.75 Cone Type: I-CFXYP20-15	Water Level: 1.80 Collapse: 4.00	Inclinometer: 🗸
	Cone Type: I-CFXYP20-15	<b>Collapse:</b> 4.00	
			Inclinometer: 🗸

### McMILLAN Drilling

#### **TEST DETAIL**

Sounding: 206 Operator: R. Wyllie		
	Date: 22/05/2018	Effective Refusal
Cone Reference: 160925	Predrill: 0.00	Tip: 🗸
Cone Area Ratio: 0.75	Water Level: 1.40	Gauge:
Cone Type: I-CFXYP20-15	<b>Collapse:</b> 1.60	Inclinometer: Other:
Tip Resistance (MPa) Initial: -1.46	62 <b>Final:</b> -1.4953	
Local Friction (MPa) Initial: 0.021	8 <b>Final:</b> 0.0114	
Pore Pressure (kPa) Initial: 0.007	<b>Final: -</b> 0.0002	Target Depth:
PointID: CPTu207		
Sounding: 207		
Operator: R. Wyllie	Date: 22/05/2018	Effective Refusal
Cone Reference: 170302	Predrill: 0.00	Tip:
Cone Area Ratio: 0.75	Water Level: 1.80	Gauge:
Cone Type: I-CFXYP20-15	<b>Collapse:</b> 3.40	Inclinometer: 🗸 Other:
Tip Resistance (MPa) Initial: 1.375	56 <b>Final:</b> 1.3779	
Local Friction (MPa) Initial: -0.00		
Pore Pressure (kPa) Initial: -0.00	31 Final: -0.0058	Target Depth:
PointID: CPTu208		
Sounding: 208		
Operator: R. Wyllie	Date: 22/05/2018	Effective Refusal
Cone Reference: 160925	Predrill: 0.00	Tip: 🖌
Cone Area Ratio: 0.75	Water Level: 1.20	Gauge:
Cone Type: I-CFXYP20-15	<b>Collapse: 1</b> .50	Inclinometer: Other:
Tip Resistance (MPa) Initial: -1.56	01 <b>Final:</b> -1.4439	
Local Friction (MPa) Initial: 0.017		
Pore Pressure (kPa) Initial: 0.005	52 <b>Final:</b> 0.0036	Target Depth:
PointID: CPTu209		
Sounding: 209		
Operator: R. Wyllie	Date: 22/05/2018	Effective Refusal
Cone Reference: 151125	Predrill: 0.00	Tip: 🗸
Cone Area Ratio: 0.75	Water Level: 1.50	Gauge:
Cone Type: I-CFXYP20-10	<b>Collapse:</b> 2.70	Inclinometer: Other:
Tip Resistance (MPa) Initial: 1.989	97 <b>Final:</b> 1.9199	
Local Friction (MPa) Initial: 0.022		
Pore Pressure (kPa) Initial: 0.004	Final: 0.0025	Target Depth:
PointID: CPTu210		
Sounding: 210		
Operator: R. Wyllie	Date: 22/05/2018	Effective Refusal
Cone Reference: 170302	Predrill: 0.00	Tip: 🗸
Cone Area Ratio: 0.75	Water Level: 1.10	Gauge:
Cone Type: I-CFXYP20-15	Collapse: 2.40	Inclinometer: Other:
Tip Resistance (MPa) Initial: 1.367	71 <b>Final:</b> 1.4049	ether.
Local Friction (MPa) Initial: -0.01		
Pore Pressure (kPa) Initial: 0.021	I4 Final: 0.0195	Target Depth:

### Mc MILLAN Drilling

#### **TEST DETAIL**

PointID:	CPTu211		
Sounding:	211		
0	<b>Operator:</b> R. Wyllie	Date: 18/05/2018	Effective Refusal
	Cone Reference: 170302	Predrill: 0.00	Tip: 🖌
	Cone Area Ratio: 0.75	Water Level: 0.70	Gauge:
	Cone Type: I-CFXYP20-15	Collapse: 0.80	Inclinometer:
			Other:
	Tip Resistance (MPa) Initial: 1.3397	Final: 1.4119	
	Local Friction (MPa) Initial: -0.0133	Final: -0.0148	
	Pore Pressure (kPa) Initial: 0.0163	Final: 0.0127	Target Depth:
PointID:	CPTu212		
Sounding:	212		
	Operator: R. Wyllie	Date: 18/05/2018	Effective Refusal
	Cone Reference: 160925	Predrill: 0.00	Tip: 🗸
	Cone Area Ratio: 0.75	Water Level: 1.60	Gauge:
	Cone Type: I-CFXYP20-15	Collapse: 2.20	Inclinometer: Other:
	Tip Resistance (MPa) Initial: 2.0645	Final: 1.814	Ouler.
	Local Friction (MPa) Initial: 0.0225	Final: 0.021	
	Pore Pressure (kPa) Initial: 0.0059	Final: 0.005	Target Depth:
PointID:	CPTu213		
Sounding:	213		
e contanig.	Operator: R. Wyllie	Date: 18/05/2018	Effective Refusal
	Cone Reference: 151125	Predrill: 0.00	Tip: 🗸
	Cone Area Ratio: 0.75	Water Level: 1.60	Gauge:
	Cone Type: I-CFXYP20-10	Collapse: 2.80	Inclinometer:
			Other:
	Tip Resistance (MPa) Initial: 2.0674	Final: 1.9701	
	Local Friction (MPa) Initial: 0.0212	Final: 0.0193	
	Pore Pressure (kPa) Initial: 0.0045	Final: 0.0008	Target Depth:
PointID:	CPTu214		
Sounding:	214		
	Operator: R. Wyllie	Date: 18/05/2018	Effective Refusal
	Cone Reference: 151125	Predrill: 0.00	Tip: 🗸
	Cone Area Ratio: 0.75	Water Level: 1.50	Gauge:
	Cone Type: I-CFXYP20-10	<b>Collapse</b> : 2.60	Inclinometer: Other:
	Tip Resistance (MPa) Initial: 2.0319	Final: 2.0591	other.
	Local Friction (MPa) Initial: 0.0189	Final: 0.0194	
	Pore Pressure (kPa) Initial: 0.0075	Final: 0.0033	Target Depth:
PointID:	CPTu215		
Sounding:	215		
	Operator: R. Wyllie	Date: 18/05/2018	Effective Refusal
	Cone Reference: 160925	Predrill: 0.00	Tip: 🗸
	Cone Area Ratio: 0.75	Water Level: 1.70	Gauge:
	Cone Type: I-CFXYP20-15	<b>Collapse</b> : 3.30	Inclinometer:
	Tip Resistance (MPa) Initial: 1.3107	Final: 2.0432	Other:
	Local Friction (MPa) Initial: 0.0272	Final: 0.02	
	Pore Pressure (kPa) Initial: 0.0111	Final: 0.003	Target Depth:

### Mcmillan Drilling

#### CPT CALIBRATION AND TECHNICAL NOTES

These notes describe the technical specifications and associated calibration references pertaining to the following cone types:

- I-CFXY-10 measuring cone resistance, sleeve friction and inclination (standard cone, 10cm<sup>2</sup>);
- I-CFXY-15 measuring cone resistance, sleeve friction and inclination (standard cone, 15cm<sup>2</sup>);
- I-CFXYP20-10 measuring cone resistance, sleeve friction, inclination and pore pressure (piezocone, 10cm<sup>2</sup>); .
- I-CFXYP20-15 measuring cone resistance, sleeve friction, inclination and pore pressure (piezocone, 15cm<sup>2</sup>); .
- I-C5F0p15XYP20-10 measuring sensitive cone resistance, sleeve friction, inclination and pore pressure (piezocone, 10cm<sup>2</sup>). .

#### Dimensions

Dimensional specifications for all cone types are detailed below. All tolerances are routinely checked prior to testing and measurements taken are manually recorded on CPT field sheets. All field sheets are kept on file and available on request.

A.P. van den Berg Machinefabriek tel.: +31 (0)513-631355 info@apvandenberg.com	DEVIATION of Straightness + MINIMUM Dimension tip, friction jacket, cone a		Standards: EN ISO 22476-1 APB-standard			
Type of cone:	Icone 10 cm <sup>2</sup>		_[_]	Icone 15 cm <sup>2</sup>	1	3.5
ALLOWABLE SIZE VARIATION		T				\$\$ \
Diameter of tip:	35,3 ≲ d1 ≤ 36,0			43,2 ≤ d₁ ≤ 44,1		
Diameter of centering ring CFP	35,3 ≤ d1 ≤ 36,0			43,2 ≤ d₁ ≤ 44,1		
Diameter of friction jacket:	$d_1 \le d_2 < d_1 + 0.35$			$d_1 \le d_2 < d_1 + 0,43$		
Height dimension of tip edge:	$7 \le h_e \le 10$			9 ≤ h <sub>e</sub> ≤ 12		۵.
PRODUCTION DIMENSIONS						245
Tip:	$d_1 = 35.7^{+0.2}$	215		$d_1 = 43.8^{+0.2}$		
Jacket (C-cone):	$d_2 = 35.7^{0.2}$			$d_2 = 43.7 \frac{1000}{2}$		
Friction jacket (CF-cone):	$d_7 = 35.9^{-0.1}$			$d_2 = 44,0^{+0,1}$		
Tip for used cone:	$d_1 = 35,5^{+0,1}$			$d_1 = 43.5 \frac{1}{6}$	482	d
MINIMUM DIMENSIONS		19				<u> </u>
Minimum diameter jacket (C-cone):	d <sub>2</sub> = 35,2 (APB standard)			d <sub>2</sub> = 43,0 (APB standard)		
Minimum diameter friction jacket (CF-cone):	d, = 35,3			d <sub>2</sub> = 43,2		0
Use "used cone"-tip when friction jacket diameter:	d₂ ≤ 35,65			d, ≤ 43,7		163.9
Minimum diameter of cone adaptor:	d = 35,3	1461		d = 43,8		d2
Maximum deviation of straightness:	1 mm on a length of 1000 mm (max. oscillation 1,0 mm.)	4	e e	1 mm on a length of 1000 mm (max. oscillation: 2.0 mm)		2
		The second se		<b>Cone area ratio</b> α = A / B = 0.75		

 $\beta = 1 - A / B = 0.25$ 



McMILLAN Drilling

#### **CPT CALIBRATION AND TECHNICAL NOTES (cont.)**

#### Calibration

Each cone has a unique identification number that is electronically recorded and reported for each CPT test. The identification number enables the operator to compare 'zero-load offsets' to manufacturer calibrated zero-load offsets.

The recommended maximum zero-load offset for each sensor is determined as  $\pm$  5% of the nominal measuring range.

In addition to maximum zero-load offsets, McMillan Drilling also limits the difference in zero load offset before and after the test as  $\pm 2\%$  of the maximum measuring range. See table below:

	Tip (MPa)	Friction (MPa)	Pore Pressure (MPa)
Maximum Measuring Range:	150	1.50	3.00
Nominal Measuring Range:	75	1.00	2.00
Max. 'zero-load offset':	7.5	0.10	0.20
Max 'before and after test':	3	0.03	0.06

**Note**: The zero offsets are electronically recorded and reported for each test in the same units as that of each sensor.



Supplier:	A.P. v.d. Berg Machinefabriek, Heerenveer	A.P. v.d. Berg Machinefabriek, Heerenveen The Netherlands						
Production-order:	73444							
Client:	McMillan							
Cone-type:	I-CFXYP20-10							
Cone-number:	151125							
		Required	Checked					
To test / To check i	tem	value	value					
Check Quad-ring groov	e behind friction sleeve with check ring;	Sleeve	OK					
Sample testing: 1 of	every 5 Icones is tested.	fixed	CK					
Isolation-resistance.		>0.5 GΩ	<b>Ι</b> GΩ					
-	10 and 15 cm <sup>2</sup> S < 2.2. mm.	S<= 2,2 mm	1,/ mm					
At Icone base: 5 < 0,2			,					
"Classic calibration" NC Check of callbration-file	О.К.							
	0.K.	CK						
Software version - che	cone. Alarm values are set. (Kill Shutdown).	version:	2.0					
	ne; check cone data [F1][F1].	O.K.	OK					
	Rer calibration – within 1.0 % of nominal load.	Value:						
	Friction after calibration – within 1.0% of		7~2					
nominal load.		Value:	Caczi MPa					
Initial zero-Value Pore nominal load.	Pressure after calibration – within 1.0% of	Value:	්පි kPa					
Initial zero-Value Inclin	nation X1°< X <+1°	Value:	93 0					
Initial zero-Value Inclin	ation Y1° < Y <+1°	Value:	-0,1 •					
Measurements Tip rest		Tested range	C-75 MP?					
	ocal Friction and Pore Pressure:	LF < 10 kPa	4 1.00					
Max. tip load: 5 cm <sup>2</sup> : 6	5 MPa; 10 cm <sup>2</sup> : 100 MPa; 15 cm <sup>2</sup> : 75 MPa.	PP <1/2% nom	0,2 Kpp					
Measurements local frie	ction OK?	Tested range:	C-IMAG					
Local friction at max. Ic	pad.	Tested value:	1,5 MPA					
Measurements Pore Pro	essure OK?	Tested range:	C-200 har					
Measure Pore Pressure	to 150%.	Tested value:	Seco Kah					
Measurements Inclinat	ion OK?	Tested range:	24-0-24					
Cone recognition on di	sconnecting and connecting Icone again?	Yes	CK					
Remarks:			(b)					

Calibrated by: C.J. Cuweyan	Date: 28-10-2016	Sign.:	COS
Final check: J.W. van der Mary	Date: 31-10-2016	Sign.:	Jan 1
			OK
R:\E&D\Beproevingsprotocollen\Beproevingsprotocol Icone Eng	lish version Mc Millan.doc.docx		E.

R:\E&D\Beproevingsprotocollen\Beproevingsprotocol Icone English version Mc Millan.doc.docx

### McMILLAN Drilling

Supplier:	A.P. v.d. Berg Machinef	A.P. v.d. Berg Machinefabriek, Heerenveen The Netherlands					
Production-order:	72614						
Client:							
Cone-type:	Mc Millan						
	I-CFXYP20	- 15					
Cone-number:	100925						
To test / To check iten	<b>n</b>		Required value	Checked value			
Check Quad-ring groove be		check ring;	Sieeve				
Sample testing: 1 of eve	ry 5 Icones is tested.		fixed				
Isolation-resistance.			>0.5 GΩ	/./ GΩ			
Straightness: Icone 5, 10 a At Icone base: S < 0,2 mm			S<= 2,2 mn	n 🕖 y mm			
"Classic calibration" NOT pr Check of calibration-file: "C	О.К.	/					
	Check alarm-settings Icone. Alarm values are set. (Kill Shutdown).						
Software version - check at	version:	2.0					
Calibration date of Icone; c	O.K.	0 K.					
Initial zero-Value Tip after calibration – within 1.0 % of nominal load.			Value:	-0.103 MPa			
Initial zero-Value Local Friction after calibration – within 1.0% of nominal load.			Value:	0,0001 MPa			
Initial zero-Value Pore Press nominal load.		thin 1.0% of	Value:	-1.4 kPa			
Initial zero-Value Inclination		-1°< X <+1°	Value:	-02 0			
Initial zero-Value Inclination		-1° < Y <+1°	Value:	030			
Measurements Tip resistance			Tested range	0 /51114			
Influence Tip load on Local			LF < 10 kPa	- I ISOPT			
Max. tip load: 5 cm <sup>2</sup> : 65 MP		cm*: 75 MPa.	PP <1/2% noi	VINIA			
Measurements local friction	UK?		Tested range	0 11114			
Local friction at max. load.			Tested value	= 1.5 MPa			
Measurements Pore Pressur	e OK?		Tested range	e: a zece kPa			
Measure Pore Pressure to 1	50%.		Tested value	: 3000 icPa			
Measurements Indination C	K?		Tested range	e: 24-0-+24			
Cone recognition on discon	necting and connecting Io	one again?	Yes	Yes			
Remarks:			I				
Calibrated by: W de	Jong	Date: 28 - 09 Date: 28 - 09	. 16 si	gn.: ()			
Final check:	low Maine	Date: 28-09	- 16 Si	gn.: 219			

Generated with Core-GS by Geroc



	TEST CERTIFICAT Icone (all versions)	E		
Supplier:	A.P. v.d. Berg Machinefabriek, Heerenveen The Netherlands			
Production-order:	74378			
Client:	Mc Millan			
Cone-type:	1-CFXYP20-15			
Cone-number:	170302			
To test / To check item		Required value	Checked value	
Check Quad-ring groove behind friction sleeve with check ring; Sample testing: 1 of every 5 Icones is tested.		Sleeve	//	
Isolation-resistance.		>0.5 GΩ	5 GΩ	]
Straightness: Icone 5, 10 and 15 cm <sup>2</sup> S < 2.2. mm. At Icone base: S < 0,2 mm		5<= 2,2 mm	Cas mm	
"Classic calibration" NOT present! Check of callbration-file: "Classic calibration" removed.		О.К.	/	
Check alarm-settings Icone. Alarm values are set. (Kill Shutdown).		О.К.	OK	
Software version - check at opening screen.		version:	20	
Calibration date of Icone; check cone data [F1][F1].		0.K.	oK	
Initial zero-Value Tip after calibration – within 1.0 % of nominal load.		ad. Value:	0.007 MPa	0.006 M
Initial zero-Value Local Friction after calibration – within 1.0% of nominal load.		Value:	- 0,002 MPa	-0,001MI
Initial zero-Value Pore Pressure after calibration – within 1.0% of nominal load.		Value:		-5.5 KF
Initial zero-Value Inclinatio	1° Value:	0.2 0		
Initial zero-Value Inclination Y1° < Y <+1°			0,4	
Measurements Tip resistance OK?		Tested range	0 1017	-
Influence Tip load on Loca	LF < 10 kPa			
Max. tip load: 5 cm <sup>2</sup> : 65 MPa; 10 cm <sup>2</sup> : 100 MPa; 15 cm <sup>2</sup> : 75 MPa.		PP <1/2% non	~ DP1	-
Measurements local friction OK?		Tested range	O-IMA	
Local friction at max. load.		Tested value:	1,5 MpA	
Measurements Pore Pressure OK?		Tested range	: 0-2000 Kp?	1
Measure Pore Pressure to 150%.		Tested value:	3000 KpA	
Measurements Inclination OK?		Tested range	: 24-0-24	
Cone recognition on disconnecting and connecting Icone again?		Yes	CK	
Remarks				
Calibrated by:	Date:02	/03/2017 Sig	in.: (57	1
Calibrated by: CJ Ca Final check: J W 24	ander Meer Date: Ch	/03/2017 Sig	in.:	]

R:\E&D\Beproevingsprotocollen\Beproevingsprotocol Icone English version Mc Millan.doc.docx

## Mc MILLAN Drilling

# 2018 Borehole Logs

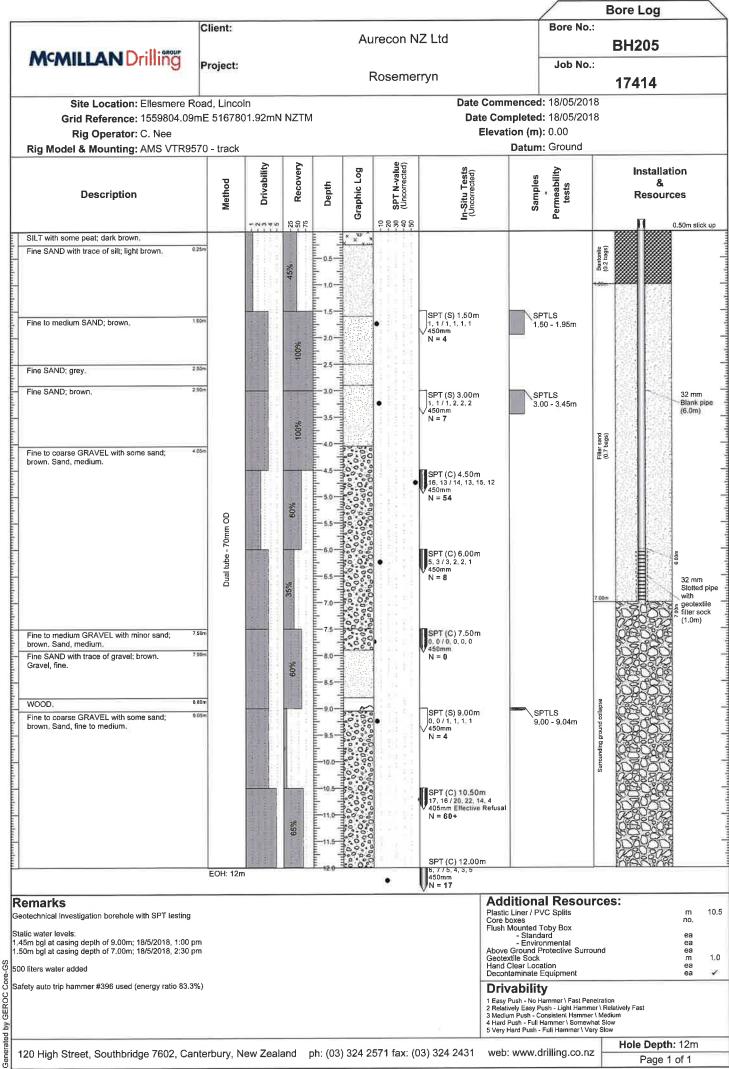
										Bore Log	1
	Client:				Au	recon N	Z Ltd		Bore No.:	BH201	
McMILLAN Drilling	Project:				F	Rosemer	ryn		Job No.:	17414	
Site Location: Ellesmere Grid Reference: 1560343.4 Rig Operator: C. Nee Rig Model & Mounting: AMS VTRS	9mE 51681(		NZTM				Da	te Complete Elevation (m	d: 17/05/2018 d: 17/05/2018 n): 0.00 n: Ground		
Description	Method	Drivability	25 50 Recovery 75	Depth	Graphic Log	10 20 30 SPT N-value 40 (Uncorrected)	In-Situ Tests (Uncorrected)	Samilee	Permeability tests	Installation & Resources	
No sample recovery.	CO um02 - buinod AseW				N NN N				0	Bom (4.0m) Bom (4.0m) Bom (1.0m) Bom (1.0m)	- - - - - - - - - - - - - - - - - - -
Remarks Geotechnical investigation borehole Static water levels: 1.40m bgl at casing depth of 5.00m; 18/5/2018, 4:40 No liters water added	pm							Plastic Liner / F Core boxes Flush Mounted - Stan Above Ground Geotextile Soc Hand Clear Lo Decontaminate <b>Drivabili</b> 1 Easy Push - No	Toby Box dard ronmental Protective Surrou k cation Equipment	nd ea ea ea ea ea ea ea ea ea	1.0 ✓
				ab: (00	0.204.0	E71 5 (0)	2) 204 0404	3 Medium Push - 4 Hard Push - Ful 5 Very Hard Push	Consistent Hammer \ I Hammer \ Somewha - Full Hammer \ Very	Medium I Slow	
120 High Street, Southbridge 7602, Ca	anterbury, N	lew Zeala	and	ph: (03	) 324 2	571 fax: (0	3) 324 2431	web: www.	drilling.co.nz	Page 1 of 1	

Client:     Aurecon NZ Ltd     Bore No.:       Project:     Rosemerryn     Ber No.:     BH202       Job No.:     Job No.:     17414       Site Location: Ellesmere Road, Lincoln Grid Reference: 1560239.44mE 5167880.67mN NZTM Rig Operator: C. Nee     Date Commenced: 17/05/2018 Elevation (m): 0.00       Rig Model & Mounting: AMS VTR9570 - track     Datum: Ground       Description     Installation & Grid Reference: 1580239.44m       No sample redovery.     Installation & Grid Reference: 1580239.44m       Description     Installation & Grid Reference: 1580239.45m       Installation & Grid Reference:											Bore Log	l.	~
Rosemerryn     17414       Site Location: Ellesmere Road, Lincoln     Date Commenced: 17/05/2018       Grid Reference: 1560239.44mE 5167880.67mN NZTM     Date Completed: 17/05/2018       Rig Operator: C. Nee     Elevation (m): 0.00       Rig Model & Mounting: AMS VTR9570 - track     Datum: Ground       Description     Image: State of the stat						A	urecon NZ	Ltd		Bore No.:			
Grid Reference: 1560239.44mE 5167880.67mN NZTM     Date Completed: 17/05/2018       Rig Operator: C. Nee     Elevation (m): 0.00       Rig Model & Mounting: AMS VTR9570 - track     Datum: Ground       Description     Image: Colspan="2">Image: Colspan="2" Image: Co	Memillan Driling	Project:					Rosemerry	'n		Job No.:			
No sample recovery.     N/R N/	Grid Reference: 1560239.44 Rig Operator: C. Nee	mE 51678	80.67mN	NZTM	ļ			Dat	te Complete Elevation (m	d: 17/05/201 ): 0.00			
No sample recovery.     N/R	Description	Method			Depth	Graphic Log		<b>In-Situ Tests</b> (Uncorrected)	Samules	- Permeability tests	Reso	¥ urces	
EOH: 3.2m	No sample recovery.	Wash boring - 70mm OD		-75	-0.5-	N/R N/ N/R N/					ed Bencholle (0.2 bags)	32 mm Blank (2.0m) 32 mm Slotted with geotes filter si	n pipe d pipe klile ock
	No. Phone and the d								Plastic Liner / P Core boxes Flush Mounted	VC Splits	ces:		
Geotechnical investigation borehole     Plastic Liner / PVC Splits     m     -       Core boxes     Core boxes     no.       Static water levels:     Flush Mounted Toby Box     -       1.45m bgl at casing depth of 3.00m; 18/5/2018, 4:47 pm     ea     -       No liters water added     Above Ground Protective Surround     ea		m							- Envir Above Ground Geotextile Sock	lard onmental Proleclive Surrou	Ind	no. ea ea m	1.0
Geotechnical investigation borehole     Plastic Liner / PVC Splits     m       Core boxes     no.       Static water levels:     Flush Mounted Toby Box       1.45m bgl at casing depth of 3.00m; 18/5/2018, 4:47 pm     ea       No liters water added     Above Ground Protective Surround     ea       Geotextile Sock     m     1.0       Hand Clear Location     ea	120 High Street, Southbridge 7602, Car	m							- Envir Above Ground Geotextile Sock Hand Clear Loc Decontaminate Drivabilit 1 Easy Push - No 2 Relatively Easy 3 Medium Push - Cul 4 Hard Push - Full	lard onmental Prolective Surrou ation Equipment <b>Y</b> tammer \ Fast Pene Push - Light Hammer Jonsistent Hammer	Iration \ Relatively Fast Medium A Slow	no. ea ea m ea	- 1.0 ×

										Bore Log	/
	Client:				Au	irecon N	Z Ltd		Bore No.:	BH203	
McMILLAN Drilling	Project:				F	Rosemei	ryn		Job No.:	17414	
Site Location: Ellesmere F Grid Reference: 1560173.8n Rig Operator: C. Nee Rig Model & Mounting: AMS VTR93	nE 516767	9.57mN N	ZTM				Dat	te Complete Elevation (m	d: 17/05/2018 d: 17/05/2018 n): 0.00 n: Ground		
Description	Method	Drivability	Recovery	Depth	Graphic Log	0 SPT N-value 0 (Uncorrected)	In-Situ Tests (Uncorrected)	Samles	Permeability tests	Installation & Resources	
No sample recovery.	CO mm07 - Boring - 80H: 3.11		-25 -50 -75	-0.5-	N/R N/ N/R N/	00- 00- 00-				32 mm Blank pl (2.0m) 1000 000 000 000 000 000 000 000 000 00	pipe lie
Remarks Geotechnical investigation borehole Static water levels: 1.40m bgl at casing depth of 3.00m; 18/5/2018, 4:50 No liters water added	pm							Plastic Liner / F Core boxes Flush Mounted - Stan - Envi	Toby Box dard ronmental Protective Surrour k cation	m no, ea ea	1.0 ✓
No liters water addeu								Drivabili 1 Easy Push - No 2 Relatively Easy 3 Medium Push - 4 Hard Push - Ful		ation Relatively Fast Medium Slow	*
120 High Street, Southbridge 7602, Ca	nterbury, N	lew Zealar	nd p	oh: (03	) 324 2	571 fax: (C	3) 324 2431	web: www.	drilling.co.nz	Hole Depth: 3.1m Page 1 of 1	

										Bore Lo	og	
	Client:				Au	irecon N	Z Ltd		Bore No.:			
McMILLAN Drilling	Project:					2			Joh Mo .	BH20	4	
3	Project.				ł	Rosemer	ryn		Job No.:	1741	4	
Site Location: Ellesmere R								Соттепсес		3		
Grid Reference: 1560065.43 Rig Operator: C. Nee	mE 51673	84.18mN	NZTM	1			Da	te Completed Elevation (m		3		
Rig Model & Mounting: AMS VTR95	570 - track								: Ground			
		bility	Recovery		6o-	SPT N-value (Uncorrected)	ed)	w	lity	Inst	allation	
Description	Method	Drivability	Reco	Depth	Graphic Log	PT N-1	<b>In-Situ Tests</b> (Uncorrected)	Samples	Permeability tests	Res	& sources	
	2	-0040	25 50 75		Gra	20 9 3 3 0 10 2 4 9 3 2 0 10	nn. Un	ő	Per	П	0.70	atial
No sample recovery,			<u>9 7 9</u>	E.	N/R N/ N/R N N/R N/						0.70m :	ыск ир
		naióití. TBR	48	0.5-	NZR NZ NZR N					dentomie (0.2 bags)		-
			1.5	1.0-	N/R N/ N/R N					8000000 B		
	u oD			1.5-	NZR NZ NZR N NZR NZ							
	Wash boring - 70mm OD	1 2 2 4	1.13		N/R N						32 m Blan (3.0r	k pipe
	boring	Leial Tatt			N/R N N/R N/							
	Wash			2.5-	N/R N N/R N/ N/R N					Piller sand (0.7 bags)		
			1 4	3.0-	NZR NZ NZR N					민준이 가격을 즐기 때 다	튭 32 m	ım ed pipe
				3.5-	N/R N/ N/R N N/R N/							ed pipe
	EOH: 4,1	1. T	1	4.0-		1.1					filter (1.0r	sock
Remarks						C.		Additiona	I Resourc	ces:		
Geotechnical investigation borehole								Plastic Liner / P Core boxes Flush Mounted 1	/C Splits		т. по.	•
Static water levels: 1.50m bgl at casing depth of 4.00m; 18/5/2018, 4:00 pr	n							- Stand - Enviro Above Ground P	ard nmental	nd	ea ea ea	
No liters water added								Geotextile Sock Hand Clear Loca Decontaminate	ition		m ea ea	1₋0 ✓
								Drivabilit	у			
								1 Easy Push - No H 2 Relatively Easy Pu 3 Medium Push - Co 4 Hard Push - Full H 5 Very Hard Push -	ush - Light Hammer \ onsistent Hammer \ I fammer \ Somewhat	NRelatively Fast Medium Slow Slow		
120 High Street, Southbridge 7602, Can	terbury, N	ew Zeala	nd p	oh: (03)	324 25	571 fax: (03	3) 324 2431	web: www.d	rilling.co.nz		epth: 4.1n ge 1 of 1	n

Created: 21/05/2018 12:37:36 p.m.



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Generated by

	å	u	e	20		1		BC	DRE	НО	LE	REC	OR		DLE NO.		BH205
			igroup.co merryn		divi	sion								PR	ROJECT NO.		224464
PRO	JECT	Linco												-			
METI	HOD	Boreh	nole								ES (NZ	TM)		SHEET	. 1	of	1
MAC	HINE 8	s no.	AMS VT	R95	70 -	trac	:k		_	15598 51678	• •			DATE fi	rom 18/05/201	<b>8</b> to	18/05/2018
FLUS	SHING	MEDIU	м	/ater							VER	FICAL		GROUN	ND-LEVEL		m RL
Drilling Progress	Casing depth/size	Water level (m shift start/ end	Water Recovery % Total core Recovery %	Solid core Recovery %	R.Q.D.	Fracture Index	Tests		amples	Reduced Level	00.0 Depth (m)	Legend		S	STRUCTURE, STRENGTH GRADING, BEDDING	ACTION, MI I, MOISTURI	NOR FRACTION, COLOUR
	_		45					Type	Ref Deptr 0.00		E 0.35	<u>st 1,</u> <u>st 1</u> ,	SILT v		sand; dark brov	wn, Moi	st, low plasticity;
			45					вн			- <u>0.70</u> - 1.50	×××	SILT v Moist 0.50m	with minor low plasti	sand; grey mot icity; sand, fine. s with some san		nge and brown.
							(1, 1, 1, 1,   1, 1) ↓ N = 4	BH	— 1,50				Moist.		SAND with mino		ht brown grey.
							(1, 1, 1, 2,   2, 2)   N = 7	BH	— 3.00				2.60m dark b	i - 3.00m E prown, We	s bluish grey. W Becomes with s et, slightly odoro s fine to coarse,	ome org us,	ganic silt lenses; brown,
			6				(16, 13, 14, 13, 15 12) N = 54	BH	- 4.50		4.50	°0 °0 °0 0 0 °0 °0 °0	Suban Fine to grey. S	gular to si o coarse ( Saturated,		ome san	se gravel, id and minor silt; ided; sand, fine
			35	_			(5, 3, 3, 2,   2, 1) ↓ N = 8	-	- 6.00		6.00	0 0 0 0 0 0 0 0 0 0 0 0 0		lly fine to	medium SAND; oarse, subangul		own. Saturated, brounded.
			85	-			(0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0)	ВН	- 7.50		- 6.90 - 7.50	°0°0°0	suban Fine to	gular to si o medium	ubrounded; san GRAVEL with s	d, fine to some sa	ind; dark brown.
							N = 0	вн			- <u>8.00</u> - <u>8.50</u> - <u>8.90</u>	000 0000	Coarse Fine to Fine to	e. o medium o medium	SAND, dark bro GRAVEL with s angular to subro	own. Sa some sa	turated. ind; dark brown.
			10				(0, 0, 1, 1, 1, 1) , N = 4	ВН	- 9.00		- 9.30		Vood Fine to	e. fragment o coarse ( Saturated,	GRAVEL with so	ome sar	nd and minor silt; nded; sand, fine
			65	-			(17, 16, 20, 22, 14 4) N = 60/255 mm	BH	— 10.50								
							(6, 7, 5, 4, 3, 5) ↓ N = 17		12:00		12.00	000			Borehole at 12.0 tion Reason:Ta		
Sma	all Distur	bed Sam	ple -	¥ w	ater l	_evel		<u> </u>			-		REMA	ARKS			
	ge Distur Liner Sa	bed Sam ample	ple		•		Packer Test netration Tes	st			WILSO		Coorin likely a	ndates and accurate to	l ground level ba o +/- 5m.	sed on I	hand held GPS,
U10		urbed Sa	d Sample mple	<u> </u>		ability neter /	Test Standpipe T	ip	DATE		<u>/05/201</u> MUIRS		Static 18/5/20	water leve 018, 1:00 p 018, 2:30 p	els: 1.45m bgl at o om 1.50m bgl at o om	casing d asing d	lepth of 9.00m; epth of 7.00m;
Poc Pist	ket Pene on Samp	trometer	Test			Test	Shear Test		DATE		/06/201			ers water a			

Aurecon NZ Ltd, 93 Cambridge Terrace, Christchurch 8140. Tel: Fax:

# 2018 MASW Report

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### MASW Investigation: Rosemerryn Stages 19 to 24, Lincoln

Report prepared for Aurecon

### Southern Geophysical Ltd

3/28 Tanya St, Bromley, Christchurch 8062 Ph: 03 384 4302 Web: <u>www.southerngeophysical.com</u> Data collected and report prepared for Southern Geophysical by:

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Mike Finnemore (PhD), Geophysicist

Nick McConachie (BSc), Geologist

Rebecca Gilbert (PgDip), Geologist

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SGL Job 1610 Report Version 1



### Summary:

A series of Multi-channel Analysis of Surface Waves (MASW) surveys were undertaken at stages 19 to 24 of the Rosemerryn subdivision, Lincoln on May 24, 2018. The geophysical testing included five MASW lines, orientated South to North across a series of farm paddocks. The profiles show a low velocity unit in the top 5 m of the sections, with a marked increase to 250 m/s between 4 m and 6 m depth. Velocities increase with depth to over 500 m/s at around 15 m to 20 m depth.

### Methodology:

MASW is a geophysical technique that uses the dispersive nature of surface waves to model shear-wave velocity versus depth.

A MASW survey is undertaken as a series of lines or points across the surface of the site. The MASW lines in this survey were collected using a 24-channel towed seismic array, with 4.5 Hz geophones. The geophone spacing was 1 m and the source offset was 10 m. The active source was a 12 lb sledgehammer impacting an aluminium plate. Recording parameters for the MASW survey were set with a 0.125 ms sample interval, 1 s record length, 24 dB gains, and an electric trigger system. Shot records were collected at 5 m spacing along the line where possible.

The field records were processed using the Kansas Geological Survey software package SurfSeis5 ©. The geometry was set according to the survey parameters and the dispersion curves were generated and edited. The inversions were run using a 10 layer variable depth model.

The velocity data was interpolated into 2D  $V_s$  profiles for the MASW lines. The output shear-wave velocity data is included as a series of data files (CSV format), supplementary to this report.

The midpoint of the MASW seismic array at each shot record was recorded with a Trimble GeoXH GPS system. The GPS points were differentially corrected and output using the New Zealand Geodetic Datum (NZGD) 2000, with Mt Pleasant

2000 coordinates. The site did not have significant elevation changes, and the profiles have not been corrected for topography.

### **Results:**

Five MASW lines with a total length of 1125 meters were surveyed at the site (Figure 1). The site had moderate levels of ambient noise due to traffic on nearby roads. The MASW profiles did not show any major velocity inversions, with shear-wave velocities gradually increasing from less than 100 m/s to over 500 m/s at between 15 m and 20 m depth (Figures 2 to 4). The velocities in the upper 5 m are low, which is consistent with previous MASW surveys conducted at the subdivision. It is recommended that the MASW profiles be correlated with any intrusive investigations to add geological context to the shear-wave velocities.

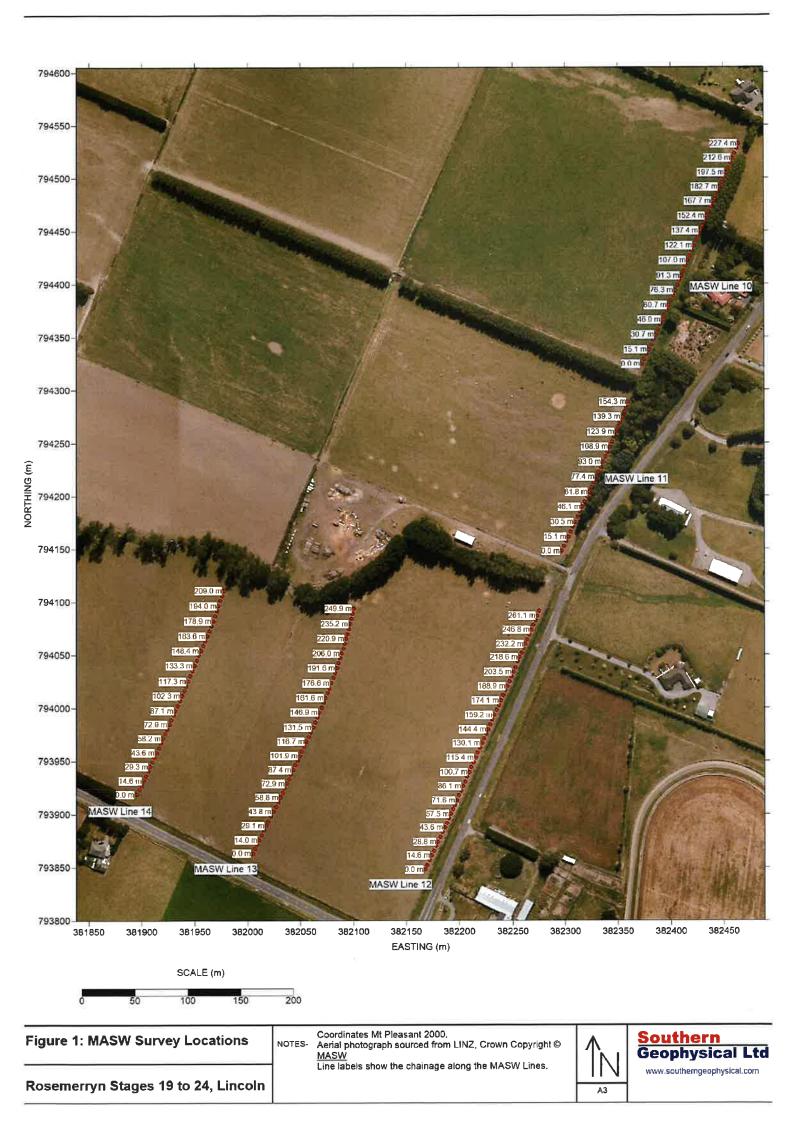
### Disclaimer:

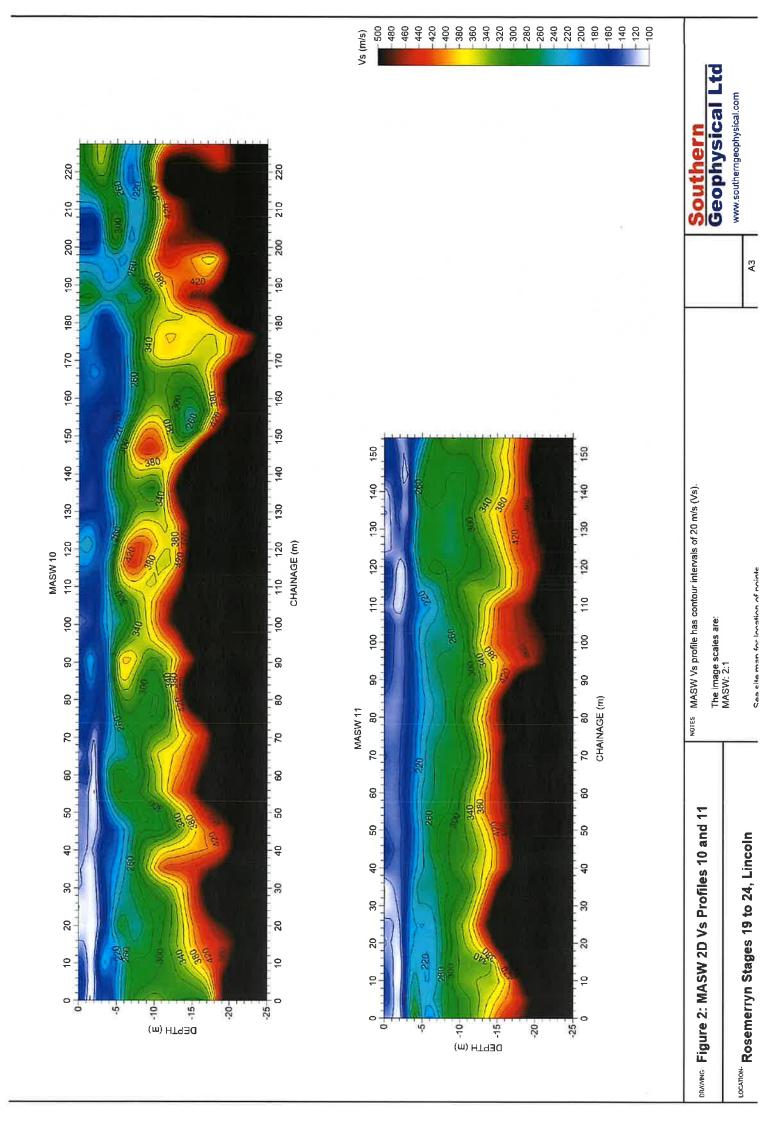
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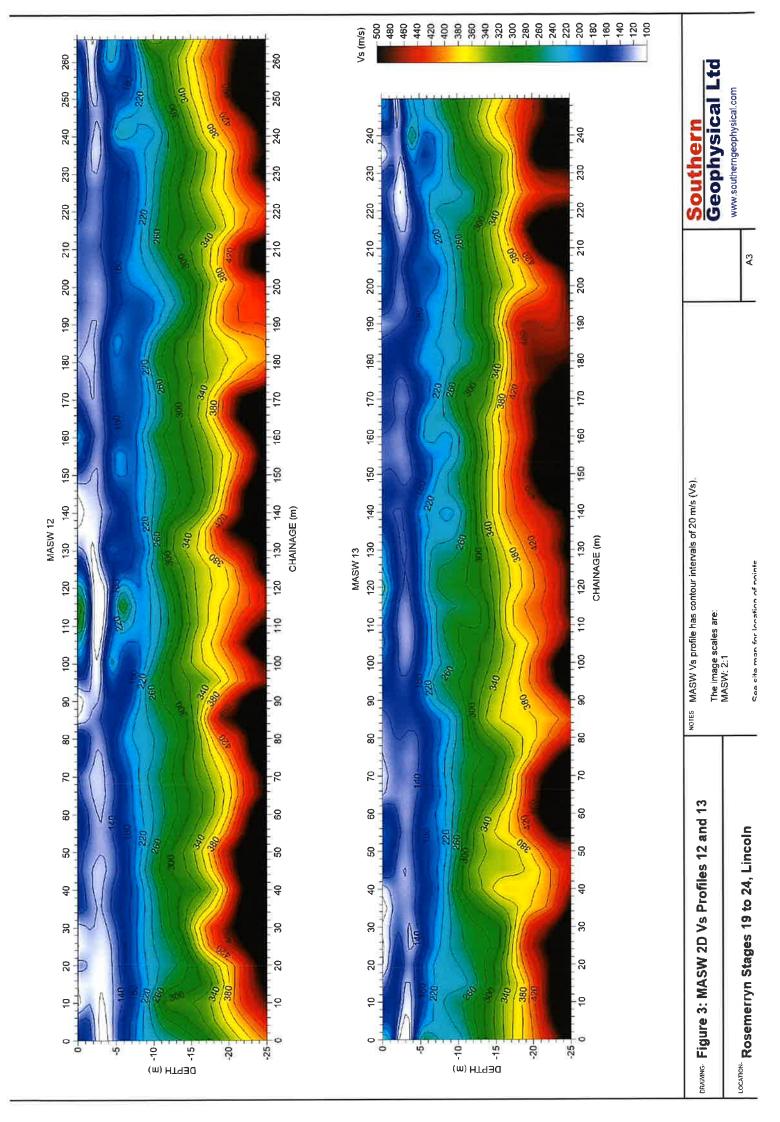
Non-invasive geophysical testing has limitations and is not a complete source of testing. Often there is a need to couple non-invasive methods with invasive testing methods, such as drilling, especially in cases where the non-invasive testing indicates anomalies.

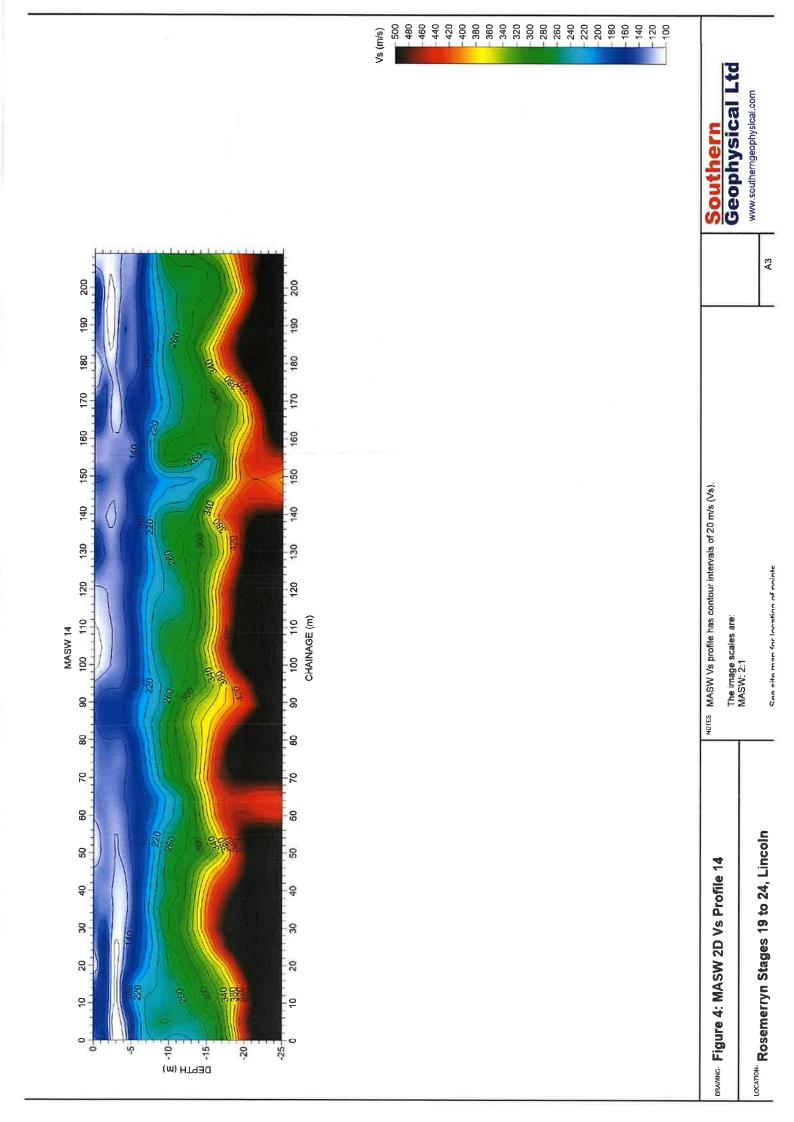
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We collected our data and based our report on information which was collected at a specific point in time. The passage of time affects the information and assessment provided by Southern Geophysical Ltd. It is understood that the services provided allowed Southern Geophysical Ltd to form no more than an opinion of the actual conditions of the site at the time the site was visited and cannot be used to assess the effect of any subsequent changes for whatever reason. Where data is supplied by the client or other sources, including where previous site investigation data have been used, it has been assumed that the information is correct. No responsibility is accepted by Southern Geophysical Ltd for incomplete or inaccurate data supplied by others. This document is provided for sole use by the client and is confidential to that client and its professional advisers. No responsibility whatsoever for the contents of this document will be accepted to any person other than the client. Any use which a third party makes of this document, or any reliance on or decisions to be made based on it, is the responsibility of such third parties. Southern Geophysical Ltd accepts no responsibility for damages, if any, suffered by any third party as a result of decisions made or actions based on this document.









Liquefaction Results

|   |  |  |   |  | Liqueffable Layons           15         2.0           15         2.0           15         2.0           15         2.0           15         2.0           15         2.0           16         2.0           17         2.0           18         2.0           19         2.0           10         2.0           11         2.0           11         2.0           11         2.0           11         2.0           11         2.0           12         2.0           13         2.0           14         2.0           15         2.0           16         2.0           17         2.0           18         2.0           19         2.0           10         2.0           11         2.0           12         2.0           13         2.0           14         2.0           15         2.0           16.0         2.0           17         2.0           18         2.0 <tr< th=""><th>Leadeninghie Layons IN<br/>1.5<br/>1.5<br/>1.5<br/>1.5<br/>1.5<br/>1.5<br/>1.5<br/>1.5</th><th>Liqueffable Layors         Inhihun           1.5         2.3         Yes           1.5         2.4         Yes           1.5         3.4         Yes           1.5         3.4         Yes           1.5         3.4         Yes           1.5         4.2         Yes           1.6         4.2         Yes           1.1         3.2         Yes           1.1         3.2         Yes           1.1         3.3         Yes           1.1         3.3         Yes           1.1         3.3         Yes           1.3         3.4         Yes           1.4         2.5         Mo           1.5         1.4         Mo           1.4         2.4         Mo           1.5         1.4         Mo           1.4         5.2         Yes           1.4         5.2         Yes           1.5         Yes         Yes           1.6         4.4         5.7           1.7         5.4         Yes           1.7         5.4         Yes</th><th>Liquerable Layour         Philhan           1.5         2.9         Yet           1.5         2.9         Yet           3.5         2.9         Yet           1.5         3.4         Yet           1.5         3.4         Yet           1.5         3.4         Yet           1.5         3.4         Yet           1.6         3.2         Yet           1.6         3.2         Yet           1.6         3.3         Yet           1.6         3.3         Yet           1.7         3.3         Yet           1.8         3.3         Yet           1.1         3.3         Yet           1.6         7.3         No           1.7         3.3         Yet           1.6         5.3         Yet           1.7         3.4         Yet           1.8         5.4         Yet           1.9         5.4         Yet           1.1         3.1         Yet           1.1         3.1         Yet           1.1         3.1         Yet           1.1         3.1         Yet     </th></tr<> <th>Liquerfache Layour         Inhihun           1.5         2.3         Yet           1.5         2.4         Yet           3.5         3.4         Yet           1.5         3.4         Yet           1.5         3.4         Yet           1.5         3.4         Yet           1.6         3         Yet           5.6         4.2         Yet           5.1         3.5         Yet           1.6         4.2         Yet           3.1         3.5         Yet           1.4         3.5         Yet           1.5         3.4         Yet           1.4         3.5         Yet           1.5         3.4         Yet           1.6         4.3         Yet           1.5         3.4         Yet           1.5         4.4         2.7           1.4         5.2         Yet           1.5         4.4         Yet           1.5         7.4         Yet           1.5         7.4         Yet           1.5         7.4         Yet           1.6         4.4         Yet     <th>Liquerable Layour         Indimination         Liquerable Layour         Individuality           1.5         2.29         Yetu         Yetu           1.5         2.49         Yetu         Yetu           3.5         2.49         Yetu         Yetu           1.5         3.41         Yetu         Yetu           1.5         3.41         Yetu         Yetu           1.6         3.21         Yetu         Yetu           1.6         3.2         Yetu         Yetu           1.6         3.2         Yetu         Yetu           1.6         3.2         Yetu         Yetu           1.6         3.2         Yetu         Yetu           1.6         5.2         Yetu         Yetu           1.6         5.2         Yetu         Yetu           1.7         3.14         Yetu         Yetu           1.7         3.1         Yetu         Yetu           1.1         3.1         Yetu         Yetu           1.1         3.1         Yetu         Yetu           1.1         3.1         Yetu         Yetu           1.7         4.4         Yetu         Yetu     <th>Liquuritable Layons         2.9           3.5         2.8           3.5         2.8           3.5         2.8           3.5         2.8           3.5         3.4           1.5         3.4           1.5         3.4           1.5         3.4           1.5         3.5           5.7         3.5           1.6         5.6           3.1         3.5           1.5         3.5           1.5         3.5           1.6         2.6           1.1         3.5           1.3         3.5           1.4         3.5           1.5         1.4           1.5         1.4           1.5         1.4           1.5         1.4           1.5         5.7           1.5         5.7           1.7         5.7           1.7         5.7           1.7         5.7           1.7         5.7           1.7         5.7           1.7         5.7           1.7         5.7           1.7         5.7</th><th>Liquidiable Layons<br/>Liquidiable Layons<br/>3.5<br/>3.5<br/>3.5<br/>3.5<br/>3.5<br/>3.5<br/>3.5<br/>3.5</th><th>Liquertable Ligner         Ligner           15         2.0           15         2.0           15         3.1           15         3.1           15         3.1           15         3.1           15         3.1           15         3.1           15         3.1           15         5.0           16         5.2           21         3.3           15         3.2           16         2.4           17         3.3           18         3.2           19         2.4           13         2.4           14         2.4           15         1.1           16         5.6           17         5.1           18         4.4           19         5.1           10         6.1           11         7.1           12         1.1           13         1.1           14         2.1           15         1.1           16         6.1           17         1.1           18         1.1&lt;</th><th>Liquerfable Layors<br/>15 2.0<br/>15 2.0<br/>16 2.0<br/>17 2.0<br/>18 2.0<br/>18</th><th>Liquentable Layons           15         2.0           15         2.0           15         3.4           15         3.4           15         3.4           15         5.7           16         3.4           17         3.5           16         5.7           17         3.5           18         5.6           19         5.6           14         5.6           15         3.3           16         1.3           17         1.3           18         A.4           19         2.4           11         2.4           12         3.4           13         2.4           14         2.4           15         4.4           15         6.4           15         6.4           15         6.4           15         6.4           15         6.4           15         5.2           16         6.4           17         6.4           18         6.4           19  
      7.5      1</th><th>Liquerfable Layors<br/>15 20<br/>15 20<br/>16 20<br/>10 20<br/>10</th><th>Liquer         Liquer         Final           1.5         2.0         Yet           1.5         2.4         Yet           1.5         3.4         Yet           1.5         3.4         Yet           1.5         3.4         Yet           1.5         3.4         Yet           1.5         3.7         Yet           1.5         3.7         Yet           1.5         3.7         Yet           1.5         3.7         Yet           2.7         9.6         Yet           2.7         1.3.7         Yet           2.8         2.9         Yet           2.1         3.7         Yet           3.4         2.2         Yet           3.4         2.4         Yet           1.6         2.2         Yet           1.7         3.7         Yet           1.8         3.4         Yet           1.9         4.4         2.7           1.1         1.1         Yet           1.1         1.1         Yet           1.1         2.3         Yet           1.1         2.3         Yet</th><th>Liguerable Layors         Indimination         Layors         Individuality           1.5         2.3         Yet         Yet           1.5         3.1         Yet         Yet           1.5         3.1         Yet         Yet           1.5         3.1         Yet         Yet           1.6         4.2         Yet         Yet           1.1         3.2.5         Yet         Yet           2.1         3.3         Yet         Yet           2.1         3.3         Yet         Yet           3.1         3.2         Yet         Yet           3.1         3.2         Yet         Yet           1.3         3.2         Yet         Yet           1.4         5.2         Yet         Yet           1.5         Yet         Yet         Yet           1.4         5.2         Yet         Yet           1.5         4.4         5.2         Yet           1.6         4.4         7.4         Yet           1.6         4.4         7.4         Yet           1.6         4.4         7.4         Yet           1.6         4.4<th>Liquer         Liquer         Figure         Point           1.5         2.0         Yes           1.5         2.0         Yes           1.5         3.4         Yes           1.5         3.4         Yes           1.5         5.2         Yes           1.5         5.2         Yes           1.5         3         Yes           1.5         3         Yes           1.5         3.5         Yes           1.5         3.5         Yes           1.5         3.5         Yes           1.5         3.5         Yes           1.6         2.5         Yes           1.7         3.1         Yes           1.8         3.5         Yes           1.6         4.4         2.6           1.7         3.1         Yes           1.8         4.5         Yes           1.9         5.6         Yes           1.1         1.1         Yes           1.1         2.1         Yes           1.1         2.1         Yes           1.1         2.1         Yes           1.1         3.7<th>Liguaritable Layons         Muthane         Layons         <thlayons< th=""></thlayons<></th><th>IQuarinative Layons         Software to<br/>115         Software to<br/>213         Software to 213         Softwa</th><th>Lignamethe Layors         Mutual Softment S</th><th>Liguentable Layons         Mutual Layons         Mut</th><th>Upperference         Lignament Settement Set</th><th>Liguardiable Layors         Milliament<br/>Milliament         Settlement<br/>(milliament<br/>3.5         Settlement<br/>2.8         Settlement<br/>(milliament<br/>3.5         Settlement<br/>3.5         Settlement 3.5         Set</th><th>Upperferable Layorer<br/>15         Annual<br/>22         Settement<br/>22         Sette</th><th>Upundration         Lipundration         Lipundratin         <thlipundration< th=""> <thlipundration< th="" thl<=""></thlipundration<></thlipundration<></th></th></th></th></th> | Leadeninghie Layons IN<br>1.5<br>1.5<br>1.5<br>1.5<br>1.5<br>1.5<br>1.5<br>1.5  | Liqueffable Layors         Inhihun           1.5         2.3         Yes           1.5         2.4         Yes           1.5         3.4         Yes           1.5         3.4         Yes           1.5         3.4         Yes           1.5         4.2         Yes           1.6         4.2         Yes           1.1         3.2         Yes           1.1         3.2         Yes           1.1         3.3         Yes           1.1         3.3         Yes           1.1         3.3         Yes           1.3         3.4         Yes           1.4         2.5         Mo           1.5         1.4         Mo           1.4         2.4         Mo           1.5         1.4         Mo           1.4         5.2         Yes           1.4         5.2         Yes           1.5         Yes         Yes           1.6         4.4         5.7           1.7         5.4         Yes           1.7         5.4         Yes   | Liquerable Layour         Philhan           1.5         2.9         Yet           1.5         2.9         Yet           3.5         2.9         Yet           1.5         3.4         Yet           1.5         3.4         Yet           1.5         3.4         Yet           1.5         3.4         Yet           1.6         3.2         Yet           1.6         3.2         Yet           1.6         3.3         Yet           1.6         3.3         Yet           1.7         3.3         Yet           1.8         3.3         Yet           1.1         3.3         Yet           1.6         7.3         No           1.7         3.3         Yet           1.6         5.3         Yet           1.7         3.4         Yet           1.8         5.4         Yet           1.9         5.4         Yet           1.1         3.1         Yet           1.1         3.1         Yet           1.1         3.1         Yet           1.1         3.1         Yet  
   | Liquerfache Layour         Inhihun           1.5         2.3         Yet           1.5         2.4         Yet           3.5         3.4         Yet           1.5         3.4         Yet           1.5         3.4         Yet           1.5         3.4         Yet           1.6         3         Yet           5.6         4.2         Yet           5.1         3.5         Yet           1.6         4.2         Yet           3.1         3.5         Yet           1.4         3.5         Yet           1.5         3.4         Yet           1.4         3.5         Yet           1.5         3.4         Yet           1.6         4.3         Yet           1.5         3.4         Yet           1.5         4.4         2.7           1.4         5.2         Yet           1.5         4.4         Yet           1.5         7.4         Yet           1.5         7.4         Yet           1.5         7.4         Yet           1.6         4.4         Yet <th>Liquerable Layour         Indimination         Liquerable Layour         Individuality           1.5         2.29         Yetu         Yetu           1.5         2.49         Yetu         Yetu           3.5         2.49         Yetu         Yetu           1.5         3.41         Yetu         Yetu           1.5         3.41         Yetu         Yetu           1.6         3.21         Yetu         Yetu           1.6         3.2         Yetu         Yetu           1.6         3.2         Yetu         Yetu           1.6         3.2         Yetu         Yetu           1.6         3.2         Yetu         Yetu           1.6         5.2         Yetu         Yetu           1.6         5.2         Yetu         Yetu           1.7         3.14         Yetu         Yetu           1.7         3.1         Yetu         Yetu           1.1         3.1         Yetu         Yetu           1.1         3.1         Yetu         Yetu           1.1         3.1         Yetu         Yetu           1.7         4.4         Yetu         Yetu     <th>Liquuritable Layons         2.9           3.5         2.8           3.5         2.8           3.5         2.8           3.5         2.8           3.5         3.4           1.5         3.4           1.5         3.4           1.5         3.4           1.5         3.5           5.7         3.5           1.6         5.6           3.1         3.5           1.5         3.5           1.5         3.5           1.6         2.6           1.1         3.5           1.3         3.5           1.4         3.5           1.5         1.4           1.5         1.4           1.5         1.4           1.5         1.4           1.5         5.7           1.5         5.7           1.7         5.7           1.7         5.7           1.7         5.7           1.7         5.7           1.7         5.7           1.7         5.7           1.7         5.7           1.7         5.7</th><th>Liquidiable Layons<br/>Liquidiable Layons<br/>3.5<br/>3.5<br/>3.5<br/>3.5<br/>3.5<br/>3.5<br/>3.5<br/>3.5</th><th>Liquertable Ligner         Ligner           15         2.0           15         2.0           15         3.1           15         3.1           15         3.1           15         3.1           15         3.1           15         3.1           15         3.1           15         5.0           16         5.2           21         3.3           15         3.2           16         2.4           17         3.3           18         3.2           19         2.4           13         2.4           14         2.4           15         1.1           16         5.6           17         5.1           18         4.4           19         5.1           10         6.1           11         7.1           12         1.1           13         1.1           14         2.1           15         1.1           16         6.1           17         1.1           18         1.1&lt;</th><th>Liquerfable Layors<br/>15 2.0<br/>15 2.0<br/>16 2.0<br/>17 2.0<br/>18 2.0<br/>18</th><th>Liquentable Layons           15         2.0           15         2.0           15         3.4           15         3.4           15         3.4           15         5.7           16         3.4           17         3.5           16         5.7           17         3.5           18         5.6           19         5.6           14         5.6           15         3.3           16         1.3           17         1.3           18         A.4           19         2.4           11         2.4           12         3.4           13         2.4           14         2.4           15         4.4           15         6.4           15         6.4           15         6.4           15         6.4           15         6.4           15         5.2           16         6.4           17         6.4           18         6.4           19         7.5      1</th><th>Liquerfable Layors<br/>15 20<br/>15 20<br/>16 20<br/>10 20<br/>10</th><th>Liquer         Liquer         Final           1.5         2.0         Yet           1.5         2.4         Yet           1.5         3.4         Yet           1.5         3.4         Yet           1.5         3.4         Yet           1.5         3.4         Yet           1.5         3.7         Yet           1.5         3.7         Yet           1.5         3.7         Yet           1.5         3.7         Yet           2.7         9.6         Yet           2.7         1.3.7         Yet           2.8         2.9         Yet           2.1         3.7         Yet           3.4         2.2         Yet           3.4         2.4         Yet           1.6         2.2         Yet           1.7         3.7         Yet           1.8         3.4         Yet           1.9         4.4         2.7           1.1         1.1         Yet           1.1         1.1         Yet           1.1         2.3         Yet           1.1         2.3         Yet</th><th>Liguerable Layors         Indimination         Layors         Individuality           1.5         2.3         Yet         Yet           1.5         3.1         Yet         Yet           1.5         3.1         Yet         Yet           1.5         3.1         Yet         Yet           1.6         4.2         Yet         Yet           1.1         3.2.5         Yet         Yet           2.1         3.3         Yet         Yet           2.1         3.3         Yet         Yet           3.1         3.2         Yet         Yet           3.1         3.2         Yet         Yet           1.3         3.2         Yet         Yet           1.4         5.2         Yet         Yet           1.5         Yet         Yet         Yet           1.4         5.2         Yet         Yet           1.5         4.4         5.2         Yet           1.6         4.4         7.4         Yet           1.6         4.4         7.4         Yet           1.6         4.4         7.4         Yet           1.6         4.4<th>Liquer         Liquer         Figure         Point           1.5         2.0         Yes           1.5         2.0         Yes           1.5         3.4         Yes           1.5         3.4         Yes           1.5         5.2         Yes           1.5         5.2         Yes           1.5         3         Yes           1.5         3         Yes           1.5         3.5         Yes           1.5         3.5         Yes           1.5         3.5         Yes           1.5         3.5         Yes           1.6         2.5         Yes           1.7         3.1         Yes           1.8         3.5         Yes           1.6         4.4         2.6           1.7         3.1         Yes           1.8         4.5         Yes           1.9         5.6         Yes           1.1         1.1         Yes           1.1         2.1         Yes           1.1         2.1         Yes           1.1         2.1         Yes           1.1         3.7<th>Liguaritable Layons         Muthane         Layons         <thlayons< th=""></thlayons<></th><th>IQuarinative Layons         Software to<br/>115         Software to<br/>213         Software to 213         Softwa</th><th>Lignamethe Layors         Mutual Softment S</th><th>Liguentable Layons         Mutual Layons         Mut</th><th>Upperference         Lignament Settement Set</th><th>Liguardiable Layors         Milliament<br/>Milliament         Settlement<br/>(milliament<br/>3.5         Settlement<br/>2.8         Settlement<br/>(milliament<br/>3.5         Settlement<br/>3.5         Settlement 3.5         Set</th><th>Upperferable Layorer<br/>15         Annual<br/>22         Settement<br/>22         Sette</th><th>Upundration         Lipundration         Lipundratin         <thlipundration< th=""> <thlipundration< th="" thl<=""></thlipundration<></thlipundration<></th></th></th></th> | Liquerable Layour         Indimination         Liquerable Layour         Individuality           1.5         2.29         Yetu         Yetu           1.5         2.49         Yetu         Yetu           3.5         2.49         Yetu         Yetu           1.5         3.41         Yetu         Yetu           1.5         3.41         Yetu         Yetu           1.6         3.21         Yetu         Yetu           1.6         3.2         Yetu         Yetu           1.6         3.2         Yetu         Yetu  
        1.6         3.2         Yetu         Yetu           1.6         3.2         Yetu         Yetu           1.6         5.2         Yetu         Yetu           1.6         5.2         Yetu         Yetu           1.7         3.14         Yetu         Yetu           1.7         3.1         Yetu         Yetu           1.1         3.1         Yetu         Yetu           1.1         3.1         Yetu         Yetu           1.1         3.1         Yetu         Yetu           1.7         4.4         Yetu         Yetu <th>Liquuritable Layons         2.9           3.5         2.8           3.5         2.8           3.5         2.8           3.5         2.8           3.5         3.4           1.5         3.4           1.5         3.4           1.5         3.4           1.5         3.5           5.7         3.5           1.6         5.6           3.1         3.5           1.5         3.5           1.5         3.5           1.6         2.6           1.1         3.5           1.3         3.5           1.4         3.5           1.5         1.4           1.5         1.4           1.5         1.4           1.5         1.4           1.5         5.7           1.5         5.7           1.7         5.7           1.7         5.7           1.7         5.7           1.7         5.7           1.7         5.7           1.7         5.7           1.7         5.7           1.7         5.7</th> <th>Liquidiable Layons<br/>Liquidiable Layons<br/>3.5<br/>3.5<br/>3.5<br/>3.5<br/>3.5<br/>3.5<br/>3.5<br/>3.5</th> <th>Liquertable Ligner         Ligner           15         2.0           15         2.0           15         3.1           15         3.1           15         3.1           15         3.1           15         3.1           15         3.1           15         3.1           15         5.0           16         5.2           21         3.3           15         3.2           16         2.4           17         3.3           18         3.2           19         2.4           13         2.4           14         2.4           15         1.1           16         5.6           17         5.1           18         4.4           19         5.1           10         6.1           11         7.1           12         1.1           13         1.1           14         2.1           15         1.1           16         6.1           17         1.1           18         1.1&lt;</th> <th>Liquerfable Layors<br/>15 2.0<br/>15 2.0<br/>16 2.0<br/>17 2.0<br/>18 2.0<br/>18</th> <th>Liquentable Layons           15         2.0           15         2.0           15         3.4           15         3.4           15         3.4           15         5.7           16         3.4           17         3.5           16         5.7           17         3.5           18         5.6           19         5.6           14         5.6           15         3.3           16         1.3           17         1.3           18         A.4           19         2.4           11         2.4           12         3.4           13         2.4           14         2.4           15         4.4           15         6.4           15         6.4           15         6.4           15         6.4           15         6.4           15         5.2           16         6.4           17         6.4           18         6.4           19         7.5      1</th> <th>Liquerfable Layors<br/>15 20<br/>15 20<br/>16 20<br/>10 20<br/>10</th> <th>Liquer         Liquer         Final           1.5         2.0         Yet           1.5         2.4         Yet           1.5         3.4         Yet           1.5         3.4         Yet           1.5         3.4         Yet           1.5         3.4         Yet           1.5         3.7         Yet           1.5         3.7         Yet           1.5         3.7         Yet           1.5         3.7         Yet           2.7         9.6         Yet           2.7         1.3.7         Yet           2.8         2.9         Yet           2.1         3.7         Yet           3.4         2.2         Yet           3.4         2.4         Yet           1.6         2.2         Yet           1.7         3.7         Yet           1.8         3.4         Yet           1.9         4.4         2.7           1.1         1.1         Yet           1.1         1.1         Yet           1.1         2.3         Yet           1.1         2.3         Yet</th> <th>Liguerable Layors         Indimination         Layors         Individuality           1.5         2.3         Yet         Yet           1.5         3.1         Yet         Yet           1.5         3.1         Yet         Yet           1.5         3.1         Yet         Yet           1.6         4.2         Yet         Yet           1.1         3.2.5         Yet         Yet           2.1         3.3         Yet         Yet           2.1         3.3         Yet         Yet           3.1         3.2         Yet         Yet           3.1         3.2         Yet         Yet           1.3         3.2         Yet         Yet           1.4         5.2         Yet         Yet           1.5         Yet         Yet         Yet           1.4         5.2         Yet         Yet           1.5         4.4         5.2         Yet           1.6         4.4         7.4         Yet           1.6         4.4         7.4         Yet           1.6         4.4         7.4         Yet           1.6         4.4<th>Liquer         Liquer         Figure         Point           1.5         2.0         Yes           1.5         2.0         Yes           1.5         3.4         Yes           1.5         3.4         Yes           1.5         5.2         Yes           1.5         5.2         Yes           1.5         3         Yes           1.5         3         Yes           1.5         3.5         Yes           1.5         3.5         Yes           1.5         3.5         Yes           1.5         3.5         Yes           1.6         2.5         Yes           1.7         3.1         Yes           1.8         3.5         Yes           1.6         4.4         2.6           1.7         3.1         Yes           1.8         4.5         Yes           1.9         5.6         Yes           1.1         1.1         Yes           1.1         2.1         Yes           1.1         2.1         Yes           1.1         2.1         Yes           1.1         3.7<th>Liguaritable Layons         Muthane         Layons         <thlayons< th=""></thlayons<></th><th>IQuarinative Layons         Software to<br/>115         Software to<br/>213         Software to 213         Softwa</th><th>Lignamethe Layors         Mutual Softment S</th><th>Liguentable Layons         Mutual Layons         Mut</th><th>Upperference         Lignament Settement Set</th><th>Liguardiable Layors         Milliament<br/>Milliament         Settlement<br/>(milliament<br/>3.5         Settlement<br/>2.8         Settlement<br/>(milliament<br/>3.5         Settlement<br/>3.5         Settlement 3.5         Set</th><th>Upperferable Layorer<br/>15         Annual<br/>22         Settement<br/>22         Sette</th><th>Upundration         Lipundration         Lipundratin         <thlipundration< th=""> <thlipundration< th="" thl<=""></thlipundration<></thlipundration<></th></th></th> | Liquuritable Layons         2.9           3.5         2.8           3.5         2.8           3.5         2.8           3.5         2.8           3.5         3.4           1.5         3.4           1.5         3.4           1.5         3.4           1.5         3.5           5.7         3.5           1.6         5.6           3.1         3.5           1.5         3.5           1.5         3.5           1.6         2.6           1.1         3.5           1.3         3.5           1.4         3.5           1.5         1.4           1.5         1.4           1.5         1.4           1.5         1.4           1.5         5.7           1.5         5.7           1.7         5.7           1.7         5.7           1.7         5.7           1.7         5.7           1.7         5.7           1.7         5.7           1.7         5.7           1.7         5.7  | Liquidiable Layons<br>Liquidiable
Layons<br>3.5<br>3.5<br>3.5<br>3.5<br>3.5<br>3.5<br>3.5<br>3.5   | Liquertable Ligner         Ligner           15         2.0           15         2.0           15         3.1           15         3.1           15         3.1           15         3.1           15         3.1           15         3.1           15         3.1           15         5.0           16         5.2           21         3.3           15         3.2           16         2.4           17         3.3           18         3.2           19         2.4           13         2.4           14         2.4           15         1.1           16         5.6           17         5.1           18         4.4           19         5.1           10         6.1           11         7.1           12         1.1           13         1.1           14         2.1           15         1.1           16         6.1           17         1.1           18         1.1<   
  | Liquerfable Layors<br>15 2.0<br>15 2.0<br>16 2.0<br>17 2.0<br>18   
  | Liquentable Layons           15         2.0           15         2.0           15         3.4           15         3.4           15         3.4           15         5.7           16         3.4           17         3.5           16         5.7           17         3.5           18         5.6           19         5.6           14         5.6           15         3.3           16         1.3           17         1.3           18         A.4           19         2.4           11         2.4           12         3.4           13         2.4           14         2.4           15         4.4           15         6.4           15         6.4           15         6.4           15         6.4           15         6.4           15         5.2           16         6.4           17         6.4           18         6.4           19         7.5      1   
  | Liquerfable Layors<br>15 20<br>15 20<br>16 20<br>10 | Liquer         Liquer         Final           1.5         2.0         Yet           1.5         2.4         Yet           1.5         3.4         Yet           1.5         3.4         Yet           1.5         3.4         Yet           1.5         3.4         Yet           1.5         3.7         Yet           1.5         3.7         Yet           1.5         3.7         Yet           1.5         3.7         Yet           2.7         9.6         Yet           2.7         1.3.7         Yet           2.8         2.9         Yet           2.1         3.7         Yet           3.4         2.2         Yet           3.4         2.4         Yet           1.6         2.2         Yet           1.7         3.7         Yet           1.8         3.4         Yet           1.9         4.4         2.7           1.1         1.1         Yet           1.1         1.1         Yet           1.1         2.3         Yet           1.1         2.3         Yet  | Liguerable Layors         Indimination         Layors         Individuality           1.5         2.3         Yet         Yet           1.5         3.1         Yet         Yet           1.5         3.1         Yet         Yet           1.5         3.1         Yet         Yet           1.6         4.2         Yet         Yet           1.1         3.2.5         Yet         Yet           2.1         3.3         Yet         Yet           2.1         3.3         Yet         Yet           3.1         3.2         Yet         Yet           3.1         3.2         Yet         Yet           1.3         3.2         Yet         Yet           1.4         5.2         Yet         Yet           1.5         Yet         Yet         Yet     
     1.4         5.2         Yet         Yet           1.5         4.4         5.2         Yet           1.6         4.4         7.4         Yet           1.6         4.4         7.4         Yet           1.6         4.4         7.4         Yet           1.6         4.4 <th>Liquer         Liquer         Figure         Point           1.5         2.0         Yes           1.5         2.0         Yes           1.5         3.4         Yes           1.5         3.4         Yes           1.5         5.2         Yes           1.5         5.2         Yes           1.5         3         Yes           1.5         3         Yes           1.5         3.5         Yes           1.5         3.5         Yes           1.5         3.5         Yes           1.5         3.5         Yes           1.6         2.5         Yes           1.7         3.1         Yes           1.8         3.5         Yes           1.6         4.4         2.6           1.7         3.1         Yes           1.8         4.5         Yes           1.9         5.6         Yes           1.1         1.1         Yes           1.1         2.1         Yes           1.1         2.1         Yes           1.1         2.1         Yes           1.1         3.7<th>Liguaritable Layons         Muthane         Layons         <thlayons< th=""></thlayons<></th><th>IQuarinative Layons         Software to<br/>115         Software to<br/>213         Software to 213         Softwa</th><th>Lignamethe Layors         Mutual Softment S</th><th>Liguentable Layons         Mutual Layons         Mut</th><th>Upperference         Lignament Settement Set</th><th>Liguardiable Layors         Milliament<br/>Milliament         Settlement<br/>(milliament<br/>3.5         Settlement<br/>2.8         Settlement<br/>(milliament<br/>3.5         Settlement<br/>3.5         Settlement 3.5         Set</th><th>Upperferable Layorer<br/>15         Annual<br/>22         Settement<br/>22         Sette</th><th>Upundration         Lipundration         Lipundratin         <thlipundration< th=""> <thlipundration< th="" thl<=""></thlipundration<></thlipundration<></th></th> | Liquer         Liquer         Figure         Point           1.5         2.0         Yes           1.5         2.0         Yes           1.5         3.4         Yes           1.5         3.4         Yes           1.5         5.2         Yes           1.5         5.2         Yes           1.5         3         Yes           1.5         3         Yes           1.5         3.5         Yes           1.5         3.5         Yes           1.5         3.5         Yes           1.5         3.5         Yes           1.6         2.5         Yes           1.7         3.1         Yes           1.8         3.5         Yes           1.6         4.4         2.6           1.7         3.1         Yes           1.8         4.5         Yes           1.9         5.6         Yes           1.1         1.1         Yes           1.1         2.1         Yes           1.1         2.1         Yes           1.1         2.1         Yes           1.1         3.7 <th>Liguaritable Layons         Muthane         Layons         <thlayons< th=""></thlayons<></th> <th>IQuarinative Layons         Software to<br/>115         Software to<br/>213         Software to 213         Softwa</th> <th>Lignamethe Layors         Mutual Softment S</th> <th>Liguentable Layons         Mutual Layons         Mut</th> <th>Upperference         Lignament Settement Set</th> <th>Liguardiable Layors         Milliament<br/>Milliament         Settlement<br/>(milliament<br/>3.5         Settlement<br/>2.8         Settlement<br/>(milliament<br/>3.5         Settlement<br/>3.5         Settlement 3.5         Set</th> <th>Upperferable Layorer<br/>15         Annual<br/>22         Settement<br/>22         Sette</th> <th>Upundration         Lipundration         Lipundratin         <thlipundration< th=""> <thlipundration< th="" thl<=""></thlipundration<></thlipundration<></th> | Liguaritable Layons         Muthane         Layons         Layons <thlayons< th=""></thlayons<>  
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27         5.1         13           27         5.1         13           2         1.3         5.5           2         1.3         5.5           3         1.4         5.7           3         1.4         5.7           3         1.4         5.7           3         1.4         5.4           5         5.4         5.4           5         5.4         5.4           5         5.4         5.4           5         5.4         5.4           5         5.4         5.4           5         5.4         5.4           5         5.4         5.4           5 | 23 115 24<br>24 13 24<br>24 13 24<br>24 15 25<br>25 25<br>25 25<br>25 25<br>25 25<br>25 25<br>25 25<br>25 25<br>25 25<br>26 25<br>27 25<br>28 25<br>29 25<br>20  | 23         15         2.8         Yes           24         1.5         5.4         Yes           26         1.5         3.4         Yes           27         1.6         3.7         Yes           27         1.6         3.7         Yes           27         1.6         3.7         Yes           28         1.6         3.7         Yes           29         1.6         3.7         Yes           21         1.6         1.9         Yes           27         1.6         1.9         Yes           28         1.4         5.6         Yes           29         1.4         5.6         Yes           29         1.4         5.6         Yes           31         1.6         3.1         Yes           32         1.4         5.6         Yes           33         1.4         5.2         Yes           35         1.6         5.7         Yes           36         1.4         5.7         Yes           36         1.4         5.7         Yes           36         1.4         5.7         Yes      <   | 23         15         2.0         Yea           241         1.9         3.4         Yea           241         1.9         3.4         Yea           11         1.5         3.7         Yea           12         1.9         3.7         Yea           13         1.6         3.7         Yea           14         1.6         3.7         Yea           15         1.7         6.4         Yea           16         1.1         3.3         Yea           16         1.1         3.3         Yea           16         1.1         3.3         Yea           16         1.1         3.3         Yea           17         1.1         3.3         Yea           16         1.1         3.1         Wea           17         1.4         5.2         Yea           17         1.4         5.2         Yea           17         1.4         5.2         Yea           18         1.4         5.2         Yea           19         1.4         5.2         Yea           10         1.4         5.2         Yea  
   
   
  | 20         1.5         5.4           20         3.5         5.4           20         1.5         5.4           20         1.5         5.4           20         1.5         5.4           21         1.5         5.4           21         1.5         5.4           21         1.5         5.7           21         1.5         5.4           21         1.6         5.7           21         1.6         5.5           21         1.5         2.4           21         1.5         2.4           21         1.5         2.4           22         2.4         2.4           23         1.4         5.5           36         1.4         5.5           37         1.5         2.4           38         1.4         5.5           39         1.5         5.4           30         1.5         5.5           36         1.5         5.4           39         1.5         5.5           30         1.5         5.5           30         1.5         5.5 <t< th=""><th>20         115         24           201         13         24           201         13         24           201         13         24           201         13         24           201         13         24           201         13         24           201         13         24           201         14         2           201         14         2           201         14         2           201         14         2           201         14         2           201         14         2           201         14         2           201         14         2           201         14         2           201         14         2           201         14         2           201         14         2           201         15         2           201         15         2           201         15         2           201         15         2           201         15         2      201         2</th><th>23         115         2.4         2.5         2.4           241         1.3         3.4         3.4         3.4           241         1.3         3.4         3.4         3.4           21         1.3         3.4         3.4         3.4           21         1.6         3.4         3.5         3.4           21         1.6         3.4         2.6         3.4           21         1.4         3.5         2.6         3.4           21         1.3         3.4         2.6         3.4           21         1.4         3.5         3.4         3.5           21         1.3         3.4         2.6         3.4         3.5           21         1.4         3.5         3.4         3.5         3.4           21         1.4         3.5         3.4         3.5         3.4           22         3.6         4.4         5.7         3.4         3.4           23         1.6         4.4         5.7         3.4         3.4           23         1.6         4.4         5.7         3.4         3.4           24         1.6         5.4</th><th>20         115         5.4           241         1.3         3.4           241         1.3         3.4           251         1.3         3.4           251         5.7         3.4           251         5.7         5.6           251         5.7         3.4           251         1.6         5.7           251         2.1         3.3           251         2.1         3.3           26         1.4         5.7           21         3.3         3.4           21         3.3         3.4           21         3.4         2.4           21         3.4         2.4           23         3.4         2.4           24         2.4         2.4           25         3.4         2.4           26         1.7         2.4           26         1.5         2.4           26         1.5         2.4           26         1.5         2.4           27         2.4         2.4           28         1.5         2.4           29         1.5         2.4</th><th>23 115 25 28<br/>24 113 34<br/>24 115 34<br/>25 15 45<br/>25 15 45<br/>25 15 45<br/>25 15 45<br/>25 15 45<br/>25 15 15<br/>26 15 15<br/>27 15 15<br/>28 1</th><th>20         115         5.4           24         1.3         3.4           24         1.5         3.4           25         5.7         3.4           25         5.7         3.4           25         5.7         5.6           25         5.7         5.5           26         5.7         5.5           27         5.7         3.5           28         1.6         5.5           29         1.6         5.5           21         1.3         3.5           21         1.3         3.5           21         1.3         3.5           21         1.3         3.5           21         1.3         3.5           21         1.4         2.4           21         1.7         5.5           22         1.7         5.6           23         1.7         5.6           24         1.7         5.6           21         1.7         5.6           23         1.7         5.7           24         1.7         5.6           25         1.7         5.7           <t< th=""><th>20         115         5.4           241         1.3         3.4           241         1.3         3.4           251         1.5         3.4           251         1.5         3.4           251         1.5         3.4           251         1.5         3.5           251         1.5         3.5           251         1.5         3.5           251         1.5         3.5           251         1.3         3.5           251         1.3         3.5           251         1.3         3.5           251         1.3         3.5           251         1.3         3.5           251         1.3         3.5           251         1.3         3.5           251         1.3         3.5           251         1.5         1.5           251         1.5         1.5           251         1.5         1.5           251         1.5         1.5           251         1.5         1.5           251         1.5         1.5           251         1.5         1.5     &lt;</th><th>20         115         5.4           201         15         5.4           201         15         5.4           201         15         5.4           201         15         5.4           201         5.7         5.5           201         5.7         5.5           201         5.7         5.5           201         5.7         5.5           201         5.7         5.5           201         5.5         5.5           201         5.5         5.5           201         5.5         5.5           201         5.5         5.5           201         5.5         5.5           201         5.5         5.5           201         5.5         5.5           201         5.5         5.5           201         5.5         5.5           201         5.5         5.5           202         5.5         5.5           203         5.5         5.5           203         5.5         5.5           203         5.5         5.5           203         5.5         5.5</th><th>23         15         2.0         Year           241         1.5         3.4         Year           241         1.5         3.4         Year           11         1.5         3.7         Year           12         1.5         3.7         Year           13         1.5         3.7         Year           14         1.5         3.7         Year           15         1.5         4.2         Year           15         1.4         3.1         No           16         1.1         3.1         No           16         1.1         3.1         No           17         1.1         3.1         No           18         1.1         3.1         No           19         1.1         2.4         No           19         1.5         2.7         No           10         1.5         2.4         No           11         1.5         1.4         Year           12         1.4         2.4         No           13         1.4         2.4         No           14         2.3         No         No      <t< th=""><th>23         15         2.3         Yea           241         1.5         3.4         Yea           241         1.5         3.4         Yea           25         5.7         6         3         Yea           25         5.7         6         3         Yea           25         5.7         6         3         Yea           26         1.4         5.7         6         4           27         1.4         5.6         6         4           28         1.4         5.6         6         4           7         1.3         3.1         1.0         6           7         1.3         3.1         1.0         6           7         1.3         3.1         1.0         6           7         1.3         3.1         1.0         6           7         1.3         3.1         1.0         6           1.3         1.3         1.3         1.0         6           1.3         1.3         1.3         1.0         6           1.4         1.3         1.0         1.0         6           1.3         1.1</th><th><math display="block">\begin{array}{c ccccccccccccccccccccccccccccccccccc</math></th><th><math display="block">\begin{array}{c ccccccccccccccccccccccccccccccccccc</math></th><th><math display="block"> \begin{array}{c 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  | 20         115         24           201         13         24           201         13         24           201         13         24           201         13         24           201         13         24           201         13         24           201         13         24           201         14         2           201         14         2           201         14         2           201         14         2           201         14         2           201         14         2           201         14         2           201         14         2           201         14         2           201         14         2           201         14         2           201         14         2           201         15         2           201         15         2           201         15         2           201         15         2           201         15         2      201         2  | 23         115         2.4         2.5         2.4           241         1.3         3.4         3.4         3.4           241         1.3         3.4         3.4         3.4           21         1.3         3.4         3.4         3.4           21         1.6         3.4         3.5         3.4           21         1.6         3.4         2.6         3.4           21         1.4         3.5         2.6         3.4           21         1.3         3.4         2.6         3.4           21         1.4         3.5         3.4         3.5           21         1.3         3.4         2.6         3.4         3.5           21         1.4         3.5         3.4         3.5         3.4           21         1.4         3.5         3.4         3.5         3.4           22         3.6         4.4         5.7         3.4         3.4           23         1.6         4.4         5.7         3.4         3.4           23         1.6         4.4         5.7         3.4         3.4           24         1.6         5.4  | 20         115         5.4           241         1.3         3.4           241         1.3         3.4           251         1.3         3.4           251         5.7         3.4           251         5.7         5.6           251         5.7         3.4           251         1.6         5.7           251         2.1         3.3           251         2.1         3.3           26         1.4         5.7           21         3.3         3.4           21         3.3         3.4           21         3.4         2.4           21         3.4         2.4           23         3.4         2.4           24         2.4         2.4           25         3.4         2.4           26         1.7         2.4           26         1.5         2.4           26         1.5         2.4           26         1.5         2.4           27         2.4
        2.4           28         1.5         2.4           29         1.5         2.4  
   | 23 115 25 28<br>24 113 34<br>24 115 34<br>25 15 45<br>25 15 45<br>25 15 45<br>25 15 45<br>25 15 45<br>25 15 15<br>26 15 15<br>27 15 15<br>28 1  
   | 20         115         5.4           24         1.3         3.4           24         1.5         3.4           25         5.7         3.4           25         5.7         3.4           25         5.7         5.6           25         5.7         5.5           26         5.7         5.5           27         5.7         3.5           28         1.6         5.5           29         1.6         5.5           21         1.3         3.5           21         1.3         3.5           21         1.3         3.5           21         1.3         3.5           21         1.3         3.5           21         1.4         2.4           21         1.7         5.5           22         1.7         5.6           23         1.7         5.6           24         1.7         5.6           21         1.7         5.6           23         1.7         5.7           24         1.7         5.6           25         1.7         5.7 <t< th=""><th>20         115         5.4           241         1.3         3.4           241         1.3         3.4           251         1.5         3.4           251         1.5         3.4           251         1.5         3.4           251         1.5         3.5           251         1.5         3.5           251         1.5         3.5           251         1.5         3.5           251         1.3         3.5           251         1.3         3.5           251         1.3         3.5           251         1.3         3.5           251         1.3         3.5           251         1.3         3.5           251         1.3         3.5           251         1.3         3.5           251         1.5         1.5           251         1.5         1.5           251         1.5         1.5           251         1.5         1.5           251         1.5         1.5           251         1.5         1.5           251         1.5         1.5     &lt;</th><th>20         115         5.4           201         15         5.4           201         15         5.4           201         15         5.4           201         15         5.4           201         5.7         5.5           201         5.7         5.5           201         5.7         5.5           201         5.7         5.5           201         5.7         5.5           201         5.5         5.5           201         5.5         5.5           201         5.5         5.5           201         5.5         5.5           201         5.5         5.5           201         5.5         5.5           201         5.5         5.5           201         5.5         5.5           201         5.5         5.5           201         5.5         5.5           202         5.5         5.5           203         5.5         5.5           203         5.5         5.5           203         5.5         5.5           203         5.5         5.5</th><th>23         15         2.0         Year           241         1.5         3.4         Year           241         1.5         3.4         Year           11         1.5         3.7         Year           12         1.5         3.7         Year           13         1.5         3.7         Year           14         1.5         3.7         Year           15         1.5         4.2         Year           15         1.4         3.1         No           16         1.1         3.1         No           16         1.1         3.1         No           17         1.1         3.1         No           18         1.1         3.1         No           19         1.1         2.4         No           19         1.5         2.7         No           10         1.5         2.4         No           11         1.5         1.4         Year           12         1.4         2.4         No           13         1.4         2.4         No           14         2.3         No         No      <t< th=""><th>23         15         2.3         Yea           241         1.5         3.4         Yea           241         1.5         3.4         Yea           25         5.7         6         3         Yea           25         5.7         6         3         Yea           25         5.7         6         3         Yea           26         1.4         5.7         6         4           27         1.4         5.6         6         4           28         1.4         5.6         6         4           7         1.3         3.1         1.0         6           7         1.3         3.1         1.0         6           7         1.3         3.1         1.0         6           7         1.3         3.1         1.0         6           7         1.3         3.1         1.0         6           1.3         1.3         1.3         1.0         6           1.3         1.3         1.3         1.0         6           1.4         1.3         1.0         1.0         6           1.3         1.1</th><th><math display="block">\begin{array}{c ccccccccccccccccccccccccccccccccccc</math></th><th><math display="block">\begin{array}{c ccccccccccccccccccccccccccccccccccc</math></th><th><math 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   | 20         115         5.4           241         1.3         3.4           241         1.3         3.4           251         1.5         3.4           251         1.5         3.4           251         1.5         3.4           251         1.5         3.5           251         1.5         3.5           251         1.5         3.5           251         1.5         3.5           251         1.3         3.5           251         1.3         3.5           251         1.3         3.5           251         1.3         3.5           251         1.3         3.5           251         1.3         3.5           251         1.3         3.5           251         1.3         3.5           251         1.5         1.5           251         1.5         1.5           251         1.5         1.5           251         1.5         1.5           251         1.5         1.5           251         1.5         1.5           251         1.5         1.5     <  | 20         115         5.4           201         15         5.4           201         15         5.4           201         15         5.4           201         15         5.4           201         5.7         5.5           201         5.7         5.5           201         5.7         5.5           201         5.7         5.5           201         5.7         5.5           201         5.5         5.5           201         5.5         5.5           201         5.5         5.5           201         5.5         5.5           201         5.5         5.5           201         5.5         5.5           201         5.5         5.5           201         5.5         5.5           201         5.5         5.5           201         5.5         5.5           202         5.5         5.5           203         5.5         5.5           203         5.5         5.5           203         5.5         5.5           203         5.5         5.5   | 23         15         2.0         Year           241         1.5         3.4         Year           241         1.5         3.4         Year           11         1.5         3.7         Year           12         1.5         3.7         Year           13         1.5         3.7         Year           14         1.5         3.7         Year           15         1.5         4.2         Year           15         1.4         3.1         No           16         1.1         3.1         No           16         1.1         3.1         No           17         1.1         3.1         No           18         1.1         3.1         No           19         1.1         2.4         No           19         1.5         2.7         No           10         1.5         2.4         No           11         1.5         1.4         Year           12         1.4         2.4         No           13         1.4         2.4         No           14         2.3         No         No <t< th=""><th>23         15         2.3         Yea           241         1.5         3.4         Yea           241         1.5         3.4         Yea           25         5.7         6         3         Yea           25         5.7         6         3         Yea           25         5.7         6         3         Yea           26         1.4         5.7         6         4           27         1.4         5.6         6         4           28         1.4         5.6         6         4           7         1.3         3.1         1.0         6           7         1.3         3.1         1.0         6           7         1.3         3.1         1.0         6           7         1.3         3.1         1.0         6           7         1.3         3.1         1.0         6           1.3         1.3         1.3         1.0         6           1.3         1.3         1.3         1.0         6           1.4         1.3         1.0         1.0         6           1.3         1.1</th><th><math display="block">\begin{array}{c ccccccccccccccccccccccccccccccccccc</math></th><th><math display="block">\begin{array}{c ccccccccccccccccccccccccccccccccccc</math></th><th><math display="block"> \begin{array}{c ccccccccccccccccccccccccccccccccccc</math></th></t<>  
   
  | 23         15         2.3         Yea           241         1.5         3.4         Yea           241         1.5         3.4         Yea           25         5.7         6         3         Yea           25         5.7         6         3         Yea           25         5.7         6         3         Yea           26         1.4         5.7         6         4           27         1.4         5.6         6         4           28         1.4         5.6         6         4           7         1.3         3.1         1.0         6           7         1.3         3.1         1.0         6           7         1.3         3.1         1.0         6           7         1.3         3.1         1.0         6           7         1.3         3.1         1.0         6           1.3         1.3         1.3         1.0         6           1.3         1.3         1.3         1.0         6           1.4         1.3         1.0         1.0         6           1.3         1.1  
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|   |  |  |   | 20<br>10<br>10<br>10<br>10<br>10<br>10<br>10<br>10<br>10<br>1  | 135<br>135<br>157<br>157<br>157<br>157<br>157<br>157<br>157<br>157<br>157<br>15   
   
   
   | 135<br>135<br>155<br>155<br>155<br>155<br>155<br>155<br>155<br>155  | 10<br>10<br>10<br>10<br>10<br>10<br>10<br>10<br>10<br>10   | 13         54         Vet           113         3.7         Yes           115         3.7         Yes           15         3.7         Yes           15         3         Yes           15         3         Yes           15         3         Yes           15         3         Yes           14         3         Yes           15         3         He           16         3         He           16         3         He           16         3         He           16         25         Yes           17         52         Yes           18         53         He           19         52         Yes           11         3         3.4           12         53         Yes           15         53         Yes           16         52         Yes           17         52         Yes   | 1.3         5.4         Yet           1.3         3.4         Yet           1.3         3.4         Yet           1.1         3.7         Yet           1.2         3.1         Yet           1.3         2.4         3.0           1.4         3.2         Yet           1.3         2.4         3.0           1.4         3.1         Yet           1.5         9.0         Yet           1.5         9.0         Yet           1.5         9.0         Yet           1.5         9.0         Yet           1.6         9.2         Yet           1.6         9.2         Yet           1.7         9.0         Yet           1.6         9.0         Yet           1.7         9.0         Yet  
   
   
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  | 135<br>157<br>157<br>157<br>157<br>157<br>157<br>157<br>15   
  | 135<br>155<br>16<br>157<br>157<br>157<br>157<br>157<br>157<br>157<br>157   
  | 135<br>135<br>157<br>157<br>157<br>157<br>157<br>157<br>157<br>15   | 135<br>155<br>15<br>15<br>15<br>15<br>15<br>15<br>15<br>15   
   | 1.3         5.4         Yea           1.13         3.1         Yea           1.15         3.1         Yea           1.15         3.1         Yea           1.15         5.0         Yea           1.15         5.0         Yea           1.15         3.1         Yea           1.15         3.1         Yea           1.1         4.1         Yea <th>13         24         Vea           13         34         Yea           15         3         Y         Yea           15         3         Yea         Yea           15         3         Yea         Yea           15         3         Yea         Yea           15         3         Yea         Yea           15         3         14         25         Yea           15         3         14         14         Yea           16         3         14         23         Hea           16         13         Yea         Hea         Yea           16         23         14         23         Hea           16         17         23         Yea         Hea           16         17         17         Yea         Hea           16         23</th> <th>13         5.4         Yes         43           15         3.7         Yes         49           15         3.7         Yes         49           15         2.6         Yes         49           15         2.6         Yes         49           15         2.6         Yes         49           14         3.5         Yes         49           10         4.7         3.9         49           11         4.8         49         49           12         3.1         Yes         49           13         4.9         Yes         49           14         4.9         Yes         49           14         4.9         Yes         49           14         4.9         Yes         49           15         4.9         Yes         49           14         2.9         Yes         49           15<!--</th--><th>13         5.4         Yes         43           1.15         3.7         Yes         49           1.16         3.7         Yes         49           1.6         4.3         Yes         49           1.6         4.3         Yes         49           1.1         5.9         6         Yes         49           1.1         5.9         6         Yes         49           1.1         5.9         Yes         9         9           1.1         2.3         10         9         9         9           1.13         2.3         10         9         9         9           1.13         2.3         10         3         10         9         9           1.13         2.4         2.3         10         3         1<!--</th--><th>13.5         5.4         Yea         43         Yea         43         Yea         43         HA           11.5         3.7         Yea         3         Yea         43         HA           15.7         6         Yea         3         Yea         43         HA           15.7         6         Yea         43         HA         HA           15.7         6         Yea         43         HA           13.4         5.9         Yea         43         HA           14.1         3         HA         HA         HA           13.4         5.9         Yea         49         HA           14.1         3         HA         3         HA           14.1         3         HA         3         HA           14.1         3         HA         3         HA           14.1         4         3         HA         HA           14.1         HA         3         HA         HA           14.1         HA         HA         HA         HA           14.1         HA         HA         HA         HA           14.1         HA<th>13.5         5.4         Yea         14           11.5         3.7         Yea         19         145           15.6         3         Yea         19         145           15.7         6         Yea         19         145           15.7         13         14         19         145           15.7         13         14         14         145           15.3         14         13         145         145           15.3         14         23         146         145           15.3         14         23         145         145           15.3         14         15         145         145           15.3         15         145         145         145           16         1         146         145         145           16         1         145         145         145           16         1         145         145         145</th><th>13.         5.4         Yes         3.5         6.4         Yes         3.5           1.5         2.3         Yes         3.5         NA         NA         20         14           1.5         2.3         Yes         3.5         NA         16         2         2           1.5         2.5         Yes         3.5         NA         16         1         1           1.5         2.5         Yes         3.5         NA         36         14         1         1         1           1.5         2.5         Yes         3.5         NA         36         3         34         1         <t< th=""><th>13         54         Ven         43         144         26         33         3</th><th><math display="block"> \begin{array}{ c c c c c c c c c c c c c c c c c c c</math></th><th>1.3         5.4         Yea         4.1         Yea         4.1         Yea         4.1         Yea         4.1         Yea         4.1         Yea         1.1         2.1         Yea         3.1         3.1         3.1         3.1         3.1         3.1         3.1         3.1         3.1        
3.1         3.1         3.1         3.1         3.1         3.1</th></t<></th></th></th></th>   | 13         24         Vea           13         34         Yea           15         3         Y         Yea           15         3         Yea         Yea           15         3         Yea         Yea           15         3         Yea         Yea           15         3         Yea         Yea           15         3         14         25         Yea           15         3         14         14         Yea           16         3         14         23         Hea           16         13         Yea         Hea         Yea           16         23         14         23         Hea           16         17         23         Yea         Hea           16         17         17         Yea         Hea           16         23  
   | 13         5.4         Yes
        43           15         3.7         Yes         49           15         3.7         Yes         49           15         2.6         Yes         49           15         2.6         Yes         49           15         2.6         Yes         49           14         3.5         Yes         49           10         4.7         3.9         49           11         4.8         49         49           12         3.1         Yes         49           13         4.9         Yes         49           14         4.9         Yes         49           14         4.9         Yes         49           14         4.9         Yes         49           15         4.9         Yes         49           14         2.9         Yes         49           15 </th <th>13         5.4         Yes         43           1.15         3.7         Yes         49           1.16         3.7         Yes         49           1.6         4.3         Yes         49           1.6         4.3         Yes         49           1.1         5.9         6         Yes         49           1.1         5.9         6         Yes         49           1.1         5.9         Yes         9         9           1.1         2.3         10         9         9         9           1.13         2.3         10         9         9         9           1.13         2.3         10         3         10         9         9           1.13         2.4         2.3         10         3         1<!--</th--><th>13.5         5.4         Yea         43         Yea         43         Yea         43         HA           11.5         3.7         Yea         3         Yea         43         HA           15.7         6         Yea         3         Yea         43         HA           15.7         6         Yea         43         HA         HA           15.7         6         Yea         43         HA           13.4         5.9         Yea         43         HA           14.1         3         HA         HA         HA           13.4         5.9         Yea         49         HA           14.1         3         HA         3         HA           14.1         3         HA         3         HA           14.1         3         HA         3         HA           14.1         4         3         HA         HA           14.1         HA         3         HA         HA           14.1         HA         HA         HA         HA           14.1         HA         HA         HA         HA           14.1         HA<th>13.5         5.4         Yea         14           11.5         3.7         Yea         19         145           15.6         3         Yea         19         145           15.7         6         Yea         19         145           15.7         13         14         19         145           15.7         13         14         14         145           15.3         14         13         145         145           15.3         14         23         146         145           15.3         14         23         145         145           15.3         14         15         145         145           15.3         15         145         145         145           16         1         146         145         145           16         1         145         145         145           16         1         145         145         145</th><th>13.         5.4         Yes         3.5         6.4         Yes         3.5           1.5         2.3         Yes         3.5         NA         NA         20         14           1.5         2.3         Yes         3.5         NA         16         2         2           1.5         2.5         Yes         3.5         NA         16         1         1           1.5         2.5         Yes         3.5         NA         36         14         1         1         1           1.5         2.5         Yes         3.5         NA         36         3         34         1         <t< th=""><th>13         54         Ven         43         144         26         33         3</th><th><math display="block"> \begin{array}{ c c c c c c c c c c c c c c c c c c c</math></th><th>1.3         5.4         Yea         4.1         Yea         4.1         Yea         4.1         Yea         4.1         Yea         4.1         Yea         1.1         2.1         Yea         3.1         3.1         3.1         3.1         3.1         3.1         3.1         3.1         3.1         3.1         3.1         3.1         3.1         3.1         3.1</th></t<></th></th></th>  | 13         5.4         Yes         43           1.15         3.7         Yes         49           1.16         3.7         Yes         49           1.6         4.3         Yes         49           1.6         4.3         Yes         49           1.1         5.9         6         Yes         49           1.1         5.9         6         Yes         49           1.1         5.9         Yes         9         9           1.1         2.3         10         9         9         9           1.13         2.3         10         9         9         9           1.13         2.3         10         3         10         9         9           1.13         2.4         2.3         10         3         1 </th <th>13.5         5.4         Yea         43         Yea         43         Yea         43         HA           11.5         3.7         Yea         3         Yea         43         HA           15.7         6         Yea         3         Yea         43         HA           15.7         6         Yea         43         HA         HA           15.7         6         Yea         43         HA           13.4         5.9         Yea         43         HA           14.1         3         HA         HA         HA           13.4         5.9         Yea         49         HA           14.1         3         HA         3         HA           14.1         3         HA         3         HA           14.1         3         HA         3         HA           14.1         4         3         HA         HA           14.1         HA         3         HA         HA           14.1         HA         HA         HA         HA           14.1         HA         HA         HA         HA           14.1         HA<th>13.5         5.4         Yea         14           11.5         3.7         Yea         19         145           15.6         3         Yea         19         145           15.7         6         Yea         19         145           15.7         13         14         19         145           15.7         13         14         14         145           15.3         14         13         145         145           15.3         14         23         146         145           15.3         14         23         145         145           15.3         14         15         145         145           15.3         15         145         145         145           16         1         146         145         145           16         1         145         145         145           16         1         145         145         145</th><th>13.         5.4         Yes         3.5         6.4         Yes         3.5           1.5         2.3         Yes         3.5         NA         NA         20         14           1.5     
   2.3         Yes         3.5         NA         16         2         2           1.5         2.5         Yes         3.5         NA         16         1         1           1.5         2.5         Yes         3.5         NA         36         14         1         1         1           1.5         2.5         Yes         3.5         NA         36         3         34         1         <t< th=""><th>13         54         Ven         43         144         26         33         3</th><th><math display="block"> \begin{array}{ c c c c c c c c c c c c c c c c c c c</math></th><th>1.3         5.4         Yea         4.1         Yea         4.1         Yea         4.1         Yea         4.1         Yea         4.1         Yea         1.1         2.1         Yea         3.1         3.1         3.1         3.1         3.1         3.1         3.1         3.1         3.1         3.1         3.1         3.1         3.1         3.1         3.1</th></t<></th></th>  | 13.5         5.4         Yea         43         Yea         43         Yea         43         HA           11.5         3.7         Yea         3         Yea         43         HA           15.7         6         Yea         3         Yea         43         HA           15.7         6         Yea         43         HA         HA           15.7         6         Yea         43         HA           13.4         5.9         Yea         43         HA           14.1         3         HA         HA         HA           13.4         5.9         Yea         49         HA           14.1         3         HA         3         HA           14.1         3         HA         3         HA           14.1         3         HA         3         HA           14.1         4         3         HA         HA           14.1         HA         3         HA         HA           14.1         HA         HA         HA         HA           14.1         HA         HA         HA         HA           14.1         HA <th>13.5         5.4         Yea         14           11.5         3.7         Yea         19         145           15.6         3         Yea         19         145           15.7         6         Yea         19         145           15.7         13         14         19         145           15.7         13         14         14         145           15.3         14         13         145         145           15.3         14         23         146         145           15.3         14         23         145         145           15.3         14         15         145         145           15.3         15         145         145         145           16         1         146         145         145           16         1         145         145         145           16         1         145         145         145</th> <th>13.         5.4         Yes         3.5         6.4         Yes         3.5           1.5         2.3         Yes         3.5         NA         NA         20         14           1.5         2.3         Yes         3.5         NA         16         2         2           1.5         2.5         Yes         3.5         NA         16         1         1           1.5         2.5         Yes         3.5         NA         36         14         1         1         1           1.5         2.5         Yes         3.5         NA         36         3         34         1         <t< th=""><th>13         54         Ven         43         144         26         33         3</th><th><math display="block"> \begin{array}{ c c c c c c c c c c c c c c c c c c c</math></th><th>1.3         5.4         Yea         4.1         Yea         4.1         Yea         4.1         Yea         4.1         Yea         4.1         Yea         1.1         2.1         Yea         3.1         3.1         3.1         3.1         3.1         3.1         3.1         3.1         3.1         3.1         3.1         3.1         3.1         3.1         3.1</th></t<></th>  | 13.5         5.4         Yea         14           11.5         3.7         Yea         19         145           15.6         3         Yea         19         145           15.7         6         Yea         19         145           15.7         13         14         19         145           15.7         13         14         14         145           15.3         14         13         145         145           15.3         14         23         146         145           15.3         14         23         145         145           15.3         14         15         145         145           15.3         15         145         145         145           16         1         146         145         145           16         1         145         145         145           16         1         145         145         145   
   | 13.         5.4         Yes         3.5         6.4         Yes         3.5           1.5         2.3         Yes         3.5         NA         NA         20         14           1.5         2.3         Yes         3.5         NA         16         2         2           1.5         2.5         Yes         3.5         NA         16         1         1           1.5         2.5         Yes         3.5         NA         36         14         1         1         1           1.5         2.5         Yes         3.5         NA         36         3         34         1 <t< th=""><th>13         54         Ven         43         144         26         33         3</th><th><math display="block"> \begin{array}{ c c c c c c c c c c c c c c c c c c c</math></th><th>1.3         5.4         Yea         4.1         Yea         4.1         Yea         4.1         Yea         4.1         Yea         4.1         Yea         1.1         2.1         Yea         3.1         3.1         3.1         3.1         3.1         3.1         3.1         3.1         3.1         3.1         3.1         3.1         3.1         3.1         3.1</th></t<>   | 13         54         Ven         43         144         26         33         3  
   | $ \begin{array}{ c c c c c c c c c c c c c c c c c c c$  | 1.3         5.4         Yea         4.1         Yea         4.1         Yea         4.1         Yea         4.1         Yea         4.1         Yea         1.1         2.1         Yea         3.1         3.1         3.1         3.1         3.1         3.1         3.1         3.1         3.1         3.1         3.1         3.1         3.1         3.1         3.1   |
|   |  |  |   | 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1  | 19 34<br>15 34<br>15 42 34<br>15 42 34<br>15 75 55<br>14 15 28<br>14 23<br>14 23  
   
  | 11<br>11<br>11<br>11<br>11<br>11<br>11<br>11<br>11<br>11  | 13 334<br>15 334<br>16 63 33<br>16 63<br>16 63<br>16 53<br>16 53<br>16 33<br>16 33<br>16 33<br>16 33<br>16 33<br>16 43<br>16 13<br>16 13<br>16 13<br>16
13<br>17 15<br>16 13<br>16 13<br>17 15<br>16 13<br>16 13<br>17 15<br>16 13<br>17 15<br>16 13<br>17 15<br>16 13<br>17 15<br>17 15<br>1 | 1.3         3.4         Yes           1.13         3.4         Yes           1.15         3.7         Yes           1.15         3.7         Yes           1.16         3.7         Yes           1.15         3.7         Yes           1.16         3.0         Yes           1.16         3.0         Yes           1.16         3.0         Yes           1.16         3.0         Yes           1.18         3.0         Yes           1.19         3.0         Yes           1.10         2.6         Yes           1.13         3.0         Yes           1.16         3.0         Yes           1.13         3.0         Yes           1.13         3.0         Yes           1.13         3.0         Yes           1.13         3.0         Yes           1.14         3.0         Yes           1.15         3.0         Yes           1.16         3.0         Yes           1.16         3.0         Yes           1.16         3.0         Yes           1.16         3.0   | 113         3.24         Yes           113         3.7         Yes           115         3.7         Yes           115         3.7         Yes           115         4.2         Yes           115         5.0         Yes           115         5.0         Yes           115         5.0         Yes           115         5.0         Yes           115         3.0         Yes           115         5.0         Yes           115         3.0         Yes           115         3.0         Yes           116         5.2         Yes           117         5.2         Yes           118         5.2         Yes           115         5.4         Yes   
   
   | 11<br>12<br>13<br>14<br>15<br>15<br>15<br>15<br>15<br>15<br>15<br>15<br>15<br>15  
   
   
   | 13 234<br>15 23 234<br>16 15 25<br>14 526<br>14 526<br>15 526<br>14 526<br>14 12<br>14 12<br>15 52<br>14 12<br>15 12<br>16 1   | 11 13 13 13 13 13 13 13 13 13 13 13 13 1   | 11<br>15<br>16<br>16<br>17<br>16<br>16<br>16<br>16<br>16<br>16<br>16<br>17<br>18<br>18<br>18<br>19<br>19<br>19<br>19<br>19<br>19<br>19<br>19<br>19<br>19  
   
  | 11<br>12<br>13<br>14<br>15<br>15<br>15<br>15<br>15<br>15<br>15<br>15<br>15<br>15   
  | 113         3.34           115         3.14           116         5.17           517         6.16           517         5.13           114         5.26           115         5.26           116         5.26           117         3.34           118         5.26           119         5.26           110         4.3           111         3.34           112         3.34           113         5.26           114         5.26           115         5.26           116         5.26           117         5.32           118         5.4           119         5.4           110         5.2           111         5.2           118         5.4           118         5.4           118         5.4           118         5.4           118         5.35           118         5.35           118         5.35           118         5.35           118         5.35           118         5.35 <tr< td=""><td>11<br/>12<br/>13<br/>14<br/>15<br/>15<br/>15<br/>15<br/>15<br/>15<br/>15<br/>15<br/>15<br/>15</td><td>113         213           115         213           116         213           117         213           118         214           119         213           119         213           111         213           111         213           111         213           111         213           112         213           113         213           114         213           115         213           116         213           117         214           118         213           118         214           118         214           118         214           118         214           118         214           118         214           118         214           118         214           118         214           118         214           118         214           118         214           118         214           118         214           118         214           118</td><td>113         3.24         Yea           115         3.7         Yea           115         6         3         Yea           115         6         3         Yea           115         5         9         Yea           115         5         9         Yea           115         5         9         Yea           115         5         9         Yea           11         3         9         Yea           11         3         9         Yea           11         3         2.4         Wa           11         3         2.4         Wa           11         3         2.4         Wa           11         4         2.3         Wa           12         3         2.4         Wa           12         4         Yea         Yea           12         5         Yea         Yea           13         2.4         Yea         Yea           14         2.3         Yea         Yea           15         2.4         Yea         Yea           15         2.4         Yea         Yea<!--</td--><td>1.3         3.3.4         Yea           1.13         3.7         Yea           1.15         5.0         Yea           1.15         3.0         Yea           1.15         3.0         Yea           1.15         3.0         Yea           1.15         3.0         Yea           1.16         3.0         Yea           1.17         5.2         Yea           1.18         4.1         3.1           1.19         4.1         4.1           1.10         4.1         4.1           1.10         4.1         4.1           1.10         4.1         4.1           1.10         4.1         4.1           1.10         4.1         4.1           1.10         4.1         4.1           1.10         4.1         4.1           1.10         4.1         4.1           1.10         4.1         4.1           1.10         4.1</td><td>1(3         3.34         Yee         43           1(5         3.14         Yee         43           1(5         3.1         Yee         43           1(5         5.0         Yee         49           1(6         2.0         Yee         49           1(1         2.0         Yee         49           1(1         2.0         Yee         49           1(1         2.0         Yee         49           1(1         2.0         Yee         30           1(1         2.1         30         44           1(1         2.1         30         31           1(1         2.1         30         31           1(1         2.1         30         31           1(1         2.1         30         31           1(1         2.1         100         31           1(1         2.1         100         31           1(1         2.1         100         31           1(1         1.1         100         31           1(1         1.1         100         31           1(1         1.1         100         31      <tr< td=""><td><math display="block"> \begin{array}{ c c c c c c c c c c c c c c c c c c c</math></td><td>1(3         3.14         Yes         3.1         Wes         3.1         Mes         Mes<td>1(3         3.14         Yea         4.1         NA           1(3         3.1         Yea         4.1         NA           1(5         3         Yea         4.1         NA           1(5         6         Yea         4.1         NA           1(5         5         Yea         4.1         NA           1(4         2.3         Yea         4.1         NA           1(5         3.1         100         3         100           1(5         3.1         No         3         100           1(5         3.1         No         3         100           1(4         1.1         Yea         1.1         100           1(5         3.1         No         3         100           1(4         1.1         Yea         1.1         100           1(4         1.1         Yea         1.1         100           1(4         1.1         Yea         1.1         100           1(5         1.1         Yea         1.1         1.1           1(5         1.1         Yea         1.1         1.1           1(5         1.1         Yea         <t< td=""><td>13         347         Yea         34         HA         20         10           13         317         Yea         34         HA         20         10           14         317         Yea         35         HA         14         10           15         31         Yea         35         HA         14         10           15         31         Yea         35         HA         14         10           15         32         Yea         35         HA         11         10           16         6         30         HA         14         10         11           16         9         31         HA         11         10         11           17         14         9         31         HA         11</td></t<><td>13         3.47         Yes         3.4         1.4         1.1         3.7         1.4   
     1.4         1.4         1.4         1.4         1.4         1.4         1.4         1.4         1.4         1.4         1.4         1.4         1.4         1.4         1.4         1.4         1.4         1.4         <th1.4< th=""> <th1.4< th=""> <th1.4< th=""></th1.4<></th1.4<></th1.4<></td><td>15         3.4         Yea         3.5         Hot         3.0         1.0           1.1         3.1         Yea         1.0         Hot         1.0         1.0           1.1         3.1         Yea         1.0         Hot         1.0         1.0           1.1         3.1         Yea         1.0         1.0         1.0         1.0           1.1         3.1</td><td>113         3.14         Yea         3.1         Yea         3.1         Nuk         3.0         1.0           15         3         Yea         19         Nuk         16         10         10           15         5         6         Yea         19         Nuk         16         2.2           15         5         6         Yea         19         Nuk         16         2.2           15         5         7         Yea         19         Nuk         11         2.0           15         15         10         9         10         10         11         2.0           15         14         2.0         Nuk         11         2.0         14           15         10         9         10         10         11         2.0           16         2.1         10         9         10         11         2.0           16         17         10         10         10         11         2.0           17         11         10         10         10         10         10           16         11         10         10         10         10</td></td></td></tr<></td></td></tr<> | 11<br>12<br>13<br>14<br>15<br>15<br>15<br>15<br>15<br>15<br>15<br>15<br>15<br>15  | 113         213           115         213           116         213           117         213           118         214           119         213           119         213           111         213           111         213           111         213           111         213           112         213           113         213           114         213           115         213           116         213           117         214           118         213           118         214           118         214           118         214           118         214           118         214           118         214           118         214           118         214           118         214           118         214           118         214           118         214           118         214           118         214           118         214           118  | 113         3.24         Yea           115         3.7         Yea           115         6         3         Yea           115         6         3         Yea           115         5         9         Yea           115         5         9         Yea           115         5         9         Yea           115         5         9         Yea           11         3         9         Yea           11         3         9         Yea           11         3         2.4         Wa           11         3         2.4         Wa           11         3         2.4         Wa           11         4         2.3         Wa           12         3         2.4         Wa           12         4         Yea         Yea           12         5         Yea         Yea           13         2.4         Yea         Yea           14         2.3         Yea         Yea           15         2.4         Yea         Yea           15         2.4         Yea         Yea </td <td>1.3         3.3.4         Yea           1.13         3.7         Yea           1.15         5.0         Yea           1.15         3.0         Yea           1.15         3.0         Yea           1.15         3.0         Yea           1.15         3.0         Yea           1.16         3.0         Yea           1.17         5.2         Yea           1.18         4.1         3.1           1.19         4.1         4.1           1.10         4.1         4.1           1.10         4.1         4.1           1.10         4.1         4.1           1.10         4.1         4.1           1.10         4.1         4.1           1.10         4.1         4.1           1.10         4.1         4.1           1.10         4.1         4.1           1.10         4.1         4.1           1.10         4.1</td> <td>1(3         3.34         Yee         43           1(5         3.14         Yee         43           1(5         3.1         Yee         43           1(5         5.0         Yee         49           1(6         2.0         Yee         49           1(1         2.0         Yee         49           1(1         2.0         Yee         49           1(1         2.0         Yee         49           1(1         2.0         Yee         30           1(1         2.1         30         44           1(1         2.1         30         31           1(1         2.1         30         31           1(1         2.1         30         31           1(1         2.1         30         31           1(1         2.1         100         31           1(1         2.1         100         31           1(1         2.1         100         31           1(1         1.1         100         31           1(1         1.1         100         31           1(1         1.1    
    100         31      <tr< td=""><td><math display="block"> \begin{array}{ c c c c c c c c c c c c c c c c c c c</math></td><td>1(3         3.14         Yes         3.1         Wes         3.1         Mes         Mes<td>1(3         3.14         Yea         4.1         NA           1(3         3.1         Yea         4.1         NA           1(5         3         Yea         4.1         NA           1(5         6         Yea         4.1         NA           1(5         5         Yea         4.1         NA           1(4         2.3         Yea         4.1         NA           1(5         3.1         100         3         100           1(5         3.1         No         3         100           1(5         3.1         No         3         100           1(4         1.1         Yea         1.1         100           1(5         3.1         No         3         100           1(4         1.1         Yea         1.1         100           1(4         1.1         Yea         1.1         100           1(4         1.1         Yea         1.1         100           1(5         1.1         Yea         1.1         1.1           1(5         1.1         Yea         1.1         1.1           1(5         1.1         Yea         <t< td=""><td>13         347         Yea         34         HA         20         10           13         317         Yea         34         HA         20         10           14         317         Yea         35         HA         14         10           15         31         Yea         35         HA         14         10           15         31         Yea         35         HA         14         10           15         32         Yea         35         HA         11         10           16         6         30         HA         14         10         11           16         9         31         HA         11         10         11           17         14         9         31         HA         11</td></t<><td>13         3.47         Yes         3.4         1.4         1.1         3.7         1.4         <th1.4< th=""> <th1.4< th=""> <th1.4< th=""></th1.4<></th1.4<></th1.4<></td><td>15         3.4         Yea         3.5         Hot         3.0         1.0           1.1         3.1         Yea         1.0         Hot         1.0         1.0           1.1         3.1         Yea         1.0         Hot         1.0         1.0           1.1         3.1         Yea         1.0         1.0         1.0         1.0           1.1         3.1</td><td>113         3.14         Yea         3.1         Yea         3.1         Nuk         3.0         1.0           15         3         Yea         19         Nuk         16         10         10           15         5         6         Yea         19         Nuk         16         2.2           15         5         6         Yea         19         Nuk         16         2.2           15         5         7         Yea         19         Nuk         11         2.0           15         15         10         9         10         10         11         2.0           15         14         2.0         Nuk         11         2.0         14           15         10         9         10         10         11         2.0           16         2.1         10         9         10         11         2.0           16         17         10         10         10         11         2.0           17         11         10         10         10         10         10           16         11         10         10         10         10</td></td></td></tr<></td>   
   | 1.3         3.3.4         Yea           1.13         3.7         Yea           1.15         5.0         Yea           1.15         3.0         Yea           1.15         3.0         Yea           1.15         3.0         Yea           1.15         3.0         Yea           1.16         3.0         Yea           1.17         5.2         Yea           1.18         4.1         3.1           1.19         4.1         4.1           1.10         4.1         4.1           1.10         4.1         4.1           1.10         4.1         4.1           1.10         4.1         4.1           1.10         4.1         4.1           1.10         4.1         4.1           1.10         4.1         4.1           1.10         4.1         4.1           1.10         4.1         4.1           1.10         4.1   
  | 1(3         3.34         Yee         43           1(5         3.14         Yee         43           1(5         3.1         Yee         43           1(5         5.0         Yee         49           1(6         2.0         Yee         49           1(1         2.0         Yee         49           1(1         2.0         Yee         49           1(1         2.0         Yee         49           1(1         2.0         Yee         30           1(1         2.1         30         44           1(1         2.1         30         31           1(1         2.1         30         31           1(1         2.1         30         31           1(1         2.1         30         31           1(1         2.1         100         31           1(1         2.1         100         31           1(1         2.1         100         31           1(1         1.1         100         31           1(1         1.1         100         31           1(1         1.1         100         31 <tr< td=""><td><math display="block"> \begin{array}{ c c c c c c c c c c c c c c c c c c c</math></td><td>1(3         3.14         Yes         3.1         Wes         3.1         Mes         Mes<td>1(3         3.14         Yea         4.1         NA           1(3         3.1         Yea         4.1         NA           1(5         3         Yea         4.1         NA           1(5         6         Yea         4.1         NA           1(5         5         Yea         4.1         NA           1(4         2.3         Yea         4.1         NA           1(5         3.1         100         3         100           1(5         3.1         No         3         100           1(5         3.1         No         3         100           1(4         1.1         Yea         1.1         100           1(5         3.1         No         3         100           1(4         1.1         Yea         1.1         100           1(4         1.1         Yea         1.1         100           1(4         1.1         Yea         1.1         100           1(5         1.1         Yea         1.1         1.1           1(5         1.1         Yea         1.1         1.1           1(5         1.1         Yea         <t< td=""><td>13         347         Yea         34         HA         20         10           13         317         Yea         34         HA         20         10           14         317         Yea         35         HA         14         10           15         31         Yea         35         HA         14         10           15         31         Yea         35         HA         14         10           15         32         Yea         35         HA         11         10           16         6         30         HA         14         10         11           16         9         31         HA         11         10         11           17         14         9         31         HA         11</td></t<><td>13         3.47         Yes         3.4         1.4         1.1         3.7         1.4         <th1.4< th=""> <th1.4< th=""> <th1.4< th=""></th1.4<></th1.4<></th1.4<></td><td>15         3.4         Yea         3.5         Hot         3.0         1.0           1.1         3.1         Yea         1.0         Hot         1.0         1.0           1.1         3.1         Yea         1.0         Hot         1.0         1.0           1.1         3.1         Yea         1.0         1.0         1.0         1.0           1.1         3.1</td><td>113         3.14         Yea         3.1         Yea         3.1         Nuk         3.0         1.0           15         3         Yea         19         Nuk         16         10         10           15         5         6         Yea         19         Nuk         16         2.2           15         5         6         Yea         19         Nuk         16         2.2           15         5         7         Yea         19         Nuk         11         2.0           15         15         10         9         10         10         11         2.0           15         14         2.0         Nuk         11         2.0         14           15         10         9         10         10         11         2.0           16         2.1         10         9         10         11         2.0           16         17         10         10         10         11         2.0           17         11         10         10         10         10         10           16         11         10         10         10         10</td></td></td></tr<>   
         | $ \begin{array}{ c c c c c c c c c c c c c c c c c c c$   | 1(3         3.14         Yes         3.1         Wes         3.1         Mes         Mes <td>1(3         3.14         Yea         4.1         NA           1(3         3.1         Yea         4.1         NA           1(5         3         Yea         4.1         NA           1(5         6         Yea         4.1         NA           1(5         5         Yea         4.1         NA           1(4         2.3         Yea         4.1         NA           1(5         3.1         100         3         100           1(5         3.1         No         3         100           1(5         3.1         No         3         100           1(4         1.1         Yea         1.1         100           1(5         3.1         No         3         100           1(4         1.1         Yea         1.1         100           1(4         1.1         Yea         1.1         100           1(4         1.1         Yea         1.1         100           1(5         1.1         Yea         1.1         1.1           1(5         1.1         Yea         1.1         1.1           1(5         1.1         Yea         <t< td=""><td>13         347         Yea         34         HA         20         10           13         317         Yea         34         HA         20         10           14         317         Yea         35         HA         14         10           15         31         Yea         35         HA         14         10           15         31         Yea         35         HA         14         10           15         32         Yea         35         HA         11         10           16         6         30         HA         14         10         11           16         9         31         HA         11         10         11           17         14         9         31         HA         11</td></t<><td>13         3.47         Yes         3.4         1.4         1.1         3.7         1.4         <th1.4< th=""> <th1.4< th=""> <th1.4< th=""></th1.4<></th1.4<></th1.4<></td><td>15         3.4         Yea         3.5         Hot         3.0         1.0           1.1         3.1         Yea         1.0         Hot         1.0         1.0           1.1         3.1         Yea         1.0         Hot         1.0         1.0           1.1         3.1         Yea         1.0         1.0         1.0         1.0          
1.1         3.1</td><td>113         3.14         Yea         3.1         Yea         3.1         Nuk         3.0         1.0           15         3         Yea         19         Nuk         16         10         10           15         5         6         Yea         19         Nuk         16         2.2           15         5         6         Yea         19         Nuk         16         2.2           15         5         7         Yea         19         Nuk         11         2.0           15         15         10         9         10         10         11         2.0           15         14         2.0         Nuk         11         2.0         14           15         10         9         10         10         11         2.0           16         2.1         10         9         10         11         2.0           16         17         10         10         10         11         2.0           17         11         10         10         10         10         10           16         11         10         10         10         10</td></td> | 1(3         3.14         Yea         4.1         NA           1(3         3.1         Yea         4.1         NA           1(5         3         Yea         4.1         NA           1(5         6         Yea         4.1         NA           1(5         5         Yea         4.1         NA           1(4         2.3         Yea         4.1         NA           1(5         3.1         100         3         100           1(5         3.1         No         3         100           1(5         3.1         No         3         100           1(4         1.1         Yea         1.1         100           1(5         3.1         No         3         100           1(4         1.1         Yea         1.1         100           1(4         1.1         Yea         1.1         100           1(4         1.1         Yea         1.1         100           1(5         1.1         Yea         1.1         1.1           1(5         1.1         Yea         1.1         1.1           1(5         1.1         Yea <t< td=""><td>13         347         Yea         34         HA         20         10           13         317         Yea         34         HA         20         10           14         317         Yea         35         HA         14         10           15         31         Yea         35         HA         14         10           15         31         Yea         35         HA         14         10           15         32         Yea         35         HA         11         10           16         6         30         HA         14         10         11           16         9         31         HA         11         10         11           17         14         9         31         HA         11</td></t<> <td>13         3.47         Yes         3.4         1.4         1.1         3.7         1.4         <th1.4< th=""> <th1.4< th=""> <th1.4< th=""></th1.4<></th1.4<></th1.4<></td> <td>15         3.4         Yea         3.5         Hot         3.0         1.0           1.1         3.1         Yea         1.0         Hot         1.0         1.0           1.1         3.1         Yea         1.0         Hot         1.0         1.0           1.1         3.1         Yea         1.0         1.0         1.0         1.0           1.1         3.1</td> <td>113         3.14         Yea         3.1         Yea         3.1         Nuk         3.0         1.0           15         3         Yea         19         Nuk         16         10         10           15         5         6         Yea         19         Nuk         16         2.2           15         5         6         Yea         19         Nuk         16         2.2           15         5         7         Yea         19         Nuk         11         2.0           15         15         10         9         10         10         11         2.0           15         14         2.0         Nuk         11         2.0         14           15         10         9         10         10         11         2.0           16         2.1         10         9         10         11         2.0           16         17         10         10         10         11         2.0           17         11         10         10         10         10         10           16         11         10         10         10         10</td>   | 13         347         Yea         34         HA         20         10           13         317         Yea         34         HA         20         10           14         317         Yea         35         HA         14         10           15         31         Yea         35         HA         14         10           15         31         Yea         35         HA         14         10           15         32         Yea         35         HA         11         10           16         6         30         HA         14         10         11           16         9         31         HA         11         10         11           17         14         9         31         HA         11  
  | 13         3.47         Yes         3.4         1.4         1.1         3.7         1.4 <th1.4< th=""> <th1.4< th=""> <th1.4< th=""></th1.4<></th1.4<></th1.4<>   | 15         3.4         Yea         3.5         Hot         3.0         1.0           1.1         3.1         Yea         1.0         Hot         1.0         1.0           1.1         3.1         Yea         1.0         Hot         1.0         1.0           1.1         3.1         Yea         1.0         1.0         1.0         1.0           1.1         3.1   | 113         3.14         Yea         3.1         Yea         3.1         Nuk         3.0         1.0           15         3         Yea         19         Nuk         16         10         10           15         5         6         Yea         19         Nuk         16         2.2           15         5         6         Yea         19         Nuk         16         2.2           15         5         7         Yea         19         Nuk         11         2.0           15         15         10         9         10         10         11         2.0           15         14         2.0         Nuk         11         2.0         14           15         10         9         10         10         11         2.0           16         2.1         10         9         10         11         2.0           16         17         10         10         10         11         2.0           17         11         10         10         10         10         10           16         11         10         10         10         10  |
|   | 日<br>15<br>15<br>15<br>15<br>15<br>15<br>15<br>15<br>15<br>15      | 20 2 22 20 20 20 20 20 20 20 20 20 20 20   | 15<br>15<br>15<br>15<br>15<br>15<br>15<br>15<br>15<br>15<br>15<br>15<br>15<br>1                             | ženi konstrukcio za stali se s | N7<br>13<br>13<br>13<br>13<br>13<br>13<br>13<br>13<br>13<br>13  
   
   |
27<br>28<br>29<br>29<br>29<br>29<br>24<br>24<br>25<br>25<br>25<br>25<br>25<br>25<br>25<br>25<br>25<br>25<br>25<br>25<br>25  | 27<br>29<br>29<br>29<br>29<br>29<br>29<br>29<br>29<br>29<br>29<br>29<br>29<br>29   | 3.7         Yes           3.7         Yes           4.3         Yes           6         Yes           5         Yes           5         Yes           2.6         Yes           2.6         Yes           2.6         Yes           2.6         Yes           2.6         Yes           2.7         No           2.8         No           2.4         No  | 3,7 (file<br>3,7 (file<br>2,6 (file<br>2,6 (file<br>2,6 (file<br>2,7 (f   
   
   
   | N7<br>10<br>10<br>10<br>10<br>10<br>10<br>10<br>10<br>10<br>10  
   
   | MM<br>1995<br>1995<br>1995<br>1995<br>1995<br>1995<br>1995<br>1995<br>1995<br>1995<br>1995<br>1995<br>1995<br>1995<br>1995<br>1995<br>1995<br>1995<br>1995<br>1995<br>1995<br>1995<br>1995<br>1995<br>1995<br>1995<br>1995<br>1995<br>1995<br>1995<br>1995<br>1995<br>1995<br>1995<br>1995<br>1995<br>1995<br>1995<br>1995<br>1995<br>1995<br>1995<br>1995<br>1995<br>1995<br>1995<br>1995<br>1995<br>1995<br>1995<br>1995<br>1995<br>1995<br>1995<br>1995<br>1995<br>1995<br>1995<br>1995<br>1995<br>1995<br>1995<br>1995<br>1995<br>1995<br>1995<br>1995<br>1995<br>1995<br>1995<br>1995<br>1995<br>1995<br>1995<br>1995<br>1995<br>1995<br>1995<br>1995<br>1995<br>1995<br>1995<br>1995<br>1995<br>1995<br>1995<br>1995<br>1995<br>1995<br>1995<br>1995<br>1995<br>1995<br>1995<br>1995<br>1995<br>1995<br>1995<br>1995<br>1995<br>1995<br>1995<br>1995<br>1995<br>1995<br>1995<br>1995<br>1995<br>1995<br>1995<br>1995<br>1995<br>1995<br>1995<br>1995<br>1995<br>1995<br>1995<br>1995<br>1995<br>1995<br>1995<br>1995<br>1995<br>1995<br>1995<br>1995<br>1995<br>1995<br>1995<br>1995<br>1995<br>1995<br>1995<br>1995<br>1995<br>1995<br>1995<br>1995<br>1995<br>1995<br>1995<br>1995<br>1995<br>1995<br>1995<br>1995<br>1995<br>1995<br>1995<br>1995<br>1995<br>1995<br>1995<br>1995<br>1995<br>1995<br>1995<br>1995<br>1995<br>1995<br>1995<br>1995<br>1995<br>1995<br>1995<br>1995<br>1995<br>1995<br>1995<br>1995<br>1995<br>1995<br>1995<br>1995<br>1995<br>1995<br>1995<br>1995<br>1995<br>1995<br>1995<br>1995<br>1995<br>1995<br>1995<br>1995<br>1995<br>1995<br>1995<br>1995<br>1995<br>1995<br>1995<br>1995<br>1995<br>1995<br>1995<br>1995<br>1995<br>1995<br>1995<br>1995<br>1995<br>1995<br>1995<br>1995<br>1995<br>1995<br>1995<br>1995<br>1995<br>1995<br>1995<br>1995<br>1995<br>1995<br>1995<br>1995<br>1995<br>1995<br>1995<br>1995<br>1995<br>1995<br>1995<br>1995<br>1995<br>1995<br>1995<br>1995<br>1995<br>1995<br>1995<br>1995<br>1995<br>1995<br>1995<br>1995<br>1995<br>1995<br>1995<br>1995<br>1995<br>1995<br>1995<br>1995<br>1995<br>1995<br>1995<br>1995<br>1995<br>1995<br>1995<br>1995<br>1995<br>1995<br>1995<br>1995<br>1995<br>1995<br>1995<br>1995<br>1995<br>1995<br>1995<br>1995<br>1995<br>1995<br>1995<br>1995<br>1995<br>1995<br>1995<br>1995<br>1995<br>1995<br>1995<br>1995<br>1995<br>1995<br>1995<br>1995<br>1995<br>1995<br>1995<br>1995<br>1995<br>1995<br>1995<br>1995<br>1995<br>1995<br>1995<br>1995<br>1995<br>1995<br>1995<br>1995<br>1995<br>1995<br>1995<br>1995<br>1995<br>1995<br>1995<br>1995<br>1995<br>1995<br>1995<br>1995<br>1995<br>1995<br>1995<br>1995<br>1995<br>1995<br>1995<br>1995<br>1995<br>1995<br>1995<br>1995<br>1995<br>1995<br>1995<br>1995<br>1995<br>1995<br>1995<br>1995<br>1995<br>1995<br>1995<br>1995<br>1995<br>1995<br>1995<br>1995<br>1995<br>19 | 3.7<br>3.7<br>4.3<br>5.6<br>5.5<br>1.8<br>1.8<br>2.4<br>2.4<br>2.4<br>2.4<br>2.4<br>2.4<br>2.4<br>2.4  
   | 0.77<br>0.0<br>0.0<br>0.0<br>0.0<br>0.0<br>0.0<br>0.0   
  | 3.7<br>8.0<br>8.0<br>9.5<br>9.5<br>9.5<br>9.5<br>1.8<br>1.8<br>1.8<br>1.7<br>1.8<br>1.7<br>1.8<br>1.7<br>1.8<br>1.8<br>1.8<br>1.8<br>1.8<br>1.8<br>1.8<br>1.8  
  | N.7.<br>4.3<br>6.6<br>6.6<br>7.5<br>7.3<br>7.3<br>7.3<br>7.3<br>7.3<br>7.3<br>7.3<br>7.3   
  | NA<br>NA<br>NA<br>NA<br>NA<br>NA<br>NA<br>NA<br>NA<br>NA   
  | NT<br>10<br>10<br>10<br>10<br>10<br>10<br>10<br>10<br>10<br>10   | M.7.         Via           0.17         Via           0.17         Via           0.18         Via           0.19         Via           0.10         Via           0.11         Via           0.12         Via           0.13         Via           0.14         Via           0.15         Via           0.16         Via           0.17         Via           0.18         Via           0.19         Via           0.11         Via           0.12         Via           0.11         Via           0.11         Via           0.12         Via           0.12         Via           0.12         Via           0.12         Via           0.12         Via           0.12         Via           0.13         Via           0.14         Via           0.15         Via           0.16         Via           0.17         Via           0.16         Via           0.17         Via           0.16         Via <td>3,7         Yras           3,7         Yras           4,3         Yras           2,6         Yras           2,6         Yras           2,6         Yras           2,6         Yras           2,5         Yras           2,6         Yras           2,7         Yras           3,7         Yras     <td>M/1         Yrei         N/2         Yrei         N/3           4.2         Yrei         10         10         10           2.6         Yrei         10         10         10           2.1         10         10         10         10           2.1         10         10         10         10           2.1         10         10         10         10           2.1         10         10         10         10           2.1         10         10         10         10           2.1         10         10         10         10           2.1         10         10         10         10           2.1         10         10         10         10           2.1         10         10         10         10           2.1         10         10         10         10           2.1         10         10         10         10<td>3/7         Yres         15           3         Yes         19           26         Yes         19           26         Yes         19           26         Yes         19           26         Yes         19           313         Yes         19           313         Yes         19           313         Yes         10           313         Yes         10           314         10         10           315         Yes         10           316         Yes         10           317         Yes         10           318         Yes         10           319         Yes         10           311         Yes         10           311         Yes         10           311         Yes         10           311         Yes         10           312         Yes         10           32         Yes         10           32         Yes         10           32         Yes         10           32         Yes         10           32</td><td>3.7         Yes         35         Yes         35         HA           3         Yes         15         Yes         15         HA           25         Yes         15         Yes         15         HA           25         Yes         15         HA         HA         HA           25         Yes         16         HA         HA         HA           23         HB         16         HA         HA         HA           23         HB         16         HA         HA         HA           24         HB         16         HA         HA         HA           23         HB         16         14         HA         HA           24         HB         16         14         HA         HA           25         HB         16         14         HA         HA<td>3.7         Yes         35         With           3         Yes         19         10.4           6         Yes         19         10.4           6         Yes         19         10.4           55         Yes         19         10.4           55         Yes         19         10.4           55         Yes         19         10.4           23         106         3         10.4           23         106         3         10.4           23         106         3         10.4           24         10         3         10.4           25         Yes         14         14.5           26         Yes         14         14.5           26         Yes         10         14.5           26         Yes         10         14.5           21         10         10         14.5           21         10         10         14.5           21         10         10         14.5           21         10         10         14.5           21         10         10         14.5</td><td>N7         Yes         35         NA         14         14           3         Yes         19         NA         6         3           6         Yes         19         NA         6         3           55         Yes         19         NA         6         3           1.4         Yes         19         NA         6         3           1.4         Na         6         NA         6         3           1.4         Na         10         NA         11         13           2.5         Na         Na         11         13         3           2.6         Na         14         11         13         3           2.6         Na         14         11         26         3           2.1         Yes         11         14         12         4           2.1         Yes         11         14         13           2.1         Yes         11         14         13           2.1         Yes         11         14         14           2.1         Yes         11         14         14           2.1</td><td>3/7         Yes         3/5         Wes         1/4         1/4         1/4         1/4           3         Yes         19         MA         15         1/4         1/4         1/4           4         7         Yes         19         MA         15         2         2           5         Yes         19         MA         15         2         2         2           11.4         No         3         114         11         11         26         2           11.4         No         3         114         11         11         11/4         26           11.4         No         3         114         11         11/4         11         11/4           2.4         No         3         114         11         11/4         11         11/4           2.4         No         3         11/4         11         11/4         12         14/4           2.4         No         3         11/4         11         11/4         12         14/4           2.4         No         3         11/4         14         14         14         14         14/4         14/4</td><td>3/7    
    Yres         25         HA         <thh< td=""><td>3/7         Yres         3/5         Wei         3/5         Wei         3/6         1/1         1/1         1/1           2         Yres         10         NIA         15         2         2           2         Yres         10         NIA         15         2         2           2         Yres         10         NIA         11         11         23           13         Yres         3         HIA         11         23         13           13         Yres         3         HIA         11         23         13           13         Yres         3         HIA         11         23         14           2         Yres         3         HIA         11         23         14           2         Yres         3         HIA         11         23         14           2         Yres         3         HIA         11         23         14           1         Yres         11         Yres         14         24         14           2         Yres         11         Yres         23         2         2           1         Yres</td></thh<></td></td></td></td>  | 3,7         Yras           3,7         Yras           4,3         Yras           2,6         Yras           2,6         Yras           2,6         Yras           2,6         Yras           2,5         Yras           2,6         Yras           2,7         Yras           3,7         Yras <td>M/1         Yrei         N/2         Yrei         N/3           4.2         Yrei         10         10         10           2.6         Yrei         10         10         10           2.1         10         10         10         10           2.1         10         10         10         10           2.1         10         10         10         10           2.1         10         10         10         10           2.1         10         10         10         10           2.1         10         10         10         10           2.1         10         10         10         10           2.1         10         10         10         10           2.1         10         10         10         10           2.1         10         10         10         10           2.1         10         10         10         10<td>3/7         Yres         15           3         Yes         19           26         Yes         19           26         Yes         19           26         Yes         19           26         Yes         19           313         Yes         19           313         Yes         19           313         Yes         10           313         Yes         10           314         10         10           315         Yes         10           316         Yes         10           317         Yes         10           318         Yes         10           319         Yes         10           311         Yes         10           311         Yes         10           311         Yes         10           311         Yes         10           312         Yes         10           32         Yes         10           32         Yes         10           32         Yes         10           32         Yes         10           32</td><td>3.7         Yes         35         Yes         35         HA           3         Yes         15         Yes         15         HA           25         Yes         15         Yes         15         HA           25         Yes         15         HA         HA         HA           25         Yes         16         HA         HA         HA           23         HB         16         HA         HA         HA           23         HB         16         HA         HA         HA           24         HB         16         HA         HA         HA           23         HB         16         14         HA         HA           24         HB         16         14         HA         HA           25         HB         16         14         HA         HA<td>3.7         Yes         35         With           3         Yes         19         10.4           6         Yes         19         10.4           6         Yes         19         10.4           55         Yes         19         10.4           55         Yes         19         10.4           55         Yes         19         10.4           23         106         3         10.4           23         106         3         10.4           23         106         3         10.4           24         10         3         10.4           25         Yes         14         14.5           26         Yes         14         14.5           26         Yes         10         14.5           26         Yes         10         14.5           21         10         10        
14.5           21         10         10         14.5           21         10         10         14.5           21         10         10         14.5           21         10         10         14.5</td><td>N7         Yes         35         NA         14         14           3         Yes         19         NA         6         3           6         Yes         19         NA         6         3           55         Yes         19         NA         6         3           1.4         Yes         19         NA         6         3           1.4         Na         6         NA         6         3           1.4         Na         10         NA         11         13           2.5         Na         Na         11         13         3           2.6         Na         14         11         13         3           2.6         Na         14         11         26         3           2.1         Yes         11         14         12         4           2.1         Yes         11         14         13           2.1         Yes         11         14         13           2.1         Yes         11         14         14           2.1         Yes         11         14         14           2.1</td><td>3/7         Yes         3/5         Wes         1/4         1/4         1/4         1/4           3         Yes         19         MA         15         1/4         1/4         1/4           4         7         Yes         19         MA         15         2         2           5         Yes         19         MA         15         2         2         2           11.4         No         3         114         11         11         26         2           11.4         No         3         114         11         11         11/4         26           11.4         No         3         114         11         11/4         11         11/4           2.4         No         3         114         11         11/4         11         11/4           2.4         No         3         11/4         11         11/4         12         14/4           2.4         No         3         11/4         11         11/4         12         14/4           2.4         No         3         11/4         14         14         14         14         14/4         14/4</td><td>3/7         Yres         25         HA         <thh< td=""><td>3/7         Yres         3/5         Wei         3/5         Wei         3/6         1/1         1/1         1/1           2         Yres         10         NIA         15         2         2           2         Yres         10         NIA         15         2         2           2         Yres         10         NIA         11         11         23           13         Yres         3         HIA         11         23         13           13         Yres         3         HIA         11         23         13           13         Yres         3         HIA         11         23         14           2         Yres         3         HIA         11         23         14           2         Yres         3         HIA         11         23         14           2         Yres         3         HIA         11         23         14           1         Yres         11         Yres         14         24         14           2         Yres         11         Yres         23         2         2           1         Yres</td></thh<></td></td></td>   | M/1         Yrei         N/2         Yrei         N/3           4.2         Yrei         10         10         10           2.6         Yrei         10         10         10           2.1         10         10         10         10           2.1         10         10         10         10           2.1         10         10         10         10           2.1         10         10         10         10           2.1         10         10         10         10           2.1         10         10         10         10           2.1         10         10         10         10           2.1         10         10         10         10           2.1         10         10         10         10           2.1         10         10         10         10           2.1         10         10         10         10 <td>3/7         Yres         15           3         Yes         19           26         Yes         19           26         Yes         19           26         Yes         19           26         Yes         19           313         Yes         19           313         Yes         19           313         Yes         10           313         Yes         10           314         10         10           315         Yes         10           316         Yes         10           317         Yes         10           318         Yes         10           319         Yes         10           311
        Yes         10           311         Yes         10           311         Yes         10           311         Yes         10           312         Yes         10           32         Yes         10           32         Yes         10           32         Yes         10           32         Yes         10           32</td> <td>3.7         Yes         35         Yes         35         HA           3         Yes         15         Yes         15         HA           25         Yes         15         Yes         15         HA           25         Yes         15         HA         HA         HA           25         Yes         16         HA         HA         HA           23         HB         16         HA         HA         HA           23         HB         16         HA         HA         HA           24         HB         16         HA         HA         HA           23         HB         16         14         HA         HA           24         HB         16         14         HA         HA           25         HB         16         14         HA         HA<td>3.7         Yes         35         With           3         Yes         19         10.4           6         Yes         19         10.4           6         Yes         19         10.4           55         Yes         19         10.4           55         Yes         19         10.4           55         Yes         19         10.4           23         106         3         10.4           23         106         3         10.4           23         106         3         10.4           24         10         3         10.4           25         Yes         14         14.5           26         Yes         14         14.5           26         Yes         10         14.5           26         Yes         10         14.5           21         10         10         14.5           21         10         10         14.5           21         10         10         14.5           21         10         10         14.5           21         10         10         14.5</td><td>N7         Yes         35         NA         14         14           3         Yes         19         NA         6         3           6         Yes         19         NA         6         3           55         Yes         19         NA         6         3           1.4         Yes         19         NA         6         3           1.4         Na         6         NA         6         3           1.4         Na         10         NA         11         13           2.5         Na         Na         11         13         3           2.6         Na         14         11         13         3           2.6         Na         14         11         26         3           2.1         Yes         11         14         12         4           2.1         Yes         11         14         13           2.1         Yes         11         14         13           2.1         Yes         11         14         14           2.1         Yes         11         14         14           2.1</td><td>3/7         Yes         3/5         Wes         1/4         1/4         1/4         1/4           3         Yes         19         MA         15         1/4         1/4         1/4           4         7         Yes         19         MA         15         2         2           5         Yes         19         MA         15         2         2         2           11.4         No         3         114         11         11         26         2           11.4         No         3         114         11         11         11/4         26           11.4         No         3         114         11         11/4         11         11/4           2.4         No         3         114         11         11/4         11         11/4           2.4         No         3         11/4         11         11/4         12         14/4           2.4         No         3         11/4         11         11/4         12         14/4           2.4         No         3         11/4         14         14         14         14         14/4         14/4</td><td>3/7         Yres         25         HA         <thh< td=""><td>3/7         Yres         3/5         Wei         3/5         Wei         3/6         1/1         1/1         1/1           2         Yres         10         NIA         15         2         2           2         Yres         10         NIA         15         2         2           2         Yres         10         NIA         11         11         23           13         Yres         3         HIA         11         23         13           13         Yres         3         HIA         11         23         13           13         Yres         3         HIA         11         23         14           2         Yres         3         HIA         11         23         14           2         Yres         3         HIA         11         23         14           2         Yres         3         HIA         11         23         14           1         Yres         11         Yres         14         24         14           2         Yres         11         Yres         23         2         2           1         Yres</td></thh<></td></td> | 3/7         Yres         15           3         Yes         19           26         Yes         19           26         Yes         19           26         Yes         19           26         Yes         19           313         Yes         19           313         Yes         19           313         Yes         10           313         Yes         10           314         10         10           315         Yes         10           316         Yes         10           317         Yes         10           318         Yes         10           319         Yes         10           311         Yes         10           311         Yes         10           311         Yes         10           311         Yes         10           312         Yes         10           32  
  | 3.7         Yes         35         Yes         35         HA           3         Yes         15         Yes         15         HA           25         Yes         15         Yes         15         HA           25         Yes         15         HA         HA         HA           25         Yes         16         HA         HA         HA           23         HB         16         HA         HA         HA           23         HB         16         HA         HA         HA           24         HB         16         HA         HA         HA           23         HB         16         14         HA         HA           24         HB         16         14         HA         HA           25         HB         16         14         HA         HA <td>3.7         Yes         35         With           3         Yes         19         10.4           6         Yes         19         10.4           6         Yes         19         10.4           55         Yes         19         10.4           55         Yes         19         10.4           55         Yes         19         10.4           23         106         3         10.4           23         106         3         10.4           23         106         3         10.4           24         10         3         10.4           25         Yes         14         14.5           26         Yes         14         14.5           26         Yes         10         14.5           26         Yes         10         14.5           21         10         10         14.5           21         10         10         14.5           21         10         10         14.5           21         10         10         14.5           21         10         10         14.5</td> <td>N7         Yes         35         NA         14         14           3         Yes         19         NA         6         3           6         Yes         19         NA         6         3           55         Yes         19         NA         6         3           1.4         Yes         19         NA         6         3           1.4         Na         6         NA         6         3           1.4         Na         10         NA         11         13           2.5         Na         Na         11         13         3           2.6         Na         14         11         13         3           2.6         Na         14         11         26         3           2.1         Yes         11         14         12         4           2.1         Yes         11         14         13           2.1         Yes         11         14         13           2.1         Yes         11         14         14           2.1         Yes         11         14         14           2.1</td> <td>3/7         Yes         3/5         Wes         1/4         1/4         1/4         1/4           3         Yes         19         MA         15         1/4         1/4         1/4           4         7         Yes         19         MA         15         2         2           5         Yes         19         MA         15         2         2         2           11.4         No         3         114         11         11         26         2           11.4         No         3         114         11         11         11/4         26           11.4         No         3         114         11         11/4         11         11/4           2.4         No         3         114         11         11/4         11         11/4           2.4         No         3         11/4         11         11/4         12         14/4           2.4         No         3         11/4         11         11/4         12         14/4           2.4         No         3         11/4         14         14         14         14         14/4         14/4</td> <td>3/7         Yres         25         HA         <thh< td=""><td>3/7         Yres         3/5         Wei         3/5         Wei         3/6         1/1         1/1         1/1           2         Yres         10         NIA         15         2         2           2         Yres         10         NIA         15         2         2           2         Yres         10         NIA         11         11         23           13         Yres         3         HIA         11         23         13           13         Yres         3         HIA         11         23         13           13         Yres         3         HIA         11         23         14           2         Yres         3         HIA         11         23         14           2         Yres         3         HIA         11         23         14           2         Yres         3         HIA         11         23         14           1         Yres         11         Yres         14         24         14           2         Yres         11         Yres         23         2         2           1         Yres</td></thh<></td>  | 3.7         Yes         35         With           3         Yes         19         10.4           6         Yes         19         10.4           6         Yes         19         10.4           55         Yes         19         10.4           55         Yes         19         10.4           55         Yes         19         10.4           23         106         3         10.4           23         106         3         10.4           23         106         3         10.4           24         10         3         10.4           25         Yes         14         14.5           26         Yes         14         14.5           26         Yes         10         14.5           26         Yes         10         14.5           21         10         10         14.5           21         10         10         14.5           21         10         10         14.5           21         10         10         14.5           21         10         10         14.5   
  | N7         Yes         35         NA         14         14           3         Yes         19         NA         6         3           6         Yes         19         NA         6         3           55         Yes         19         NA         6         3           1.4         Yes         19         NA         6         3           1.4         Na         6         NA         6         3           1.4         Na         10         NA         11         13           2.5         Na         Na         11         13         3           2.6         Na         14         11         13         3           2.6         Na         14         11         26         3           2.1         Yes         11         14         12         4           2.1         Yes         11         14         13           2.1         Yes         11         14         13           2.1         Yes         11         14         14           2.1         Yes         11         14         14           2.1   | 3/7         Yes         3/5         Wes         1/4         1/4         1/4         1/4           3         Yes         19         MA         15         1/4         1/4         1/4           4         7         Yes         19         MA         15         2         2           5         Yes         19         MA         15         2         2         2           11.4         No         3         114         11         11         26         2           11.4         No         3         114         11         11         11/4         26           11.4         No         3         114         11         11/4         11         11/4           2.4         No         3         114         11         11/4         11         11/4           2.4         No         3         11/4         11         11/4         12         14/4           2.4         No         3         11/4         11         11/4         12         14/4           2.4         No         3         11/4         14         14         14         14         14/4         14/4   
  | 3/7         Yres         25         HA         HA <thh< td=""><td>3/7         Yres         3/5         Wei         3/5         Wei         3/6         1/1         1/1         1/1           2         Yres         10         NIA         15         2         2           2         Yres         10         NIA         15         2         2           2         Yres         10         NIA         11         11         23           13         Yres         3         HIA         11         23         13           13         Yres         3         HIA         11         23         13           13         Yres         3         HIA         11         23         14           2         Yres         3         HIA         11         23         14           2         Yres         3         HIA         11         23         14           2         Yres         3         HIA         11         23         14           1         Yres         11         Yres         14         24         14           2         Yres         11         Yres         23         2         2           1         Yres</td></thh<>  | 3/7         Yres         3/5         Wei         3/5         Wei         3/6         1/1         1/1         1/1           2         Yres         10         NIA         15         2         2           2         Yres         10         NIA         15         2         2           2         Yres         10         NIA         11         11         23           13         Yres         3         HIA         11         23         13           13         Yres         3         HIA         11         23         13           13         Yres         3         HIA         11         23         14           2         Yres         3         HIA         11         23         14           2         Yres         3         HIA         11         23         14           2         Yres         3         HIA         11         23         14           1         Yres         11         Yres         14         24         14           2         Yres         11         Yres         23         2         2           1         Yres   |
| 21<br>21<br>21<br>21<br>21<br>21<br>21<br>21<br>21<br>21<br>21<br>21<br>21<br>2 |  |  |   | ž.   | NA<br>25<br>25<br>25<br>25<br>25<br>25<br>25<br>25<br>25<br>25<br>25<br>25<br>25  
   
   
   | NA<br>23<br>23<br>24<br>24<br>24<br>24<br>24<br>24<br>25<br>25<br>25<br>25<br>25<br>25<br>25<br>25<br>25<br>25<br>25<br>25<br>25  | NN<br>256<br>256<br>256<br>256<br>256<br>256<br>256<br>256<br>256<br>256   | 3 Year<br>5 Year<br>5 Year<br>5 Year<br>5 Year<br>5 Year<br>1 18 Year<br>1 18 Year<br>5 Year<br>1 Y | NA 2000<br>2000<br>2000<br>2000<br>2000<br>2000<br>2000<br>200   
   
   
   | N<br>N<br>N<br>N<br>N<br>N<br>N<br>N<br>N<br>N<br>N<br>N<br>N<br>N  
   
   | (1)<br>(1)<br>(1)<br>(1)<br>(1)<br>(1)<br>(1)<br>(1)  
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  | 1<br>2<br>5<br>5<br>5<br>5<br>5<br>5<br>5<br>5<br>5<br>5<br>5<br>5<br>5  
  | 0<br>6<br>6<br>7<br>5<br>8<br>1<br>3<br>3<br>1<br>1<br>3<br>3<br>1<br>6<br>5<br>3<br>1<br>6<br>5<br>3<br>1<br>6<br>5<br>3<br>1<br>6<br>5<br>3<br>1<br>6<br>5<br>3<br>1<br>6<br>5<br>3<br>1<br>6<br>5<br>3<br>1<br>6<br>5<br>3<br>1<br>6<br>6<br>7<br>8<br>7<br>8<br>7<br>8<br>7<br>8<br>7<br>8<br>7<br>8<br>7<br>8<br>7<br>8<br>7<br>8   
  | 100<br>100<br>100<br>100<br>100<br>100<br>100<br>100 
  | NMX<br>8 6<br>8 6<br>8 7<br>8 7<br>8 7<br>8 7<br>8 7<br>8 7<br>8 7<br>8 7  | 3         Year           6         Ya           52         Ya           53         Ya           53         Ya           53         Ya           33         Ya           34         Ya           35         Ya           64         Ya           117         Ya           127         Ya           123         Ya           123         Ya           124         Ya           125         Ya           127         Ya           128         Ya           1   
   
   | 3         700           6         7           6         7           5.2         7           5.3         7           5.4         70           3.3         70           3.4         70           3.5         70           3.5         70           3.5         70           3.5         70           5.5         70           5.6         70           5.7         70           5.8         70           5.9         70           5.1         70           5.2         70           5.1         70           5.1         70           5.1         70           5.1         70           5.1         70           5.1         70           3.2         70           3.2         70           3.2         70  
  | 3         Yes         19           6         7         Yes         19           528         Yes         6         33           528         Yes         6         33           13.0         Yes         33         9           3.1         Yes         6         33           3.2         Yes         9         3           3.3         Yes         9         3           3.4         Yes         9         3           3.4         Yes         9         3           5.1         Yes         9         3           6.6         Yes         9         3           1.1         Yes         9         3           1.1         Yes         9         3           2.1         Yes         9         3           3.1         Yes         9         3           3.1         Yes         9         3           3.1         Yes         9         3           3.2         Yes         10         10           3.2         Yes         10         3           3.2         Yes         10   
   | 3         Year         19           5         Year         19           5.2         Year         10           5.3         Year         10           3.3         Year         11           3.4         Year         11           3.4         Year         11           3.4         Year         11           4.5         Year         11           4.6         Year         11           1.1         Year         11 <td>3         Year         10         Wat           5         Year         10         Wat           5         Year         10         Wat           5.5         Year         10         Wat           5.5         Year         10         Wat           5.5         Year         10         Wat           13.3         Year         20         Wat           3.1         Ho         20         Hot           3.1         Ho         20         Hot           3.1         Hot         20         Hot           3.2         Hot         20         Hot           3.1         Hot         20         Hot           3.1         Hot         20         Hot           4.1         Year         10         Hot           2.1         Year         10         Hot           4.1         Year         10         Hot           1.1         Year         10         Hot           2.2         Hot         11         Hot           2.3         Hot         12         Hot           2.3         Year         10         Hot</td> <td>3         Year         19         Year           6         Year         19         Year           5.3         Year         19         Year           5.3         Year         10         Year           7.3         Year         10         Year           7.3         Year         10         Year           7.3         Year         10         Year           7.4         Year         10         Year           7.4         Year         10         Year           7.4         Year         10         Year           7.5         Year         10         Year           7.4         Year         10         Year           7.5         Year         10         11/A           7.6         10         11         11/A           7.6         10         11         11/A           7.6         10         11         11/A           7.6         10         11         11/A           7.7         10         11         11/A           7.7         10         11         11/A           7.7         10         11         11</td> <td>3         Year         10         Wat           5         Year         10         Wat           5         Year         10         Wat           5.5         Year         10         Wat           5.5         Year         10         Wat           5.5         Year         20         Wat           5.5         Year         20         Wat           3.3         Year         20         Wat           3.3         Year         20         Wat           3.4         Wat         20         Wat           3.1         Wat         20         Wat           4.1         Year         20         Wat           5.1         Year         20         Wat           5.1         Year         20         Wat           5.1         Year         20         Wat           5.1         Year         20         Wat           5.2         Year         20         Wat           5.3         Year         20         Wat           5.3         Year         20         Wat           5.3         Year         20         Wat</td> <td>3         Year         19         Wat           6         Year         19         Wat           5.5         Year         19         Wat           5.3         Year         19         Wat           7.3         Year         10         Wat           7.3         Year         10         Wat           7.3         Year         10         Wat           7.4         Na         20         Wat           7.4         Na         20         Na           7.5         Yea         20         Na           7.4         Na         20         Na           7.5         Yea         20         Na           7.5         Yea         20         Na           7.5         Na         7         2           7.5         Na         7         2           7.6         10         10         10           7.7<td>3         Year         10         Wat           5         Year         10         Wat           5         Year         10         Wat           5.5         Year         10         Wat           5.5         Year         10         Wat           5.5         Year         10         Wat           5.5         Year         20         Wat           13.3         Year         20         Wat           3.3         Year         20         Wat           3.3         Year         20         Wat           3.4         Year         20         Wat           4.4         Year         20         Wat           5.1         Year         20         Wat           6.2         Year         20         Wat           11         Year         20         Wat           2.1         Year         20         Wat           2.2         Year         20         Wat           2.3         Year         20         Wat           2.3         Year         20         Wat           2.4         Year         20         Wat</td><td>3         Year         19         Year           5         Year         19         Year           5.3         Year         19         Year           5.3         Year         10         Year           7.3         Year         10         Year           7.3         Year         10         Year           7.4         No         3         No           7.4         No         3         No           7.4         No         3         No           7.5         Year         10         No           7.6         No         3         No           7.1         Year         10         No           7.1         Year         10         10           7.6         Year         10         10           7.1         No         1         10           1.1         Year         10         10           1.1         Year         10         10         10           1.1         Year         10         10         10           1.1         Year         10         10         10           1.2         Year</td></td> | 3         Year         10         Wat           5         Year         10         Wat           5         Year         10         Wat           5.5         Year         10         Wat           5.5         Year         10         Wat           5.5         Year         10         Wat           13.3         Year         20         Wat           3.1         Ho         20         Hot           3.1         Ho         20         Hot           3.1         Hot         20         Hot           3.2         Hot         20         Hot           3.1         Hot         20         Hot           3.1         Hot         20         Hot           4.1         Year         10         Hot           2.1         Year         10         Hot           4.1         Year         10         Hot           1.1         Year         10         Hot           2.2         Hot         11         Hot           2.3         Hot         12         Hot           2.3         Year         10         Hot  
   | 3         Year         19         Year           6         Year         19         Year           5.3         Year         19         Year           5.3         Year         10         Year           7.3         Year         10         Year           7.3         Year         10         Year           7.3         Year         10         Year           7.4         Year         10         Year           7.4         Year         10         Year           7.4         Year         10         Year           7.5         Year         10         Year           7.4         Year         10         Year           7.5         Year         10         11/A           7.6         10         11         11/A           7.6         10         11         11/A           7.6         10         11         11/A           7.6         10         11         11/A           7.7         10         11         11/A           7.7         10         11         11/A           7.7         10         11         11   
  | 3         Year         10         Wat           5         Year         10         Wat           5         Year         10         Wat           5.5         Year         10         Wat           5.5         Year         10         Wat           5.5         Year         20         Wat           5.5         Year         20         Wat           3.3         Year         20         Wat           3.3         Year         20         Wat           3.4         Wat         20         Wat           3.1         Wat         20         Wat           4.1         Year         20         Wat           5.1         Year         20         Wat           5.1         Year         20         Wat           5.1         Year         20         Wat           5.1         Year         20         Wat           5.2         Year         20         Wat           5.3         Year         20         Wat           5.3         Year         20         Wat           5.3         Year         20         Wat   | 3         Year         19         Wat           6         Year         19         Wat           5.5         Year         19         Wat           5.3         Year         19         Wat           7.3         Year         10         Wat           7.3         Year         10         Wat           7.3         Year         10         Wat           7.4         Na         20         Wat           7.4         Na         20         Na           7.5         Yea         20         Na           7.4         Na         20         Na           7.5         Yea         20         Na           7.5         Yea         20         Na           7.5         Na         7         2           7.5         Na         7         2           7.6         10         10         10           7.7 <td>3         Year         10         Wat           5         Year         10         Wat           5         Year         10         Wat           5.5         Year         10         Wat           5.5         Year         10         Wat           5.5         Year         10         Wat           5.5         Year         20         Wat           13.3         Year         20         Wat           3.3         Year         20         Wat           3.3         Year         20         Wat           3.4         Year         20         Wat           4.4         Year         20         Wat           5.1         Year         20         Wat           6.2         Year         20         Wat           11         Year         20         Wat           2.1         Year         20         Wat           2.2         Year         20         Wat           2.3         Year         20         Wat           2.3         Year         20         Wat           2.4         Year         20         Wat</td> <td>3         Year         19         Year           5         Year         19         Year           5.3         Year         19         Year           5.3         Year         10         Year           7.3         Year         10         Year           7.3         Year         10         Year           7.4         No         3         No           7.4         No         3         No           7.4         No         3         No           7.5         Year         10         No           7.6         No         3         No           7.1         Year         10         No           7.1         Year         10         10           7.6         Year         10         10           7.1         No         1         10           1.1         Year         10         10           1.1         Year         10         10         10           1.1         Year         10         10         10           1.1         Year         10         10         10           1.2         Year</td>  | 3         Year         10         Wat           5         Year         10         Wat           5         Year         10         Wat           5.5         Year         10         Wat           5.5         Year         10         Wat           5.5         Year         10         Wat           5.5         Year         20         Wat           13.3         Year         20         Wat           3.3         Year         20         Wat           3.3         Year         20         Wat           3.4         Year         20   
     Wat           4.4         Year         20         Wat           5.1         Year         20         Wat           6.2         Year         20         Wat           11         Year         20         Wat           2.1         Year         20         Wat           2.2         Year         20         Wat           2.3         Year         20         Wat           2.3         Year         20         Wat           2.4         Year         20         Wat  | 3         Year         19         Year           5         Year         19         Year           5.3         Year         19         Year           5.3         Year         10         Year           7.3         Year         10         Year           7.3         Year         10         Year           7.4         No         3         No           7.4         No         3         No           7.4         No         3         No           7.5         Year         10         No           7.6         No         3         No           7.1         Year         10         No           7.1         Year         10         10           7.6         Year         10         10           7.1         No         1         10           1.1         Year         10         10           1.1         Year         10         10         10           1.1         Year         10         10         10           1.1         Year         10         10         10           1.2         Year   |
| 23 16<br>23 57<br>23 57<br>16 11<br>15 16<br>15<br>15<br>15<br>15<br>0          | 110<br>110<br>110<br>110<br>110<br>110<br>110<br>110<br>110<br>110 | 57<br>15<br>15<br>15<br>15<br>15<br>15<br>15<br>15<br>15<br>15<br>15<br>15<br>15 |   |  | 42<br>6<br>55<br>55<br>55<br>55<br>52<br>52<br>52<br>52<br>52<br>52<br>52<br>52<br>52   
   
   
   | 42<br>58<br>53<br>55<br>55<br>55<br>55<br>55<br>55<br>55<br>55<br>55<br>55<br>55<br>55  | 42<br>42<br>55<br>55<br>55<br>55<br>55<br>55<br>55<br>55<br>55<br>55<br>55<br>55<br>55   | 4.2<br>4.2<br>5.6<br>7.8<br>2.2<br>2.2<br>2.3<br>3.5<br>2.2<br>3.3<br>1.6<br>1.6<br>1.6<br>1.6<br>1.6<br>1.6<br>1.6<br>1.6<br>1.6<br>1.6  | 2005-2005-2005-2005-2005-2005-2005-2005  
   
   
   | 42<br>2005<br>2005<br>2005<br>2005<br>2005<br>2005<br>2005<br>20  
   
   
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  | 다   | ·우·영양(2017)~ · · · · · · · · · · · · · · · · · · ·   | 442<br>442<br>135<br>135<br>135<br>148<br>148<br>148<br>148<br>148<br>148<br>148<br>148<br>148<br>148   
   
   |   
  | 4.0         Yan         4.0           5         Yan         4.0           3.10         Yan         4.0           3.11         Yan         4.0           4.11         Yan   
   | 4.6.5 1, 12, 12, 12, 12, 12, 12, 12, 12, 12,  
   | 4.2         Yan         4.3         Yan           2.2         Yan         4.5         Yan           2.3         Yan         4.5         Yan           2.3         Yan         4.5         Yan           2.3         Yan         4.5         Yan           2.4         Yan         4.6         Yan           2.1         Yan         4.6         Yan           2.3         Yan         Yan         Yan           2.4         Yan         Yan         Yan           2.2         Yan         Yan         Yan           2.4         Yan         Yan         Yan           2.5         Yan         Yan         Yan           2.5         Yan         Yan         Yan           2.6         Yan         Yan         Yan           2.7         Yan         Yan         Yan           2.3         Yan         Yan         Yan   | 4.2         Yan         4.3         Yan           2.2         Yan         4.3         Yan           2.2         Yan         4.3         Yan           2.1         Yan         4.3         Yan           2.1         Yan         4.3         Yan           2.1         Yan         2.4         Yan           2.1         Yan         2.4         Yan           2.1         Yan         2.4         Yan           2.1         Yan         2.4         Yan           2.2         Yan         2.4         Yan           2.3         Yan         2.4         Yan           2.4         Yan         2.4         Yan           2.5         Yan         2.4         Yan   
  | 4.2         Yang         4.3         Yang         4.3         Yang           2.2         Yang         4.5         Yang         4.5         Yang           3.3         Yang         4.6         Yang         4.6         Yang           3.3         Yang         4.6         Yang         4.6         Yang           3.3         Yang         4.6         Yang         4.6         Yang           3.3         Yang         Yang         4.6         Yang         4.6         Yang           3.3         Yang         Yang         Yang         Yang         Yang         Yang           3.4         Yang         Yang         Yang         Yang         Yang         Yang           3.4         Yang         Yang         Yang         Yang         Yang         Yang           3.5         Yang         Yang         Yang         Yang         Yang         Yang           3.2         Yang         Yang         Yang         Yang         Yang         Yang           3.2         Yang         Yang         Yang         Yang         Yang         Yang           3.3         Yang         Yang         Yang   | 4.2         Yan         4.3         Yan           2.2         Yan         4.3         Yan           3.1         Yan         4.3         Yan           3.1         Yan         4.3         Yan           3.1         Yan         2.4         Yan           4.4         Yan         2.4         Yan           5.5         Yan         1.4           5.6         Yan         1.4           5.7         Yan         1.4           5.8         Yan         1.4           5.9         Yan         1.4           5.1         Yan         1.4           5.2         Yan         1.4           5.3         Yan         1.4           5.4         Yan         1.4           5.5         Yan         1.4 <td>4.2         Yang         4.3         Yang         4.3         Yang           2.2         Yang         4.6         MA          
1.1         Ho         2.1         Yang         4.6         MA           1.1.1         Ho         2.1         Ho         2.1         Ho           2.1         Ho         2.1         Ho         2.1         HA           2.1         Ho         2         Ho         2.1         HA           2.1         Ho         2         Ho         2.1         HA           2.2         Ho         2         Ho         2.1         HA           2.2         Ho         2         Ho         2.1         HA           2.2         Ho         2         HA         HA         HA           2.1         Ho         2         HA         HA           2.2         Ho         HA         HA         HA           2.1         Ho         HA         HA         HA           2.1         Ho         HA         HA         HA           2.1         Ho         HA         HA         HA           2.2         Ho         HA&lt;</td> <td>4.2         Yang         4.3         Yang         4.3         Yang           2.2         Yang         4.3         Yang         4.3         Yang           3.1         Yang         4.3         Yang         4.3         Yang           3.1         Yang         4.3         Yang         4.4         Yang           3.1         Yang         Yang         Yang         Yang         Yang           3.2         Yang         Yang         Yang         Yang         Yang           3.1         Yang         Yang         Yang         Yang         Yang           3.1         Yang         Yang         Yang         Yang         Yang           3.2         Yang         Yang         Yang         Yang         Yang           3.2         Yang         Yang         Yang         Yang         Yang           3.2         Yang         Yang         Yang</td>          | 4.2         Yang         4.3         Yang         4.3         Yang           2.2         Yang         4.6         MA           1.1         Ho         2.1         Yang         4.6         MA           1.1.1         Ho         2.1         Ho         2.1         Ho           2.1         Ho         2.1         Ho         2.1         HA           2.1         Ho         2         Ho         2.1         HA           2.1         Ho         2         Ho         2.1         HA           2.2         Ho         2         Ho         2.1         HA           2.2         Ho         2         Ho         2.1         HA           2.2         Ho         2         HA         HA         HA           2.1         Ho         2         HA         HA           2.2         Ho         HA         HA         HA           2.1         Ho         HA         HA         HA           2.1         Ho         HA         HA         HA           2.1         Ho         HA         HA         HA           2.2         Ho         HA<  | 4.2         Yang         4.3         Yang         4.3         Yang           2.2         Yang         4.3         Yang         4.3         Yang           3.1         Yang         4.3         Yang         4.3         Yang           3.1         Yang         4.3         Yang         4.4         Yang           3.1         Yang         Yang         Yang         Yang         Yang           3.2         Yang         Yang         Yang         Yang         Yang           3.1         Yang         Yang         Yang         Yang         Yang           3.1         Yang         Yang         Yang         Yang         Yang           3.2         Yang         Yang         Yang         Yang         Yang           3.2         Yang         Yang         Yang         Yang         Yang           3.2         Yang         Yang         Yang   |
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  | 2.20         Yes         66           3.3.1         Yes         Yes         66           3.3.1         Ho         Ho         31           3.3.1         Ho         Ho         13           3.3.1         Yes         Ho         14           4.1         Ho         Ho         14           2.2         Ho         Ho         14           2.3         Ho         Ho         14           2.4         Ho         Ho         14           2.4         Ho         Ho         14           2.5         Ho         Yes         14           2.3         Ho         Ho         14           2.3   | (4) 11(1)(1)(1)(1)(1)(1)(1)(1)(1)(1)(1)(1)(1  
   | 2.20         Yes         66           3.3.1         Wes         66           3.3.1         Wes         31           3.3.1         Ves         30           4.1         Wes         30           4.1         Wes         30           4.1         Wes         30           3.2         Wes         30           3.3         Ves         30           3.4         Ves         30  
   | S28         Yes         66           11.1         10.0         10.0         10.0           11.1         10.0         10.0         10.0         10.0           11.1         10.0         10.0         10.0         10.0         10.0           11.1         10.0         10.0         10.0         10.0         10.0         10.0           11.1         10.0  | 2.20         Yes         66           3.3.1         Wes         Wes         66           3.3.1         Wes         Wes         31           3.3.1         Wes         Wes         31           3.3.1         Wes         Wes         Wes         31           4.1         Wes         Wes         Wes         31           2.3.1         Wes         Wes         31         31           3.3.2 
       Wes         Wes         31         31           3.3.3         Wes         Wes         31         31           3.3.3         Wes         Wes         31         31           3.3.3   | 2.28 Yes 66<br>11.11.11.11.11.11.11.11.11.11.11.11.11.  | 2.20         Yes         66           3.3.1         10.         10.         10.           3.3.1         10.         10.         10.         10.           3.3.1         10.         10.         10.         10.         10.           3.3.1         10.         10.         10.         10.         10.         10.           2.3.1         10.         10.         10.         10.         10.         10.         10.           2.3.1         10. <td>2.28 Yes 52<br/>13.10 Yes 76<br/>2.2.2 Hold Yes 75<br/>2.2.2 Hold Yes 75<br/>2.2.2 Hold Yes 75<br/>2.2.2 Yes 75<br/>2.2 Yes 7</td> | 2.28 Yes 52<br>13.10 Yes 76<br>2.2.2 Hold Yes 75<br>2.2.2 Hold Yes 75<br>2.2.2 Hold Yes 75<br>2.2.2 Yes 75<br>2.2 Yes 7   |
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   | 255 (66 11)<br>21,13 (66 11)<br>21,13 (66 11)<br>22,13 (66 11)<br>24,14 (66 11)<br>24,14 (76 11)<br>25,14 (7  | 11.1.1.1.1.1.1.1.1.1.1.1.1.1.1.1.1.1.1  
   | 3.5.5         4.1         1.0         3.1           2.1,1         1.0         1.0         1.0         3.1           2.1,1         1.0         1.0         3.1         3.1           2.1,1         1.0         1.0         3.1         3.1           2.1,1         1.0         1.0         3.1         3.1           2.1,1         1.0         1.0         1.0         3.1           2.1,1         1.0         1.0         1.0         1.0           2.1,1         1.0         1.0         1.0         1.0           2.1,1         1.0         1.0         1.0         1.0           2.1,1         1.0         1.0         1.0         1.0           2.1,1         1.0         1.0         1.0         1.0           2.1,1         1.0         1.0         1.0         1.0           2.1,1         1.0         1.0         1.0         1.0           2.1,1         1.0         1.0         1.0         1.0           2.2,1         1.0         1.0         1.0         1.0           2.2,2         1.0         1.0         1.0         1.0           2.2,2         1.0 </td <td>2015/2017<br/>2011/2017<br/>2011/2017<br/>2011/2017<br/>2011/2017<br/>2011/2017<br/>2011/2017<br/>2011/2017<br/>2011/2017<br/>2011/2017<br/>2011/2017<br/>2011/2017<br/>2011/2017<br/>2011/2017<br/>2011/2017<br/>2011/2017<br/>2011/2017<br/>2011/2017<br/>2011/2017<br/>2011/2017<br/>2011/2017<br/>2011/2017<br/>2011/2017<br/>2011/2017<br/>2011/2017<br/>2011/2017<br/>2011/2017<br/>2011/2017<br/>2011/2017<br/>2011/2017<br/>2011/2017<br/>2011/2017<br/>2011/2017<br/>2011/2017<br/>2011/2017<br/>2011/2017<br/>2011/2017<br/>2011/2017<br/>2011/2017<br/>2011/2017<br/>2011/2017<br/>2011/2017<br/>2011/2017<br/>2011/2017<br/>2011/2017<br/>2011/2017<br/>2011/2017<br/>2011/2017<br/>2011/2017<br/>2011/2017<br/>2011/2017<br/>2011/2017<br/>2011/2017<br/>2011/2017<br/>2011/2017<br/>2011/2017<br/>2011/2017<br/>2011/2017<br/>2011/2017<br/>2011/2017<br/>2011/2017<br/>2011/2017<br/>2011/2017<br/>2011/2017<br/>2011/2017<br/>2011/2017<br/>2011/2017<br/>2011/2017<br/>2011/2017<br/>2011/2017<br/>2011/2017<br/>2011/2017<br/>2011/2017<br/>2011/2017<br/>2011/2017<br/>2011/2017<br/>2011/2017<br/>2011/2017<br/>2011/2017<br/>2011/2017<br/>2011/2017<br/>2011/2017<br/>2011/2017<br/>2011/2017<br/>2011/2017<br/>2011/2017<br/>2011/2017<br/>2011/2017<br/>2011/2017<br/>2011/2017<br/>2011/2017<br/>2011/2017<br/>2011/2017<br/>2011/2017<br/>2011/2017<br/>2011/2017<br/>2011/2017<br/>2011/2017<br/>2011/2017<br/>2011/2017<br/>2011/2017<br/>2011/2017<br/>2011/2017<br/>2011/2017<br/>2011/2017<br/>2011/2017<br/>2011/2017<br/>2011/2017<br/>2011/2017<br/>2011/2017<br/>2011/2017<br/>2011/2017<br/>2011/2017<br/>2011/2017<br/>2011/2017<br/>2011/2017<br/>2011/2017<br/>2011/2017<br/>2011/2017<br/>2011/2017<br/>2011/2017<br/>2011/2017<br/>2011/2017<br/>2011/2017<br/>2011/2017<br/>2011/2017<br/>2011/2017<br/>2011/2017<br/>2011/2017<br/>2011/2017<br/>2011/2017<br/>2011/2017<br/>2011/2017<br/>2011/2017<br/>2011/2017<br/>2011/2017<br/>2011/2017<br/>2011/2017<br/>2011/2017<br/>2011/2017<br/>2011/2017<br/>2011/2017<br/>2011/2017<br/>2011/2017<br/>2011/2017<br/>2011/2017<br/>2011/2017<br/>2011/2017<br/>2011/2017<br/>2011/2017<br/>2011/2017<br/>2011/2017<br/>2011/2017<br/>2011/2017<br/>2011/2017<br/>2011/2017<br/>2011/2017<br/>2011/2017<br/>2011/2017<br/>2011/2017<br/>2011/2017<br/>2011/2017<br/>2011/2017<br/>2011/2017<br/>2011/2017<br/>2011/2017<br/>2011/2017<br/>2011/2017<br/>2011/2017<br/>2011/2017<br/>2011/2017<br/>2011/2017<br/>2011/2017<br/>2011/2017<br/>2011/2017<br/>2011/2017<br/>2011/2017<br/>2011/2017<br/>2011/2017<br/>2011/2017<br/>2011/2017<br/>2011/2017<br/>2011/2017<br/>2011/2017<br/>2011/2017<br/>2011/2017<br/>2011/2017<br/>2011/2017<br/>2011/2017<br/>2011/2017<br/>2011/2017<br/>2011/2017<br/>2011/2017<br/>2011/2017<br/>2011/2017<br/>2011/2017<br/>2011/2017<br/>2011/2017<br/>2011/2017<br/>2011/2017<br/>2011/2017<br/>2011/2017<br/>2011/2017<br/>2011/2017<br/>2011/</td> <td>2,55<br/>2,1,1,1,1,1,1,1,1,1,1,1,1,1,1,1,1,1,1,1</td> <td>2015/2011/2014/2014/2014/2014/2014/2014/2014</td>
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   | 133<br>MA<br>2.4<br>2.4<br>2.4<br>2.4<br>2.4<br>2.5<br>2.5<br>2.5<br>2.5<br>2.5<br>2.5<br>2.5<br>2.5<br>2.5<br>2.5  
  | 133<br>24<br>24<br>24<br>24<br>24<br>25<br>52<br>52<br>52<br>52<br>52<br>52<br>52<br>52<br>52<br>52<br>52<br>52  | 133<br>NA<br>23<br>134<br>24<br>25<br>55<br>55<br>55<br>55<br>55<br>55<br>55<br>55<br>55<br>55<br>55<br>55  
  | 133<br>134<br>135<br>135<br>135<br>137<br>137<br>137<br>137<br>137<br>137<br>137<br>137<br>137<br>137  
  | 133<br>14<br>15<br>15<br>15<br>15<br>15<br>15<br>15<br>15<br>15<br>15<br>15<br>15<br>15  
   
  | 193<br>8<br>8<br>10<br>10<br>10<br>10<br>10<br>10<br>10<br>10<br>10<br>10<br>10<br>10<br>10   | 193<br>194<br>194<br>194<br>194<br>194<br>194<br>194<br>194<br>194<br>194  | 13.0 (res<br>13.0 (res<br>13.1 (res))))))))))))))))))))))))))))))))))))   
   | 133<br>133<br>133<br>133<br>133<br>133<br>133<br>133  
   
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   | 13.2 (65)<br>13.2 (65)<br>13.2 (15)<br>13.3 (15)<br>13  | 13.0 (66<br>13.0 (66<br>3.1 (66<br>13.0 (66<br>13.0 (66<br>14.1 (76)<br>15.1 (  
   | 133 (65)<br>133 (65)<br>133 (65)<br>133 (65)<br>133 (65)<br>134 (65)<br>135  | 13.0         10.0           13.1         10.0           13.1         10.0           13.1         10.0           13.1         10.0           14.1         10.0           15.1         10.0           16.1         10.0           17.1         10.0           18.1         10.0           19.1         10.0           11.1 <td>133<br/>134<br/>135<br/>135<br/>135<br/>135<br/>135<br/>135<br/>135<br/>135<br/>135<br/>135</td> <td>13.0         10.0           13.1         10.0           13.1         10.0           13.1         10.0           13.1         10.0           13.1         10.0           13.1         10.0           13.1         10.0           13.1         10.0           13.1         10.0           14.1         10.0           15.1         10.0           15.1         10.0           15.1         10.0           15.1         10.0           15.1         10.0           15.1         10.0           15.1         10.0           15.1         10.0           15.1         10.0           15.1         10.0           15.1         10.0           15.1         10.0           15.1         10.0           15.1         10.0           15.2         10.0           15.2         10.0           15.2         10.0           15.2         10.0           15.2         10.0           15.2         10.0           15.2         10.0           15.2<td>33         7(6)           33         7(9)           33         8(9)           33         8(9)           34         8(9)           35         7(9)           36         7(9)           37         7(9)           38         7(9)           39         7(9)           31         8(9)           32         7(9)           33         7(9)           34         7(9)           32         7(9)           33         7(9)           33         7(9)           34         7(9)           35         7(9)           36         7(9)           37         7(9)           38         7(9)           36         7(9)           37         7(9)           38         7(9)           39         7(9)           31         7(9)           32         7(9)           33         7(9)           34         7(9)           35         7(9)           36         7(9)           37         7(9)           38</td></td>  | 133<br>134<br>135<br>135<br>135<br>135<br>135<br>135<br>135<br>135<br>135<br>135   
  | 13.0         10.0           13.1         10.0           13.1         10.0           13.1         10.0           13.1         10.0           13.1         10.0           13.1         10.0           13.1         10.0           13.1         10.0           13.1         10.0           14.1         10.0           15.1         10.0           15.1         10.0           15.1         10.0           15.1         10.0           15.1         10.0           15.1         10.0           15.1         10.0           15.1         10.0           15.1         10.0           15.1         10.0           15.1         10.0           15.1         10.0           15.1         10.0           15.1         10.0           15.2         10.0           15.2         10.0           15.2         10.0           15.2         10.0           15.2         10.0           15.2         10.0           15.2         10.0           15.2 <td>33         7(6)           33         7(9)           33         8(9)           33         8(9)           34         8(9)           35         7(9)           36         7(9)           37         7(9)           38         7(9)           39         7(9)           31         8(9)           32         7(9)           33         7(9)           34         7(9)           32         7(9)           33         7(9)           33         7(9)           34         7(9)           35         7(9)           36         7(9)           37         7(9)           38         7(9)           36         7(9)           37         7(9)           38         7(9)           39         7(9)           31         7(9)           32         7(9)           33         7(9)           34         7(9)           35         7(9)           36         7(9)           37         7(9)           38</td>   | 33         7(6)           33         7(9)           33         8(9)           33         8(9)           34         8(9)           35         7(9)           36         7(9)           37         7(9)           38         7(9)           39         7(9)           31         8(9)           32         7(9)           33         7(9)           34         7(9)           32         7(9)           33         7(9)           33         7(9)           34         7(9)           35         7(9)           36         7(9)           37         7(9)           38         7(9)           36         7(9)           37         7(9)           38         7(9)           39         7(9)           31         7(9)           32         7(9)           33         7(9)           34         7(9)           35         7(9)           36         7(9)           37         7(9)           38  |
|   | 16<br>7<br>12  | 204  | 121   | 1 Z  | 2 23<br>24<br>24<br>25<br>25<br>25<br>25<br>25<br>25<br>25<br>25<br>25<br>25<br>25<br>25<br>25  
   
   
   | 1.8<br>3.3<br>2.4<br>2.4<br>5.5<br>5.5<br>5.5<br>5.5<br>5.5<br>5.5<br>5.5<br>5.5<br>5.5<br>5  | 1.8<br>3.3<br>2.4<br>2.4<br>5.5<br>5.2<br>5.5<br>5.5<br>5.5<br>5.5<br>5.5<br>5.5<br>5.5<br>5.5   | N<br>N<br>N<br>N<br>N<br>N<br>N<br>N<br>N<br>N<br>N<br>N<br>N<br>N<br>N<br>N<br>N<br>N<br>N   | 23<br>24<br>24<br>24<br>24<br>24<br>24<br>24<br>24<br>24<br>24<br>24<br>24<br>24   
   
   
   | N 19<br>19<br>19<br>19<br>19<br>19<br>19<br>19<br>19<br>19<br>19<br>19<br>19<br>1   
   
   
   | NMX<br>2.2<br>5.2<br>5.2<br>5.2<br>5.2<br>5.2<br>5.2<br>5.2<br>5.2<br>5.2  | 1.1.4<br>2.2.2<br>2.2.2<br>2.2.2<br>2.2.2<br>5.2.1<br>5.2.1<br>5.2.1<br>5.2.1<br>5.2.1<br>5.2.1<br>5.2.1<br>5.2.1<br>5.2.1<br>5.2.1<br>5.2.1<br>5.2.1<br>5.2.1<br>5.2.1<br>5.2.1<br>5.2.1<br>5.2.1<br>5.2.1<br>5.2.1<br>5.2.1<br>5.2.1<br>5.2.1<br>5.2.1<br>5.2.1<br>5.2.1<br>5.2.1<br>5.2.1<br>5.2.1<br>5.2.1<br>5.2.1<br>5.2.1<br>5.2.1<br>5.2.1<br>5.2.1<br>5.2.1<br>5.2.1<br>5.2.1<br>5.2.1<br>5.2.1<br>5.2.1<br>5.2.1<br>5.2.1<br>5.2.1<br>5.2.1<br>5.2.1<br>5.2.1<br>5.2.1<br>5.2.1<br>5.2.1<br>5.2.1<br>5.2.1<br>5.2.1<br>5.2.1<br>5.2.1<br>5.2.1<br>5.2.1<br>5.2.1<br>5.2.1<br>5.2.1<br>5.2.1<br>5.2.1<br>5.2.1<br>5.2.1<br>5.2.1<br>5.2.1<br>5.2.1<br>5.2.1<br>5.2.1<br>5.2.1<br>5.2.1<br>5.2.1<br>5.2.1<br>5.2.1<br>5.2.1<br>5.2.1<br>5.2.1<br>5.2.1<br>5.2.1<br>5.2.1<br>5.2.1<br>5.2.1<br>5.2.1<br>5.2.1<br>5.2.1<br>5.2.1<br>5.2.1<br>5.2.1<br>5.2.1<br>5.2.1<br>5.2.1<br>5.2.1<br>5.2.1<br>5.2.1<br>5.2.1<br>5.2.1<br>5.2.1<br>5.2.1<br>5.2.1<br>5.2.1<br>5.2.1<br>5.2.1<br>5.2.1<br>5.2.1<br>5.2.1<br>5.2.1<br>5.2.1<br>5.2.1<br>5.2.1<br>5.2.1<br>5.2.1<br>5.2.1<br>5.2.1<br>5.2.1<br>5.2.1<br>5.2.1<br>5.2.1<br>5.2.1<br>5.2.1<br>5.2.1<br>5.2.1<br>5.2.1<br>5.2.1<br>5.2.1<br>5.2.1<br>5.2.1<br>5.2.1<br>5.2.1<br>5.2.1<br>5.2.1<br>5.2.1<br>5.2.1<br>5.2.1<br>5.2.1<br>5.2.1<br>5.2.1<br>5.2.1<br>5.2.1<br>5.2.1<br>5.2.1<br>5.2.1<br>5.2.1<br>5.2.1<br>5.2.1<br>5.2.1<br>5.2.1<br>5.2.1<br>5.2.1<br>5.2.1<br>5.2.1<br>5.2.1<br>5.2.1<br>5.2.1<br>5.2.1<br>5.2.1<br>5.2.1<br>5.2.1<br>5.2.1<br>5.2.1<br>5.2.1<br>5.2.1<br>5.2.1<br>5.2.1<br>5.2.1<br>5.2.1<br>5.2.1<br>5.2.1<br>5.2.1<br>5.2.1<br>5.2.1<br>5.2.1<br>5.2.1<br>5.2.1<br>5.2.1<br>5.2.1<br>5.2.1<br>5.2.1<br>5.2.1<br>5.2.1<br>5.2.1<br>5.2.1<br>5.2.1<br>5.2.1<br>5.2.1<br>5.2.1<br>5.2.1<br>5.2.1<br>5.2.1<br>5.2.1<br>5.2.1<br>5.2.1<br>5.2.1<br>5.2.1<br>5.2.1<br>5.2.1<br>5.2.1<br>5.2.1<br>5.2.1<br>5.2.1<br>5.2.1<br>5.2.1<br>5.2.1<br>5.2.1<br>5.2.1<br>5.2.1<br>5.2.1<br>5.2.1<br>5.2.1<br>5.2.1<br>5.2.1<br>5.2.1<br>5.2.1<br>5.2.1<br>5.2.1<br>5.2.1<br>5.2.1<br>5.2.1<br>5.2.1<br>5.2.1<br>5.2.1<br>5.2.1<br>5.2.1<br>5.2.1<br>5.2.1<br>5.2.1<br>5.2.1<br>5.2.1<br>5.2.1<br>5.2.1<br>5.2.1<br>5.2.1<br>5.2.1<br>5.2.1<br>5.2.1<br>5.2.1<br>5.2.1<br>5.2.1<br>5.2.1<br>5.2.1<br>5.2.1<br>5.2.1<br>5.2.1<br>5.2.1<br>5.2.1<br>5.2.1<br>5.2.1<br>5.2.1<br>5.2.1<br>5.2.1<br>5.2.1<br>5.2.1<br>5.2.2.2.1<br>5.2.1<br>5.2.1<br>5.2.1<br>5.2.1<br>5.2.1<br>5.2.1<br>5.2.1<br>5.2.1<br>5.2.1<br>5.2.1<br>5.2.1<br>5.2.1<br>5.2.1<br>5.2.1<br>5.2.1<br>5.2.1<br>5.2.1<br>5.2.1<br>5.2.1<br>5.2.1<br>5.2.1<br>5.2.1<br>5.2.1<br>5.2.1<br>5.2.1<br>5.2.1<br>5.2.1<br>5.2.1<br>5.2.1<br>5.2.1<br>5.2.1<br>5.2.1<br>5.2.1<br>5.2.1<br>5.2.1<br>5.2.1<br>5.2.1<br>5.2.1<br>5.2.1<br>5.2.1<br>5.2.1<br>5.2.1<br>5.2.1<br>5.2.1<br>5.2.1<br>5.2.1<br>5.2.1<br>5.2.1<br>5.2.1<br>5.2.1<br>5.2.1<br>5.2.1<br>5.2.1<br>5.2.1<br>5.2.1<br>5.2.1<br>5.2.1<br>5.2.1<br>5.2.1<br>5.2.1<br>5.2.1<br>5.2.1<br>5.2.1<br>5.2.1<br>5.2.1<br>5.2.1<br>5.2.1<br>5.2.1<br>5.2.1<br>5.2.1<br>5.2.1<br>5.2.1<br>5.2.1<br>5.2.1<br>5.2.1<br>5.2.1<br>5.2.1<br>5.2.1<br>5.2.1<br>5.2.1<br>5.2.1<br>5.2.1<br>5.2.1<br>5.2.1<br>5. | 1.8<br>2.3<br>2.3<br>2.3<br>2.3<br>2.3<br>5.5<br>5.5<br>5.5<br>5.5<br>5.5<br>5.5<br>5.5<br>5.5<br>5.5<br>5  
   
  | 11.8<br>11.8<br>12.8<br>12.4<br>12.4<br>12.4<br>12.4<br>12.4<br>12.4<br>12.4<br>12.4<br>12.4<br>12.4<br>12.4<br>12.4<br>12.4<br>12.4<br>12.4<br>12.4<br>12.4<br>12.4<br>12.4<br>12.4<br>12.4<br>12.4<br>12.4<br>12.4<br>12.4<br>12.4<br>12.4<br>12.4<br>12.4<br>12.4<br>12.4<br>12.4<br>12.4<br>12.4<br>12.4<br>12.4<br>12.4<br>12.4<br>12.4<br>12.4<br>12.4<br>12.4<br>12.4<br>12.4<br>12.4<br>12.4<br>12.4<br>12.4<br>12.4<br>12.4<br>12.4<br>12.4<br>12.4<br>12.4<br>12.4<br>12.4<br>12.4<br>12.4<br>12.4<br>12.4<br>12.4<br>12.4<br>12.4<br>12.4<br>12.4<br>12.4<br>12.4<br>12.4<br>12.4<br>12.4<br>12.4<br>12.4<br>12.4<br>12.4<br>12.4<br>12.4<br>12.4<br>12.4<br>12.4<br>12.4<br>12.4<br>12.4<br>12.4<br>12.4<br>12.4<br>12.4<br>12.4<br>12.4<br>12.4<br>12.4<br>12.4<br>12.4<br>12.4<br>12.4<br>12.4<br>12.4<br>12.4<br>12.4<br>12.4<br>12.4<br>12.4<br>12.4<br>12.4<br>12.4<br>12.4<br>12.4<br>12.4<br>12.4<br>12.4<br>12.4<br>12.4<br>12.4<br>12.4<br>12.4<br>12.4<br>12.4<br>12.4<br>12.4<br>12.4<br>12.4<br>12.4<br>12.4<br>12.4<br>12.4<br>12.4<br>12.4<br>12.4<br>12.4<br>12.4<br>12.4<br>12.4<br>12.4<br>12.4<br>12.4<br>12.4<br>12.4<br>12.4<br>12.4<br>12.4<br>12.4<br>12.4<br>12.4<br>12.4<br>12.4<br>12.4<br>12.4<br>12.4<br>12.4<br>12.4<br>12.4<br>12.4<br>12.4<br>12.4<br>12.4<br>12.4<br>12.4<br>12.4<br>12.4<br>12.4<br>12.4<br>12.4<br>12.4<br>12.4<br>12.4<br>12.4<br>12.4<br>12.4<br>12.4<br>12.4<br>12.4<br>12.4<br>12.4<br>12.4<br>12.4<br>12.4<br>12.4<br>12.4<br>12.4<br>12.4<br>12.4<br>12.4<br>12.4<br>12.4<br>12.4<br>12.4<br>12.4<br>12.4<br>12.4<br>12.4<br>12.4<br>12.4<br>12.4<br>12.4<br>12.4<br>12.4<br>12.4<br>12.4<br>12.4<br>12.4<br>12.4<br>12.4<br>12.4<br>12.4<br>12.4<br>12.4<br>12.4<br>12.4<br>12.4<br>12.4<br>12.4<br>12.4<br>12.4<br>12.4<br>12.4<br>12.4<br>12.4<br>12.4<br>12.4<br>12.4<br>12.4<br>12.4<br>12.4<br>12.4<br>12.4<br>12.4<br>12.4<br>12.4<br>12.4<br>12.4<br>12.4<br>12.4<br>12.4<br>12.4<br>12.4<br>12.4<br>12.4<br>12.4<br>12.4<br>12.4<br>12.4<br>12.4<br>12.4<br>12.4<br>12.4<br>12.4<br>12.4<br>12.4<br>12.4<br>12.4<br>12.4<br>12.4<br>12.4<br>12.4<br>12.4<br>12.4<br>12.4<br>12.4<br>12.4<br>12.4<br>12.4<br>12.4<br>12.4<br>12.4<br>12.4<br>12.4<br>12.4<br>12.4<br>12.4<br>12.4<br>12.4<br>12.4<br>12.4<br>12.4<br>12.4<br>12.4<br>12.4<br>12.4<br>12.4<br>12.4<br>12.4<br>12.4<br>12.4<br>12.4<br>12.4<br>12.4<br>12.4<br>12.4<br>12.4<br>12.4<br>12.4<br>12.4<br>12.4<br>12.4<br>12.4<br>12.4<br>12.4<br>12.4<br>12.4<br>12.4<br>12.4<br>12.4<br>12.4<br>12.4<br>12.4<br>12.4<br>12.4<br>12.4<br>12.4<br>12.4<br>12.4<br>12.4<br>12.4<br>12.4<br>12.4<br>12.4<br>12.4<br>12.4<br>12.4<br>12.4<br>12.4<br>12.4<br>12.4<br>12.4<br>12.4<br>12.4<br>12.4<br>12.4<br>12.4<br>12.4<br>12.4<br>12.4<br>12.4<br>12.4<br>12.4<br>12.4<br>12.4<br>12.4<br>12.4   
  | NA<br>2.2<br>2.4<br>2.4<br>2.4<br>2.4<br>2.5<br>2.5<br>2.5<br>2.5<br>2.5<br>2.5<br>2.5<br>2.5<br>2.5<br>2.5  
  | 1.8<br>2.4<br>2.4<br>2.4<br>2.4<br>2.4<br>2.5<br>2.5<br>2.5<br>2.5<br>2.5<br>2.5<br>2.5<br>2.5  | NA<br>2. 18<br>2. 2<br>2. 4<br>2. 4<br>2   | MA<br>MA<br>MA<br>MA<br>MA<br>MA<br>MA<br>MA<br>MA<br>MA  
   
   | ANA<br>2.2<br>2.4<br>2.4<br>2.4<br>2.4<br>2.4<br>2.4<br>2.4   
  | (1)<br>(1)<br>(1)<br>(1)<br>(1)<br>(1)<br>(1)<br>(1)   
   | ANA<br>2.4<br>2.4<br>2.4<br>2.4<br>2.4<br>2.4<br>2.4<br>2.4   
   | 18<br>18<br>18<br>18<br>18<br>18<br>18<br>18<br>18<br>18  | AMA 2.4<br>2.4<br>2.4<br>2.4<br>2.4<br>2.4<br>2.4<br>2.4  
  | (1) 11 11 11 11 11 11 11 11 11 11 11 11 1   | NA<br>1.8<br>1.8<br>1.8<br>1.8<br>1.8<br>1.8<br>1.8<br>1.8   
  | (1)<br>(1)<br>(1)<br>(1)<br>(1)<br>(1)<br>(1)<br>(1)   | AAA<br>2.2<br>2.4<br>2.4<br>2.4<br>2.4<br>2.5<br>2.5<br>2.5<br>2.5<br>2.5<br>2.5<br>2.5<br>2.5  |
| 35  |  |  |   | 21<br>1.6<br>1.6<br>1.4<br>1.7   | 21<br>16<br>16<br>14<br>14<br>14<br>14<br>14<br>14<br>14<br>14<br>14<br>14<br>14<br>14<br>14  
   
   
   | 21<br>15<br>NA<br>15<br>15<br>15<br>15<br>15<br>15<br>15<br>15<br>15<br>15<br>15<br>15<br>15  | 21<br>15<br>16<br>16<br>14<br>14<br>16<br>17<br>16<br>17<br>16<br>16<br>16<br>16<br>16<br>16<br>16<br>16<br>16<br>16<br>16<br>16<br>16   | 21<br>15<br>13<br>14<br>14<br>14<br>15<br>15<br>15<br>16<br>16<br>16<br>16<br>16<br>16<br>16<br>16<br>16<br>16<br>16<br>16<br>16  | 15<br>15<br>15<br>15<br>15<br>15<br>15<br>15<br>15<br>15<br>15<br>15<br>15<br>1  
   
   
   | 21<br>15<br>15<br>15<br>14<br>12<br>14<br>15<br>15<br>15<br>15<br>15<br>15<br>15<br>15<br>15<br>15  
   
   
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   | 2.6<br>5.2<br>5.4<br>5.1<br>5.1<br>5.4<br>5.4<br>7.4<br>6.6<br>6.6<br>6.6<br>6.6<br>7.4<br>6.0<br>6.6<br>7.4<br>6.6<br>6.6<br>7.4<br>6.6<br>6.6<br>7.4<br>6.6<br>7.4<br>6.6<br>7.4<br>6.6<br>7.4<br>6.6<br>7.4<br>6.6<br>7.4<br>7.4<br>6.6<br>7.4<br>7.4<br>7.4<br>7.4<br>7.4<br>7.4<br>7.4<br>7.4<br>7.4<br>7.4  | 50<br>51<br>51<br>51<br>51<br>51<br>51<br>51<br>51<br>51<br>51<br>51<br>51<br>51   | 2.6 2.6 2.7 2.6 2.6 2.6 2.6 2.6 2.6 2.6 2.6 2.6 2.6  
   
  | 3.0         0.0           5.3         Yes           5.3         Yes           5.4         Yes           5.5         K           5.6         Yes           5.1         No           5.1         No           6.4         Yes           6.5         Yes           6.6         Yes  
   | 2.6<br>5.7<br>5.7<br>5.7<br>5.7<br>5.7<br>5.7<br>5.7<br>5.7   
  | 2.6         0.6         40           5.2         0.6         40           5.2         0.6         40           5.1         0.6         40           5.1         0.6         40           5.1         0.6         40           5.1         0.6         40           5.1         0.6         40           5.1         0.6         40           6.4         0.6         110           0.6         0.6         10           0.6         10         110           0.6         10         110           0.6         10         110           0.6         10         110           0.6         10         110           0.6         10         110           0.6         10         10           0.6         10         10           0.7         10         10           0.8         10         10           0.9         10         10           0.9         10         10           0.9         10         10   | 2.6         0.6         6.0           5.1         0.6         0.0           5.2         0.6         0.0           5.2         0.6         0.0           5.1         0.6    
    0.0           5.1         0.6         0.0           5.1         0.6         0.0           5.1         0.6         0.0           5.1         0.6         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           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         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         0.0           0.0         0.0         0.0           0.0         0.0         0.0           0.0         0.0         0.0   | 2.6         0.0         40           5.2         0.0         40           5.1         0.0         40           5.1         0.0         40           5.1         0.0         40           5.1         0.0         40           5.1         0.0         40           5.1         0.0         40           5.1         0.0         100           0.4         0.0         110           0.4         0.0         110           0.4         0.0         110           0.4         0.0         110           0.4         0.0         110           0.4         0.0         110           0.4         0.0         110           0.4         0.0         110           0.0         0.0         20           0.0         0.0         20           0.0         0.0         20           0.0         0.0         20           0.0         0.0         20           0.0         0.0         20           0.0         0.0         20           0.0         0.0         20  
   | 16         10         60         60           5.2         Yea         9         9           5.2         Yea         9         9           5.3         Markin         9         9           5.4         Markin         9         9           5.4         Markin         9         9           5.4         Markin         11         14           6         Markin         13         14           6         Markin         13         14           6         Markin         14         14           Markin         Markin         14         14           Markin         14         14         14           Markin         14         14         14           Markin         14         16         12           Markin         16         16         16 <td>2.6         0.6         40           5.2         1%         40           5.1         1%         1%           5.1         1%         1%           5.1         1%         1%           5.1         1%         1%           5.1         1%         1%           5.1         1%         1%           5.1         1%         1%           6.4         1%         1%           6.4         1%         1%           6.4         1%         1%           6.4         1%         1%           6.4         1%         1%           6.4         1%         1%           6.4         1%         1%           6.4         1%         1%           6.4         1%         1%           6.4         1%         1%           6.4         1%         1%           6.5         1%         1%           6.6         1%         1%           6.7         1%         1%           7.3         1%         1%           7.4         1%         1%           7.5         1</td> <td>2.6         0.0         6.0           5.1         0.0         0.0           5.2         0.0         0.0           5.1         0.0         0.0           5.1         0.0         0.0           5.1         0.0         0.0           5.1         0.0         0.0           5.1         0.0         0.0           5.1         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         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           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         0.0         0.0           0.0         0.0         0.0           0.0         0.0         0.0           0.0         0.0         0.0</td> <td>2.6         0.0         40           5.2         10         40           5.1         10         10           5.1         10         10           5.1         10         10           5.1         10         10           5.1         10         10           5.1         10         10           6.4         10         10           6.4         10         10           6.4         10         10           6.4         10         10           6.4         10         10           6.4         10         10           6.4         10         10           6.5         10         10           6.6         10         10           6.6         10         10           6.6         10         10           6.6         10         10           7.4         10         10           6.5         10         10           7.5         10         10           7.5         10         10           7.5         10         10</td> | 2.6         0.6         40           5.2         1%         40           5.1         1%         1%           5.1         1%         1%           5.1         1%         1%           5.1         1%         1%           5.1         1%         1%           5.1         1%         1%           5.1         1%         1%           6.4         1%         1%           6.4         1%         1%           6.4         1%         1%           6.4         1%         1%           6.4         1%         1%           6.4         1%         1%           6.4         1%         1%           6.4         1%         1%           6.4         1%         1%           6.4         1%         1%           6.4         1%         1%           6.5         1%         1%           6.6         1%         1%           6.7         1%         1%           7.3         1%         1%           7.4         1%         1%           7.5         1  
   | 2.6         0.0         6.0           5.1         0.0         0.0           5.2         0.0         0.0           5.1         0.0         0.0           5.1         0.0         0.0           5.1         0.0         0.0           5.1         0.0         0.0           5.1         0.0         0.0           5.1         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         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           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         0.0         0.0           0.0         0.0         0.0           0.0         0.0         0.0           0.0         0.0         0.0  | 2.6         0.0         40           5.2         10         40           5.1         10         10           5.1         10         10           5.1         10         10           5.1         10         10           5.1         10         10           5.1         10         10           6.4         10         10           6.4         10         10           6.4         10         10           6.4         10         10           6.4         10         10           6.4         10         10           6.4         10         10           6.5         10         10           6.6         10         10           6.6         10         10           6.6         10         10           6.6         10         10           7.4         10         10           6.5         10         10           7.5         10         10           7.5         10         10           7.5         10         10  |
|   | 3 3.6 No 40 MV   | 3.0 No 40 NA   | 3.6 110 40 40   | 3.6 120 40 13/A<br>6.2 70es 9.3 AVA  | 10 49 10/   
   
   
   | 110 40 110<br>7es 11 100<br>Marks 20 100  | 10 40 104  | 10         20         11/4           Yes         11/4         11/4           Yes         11/4         11/4           Yes         11/4         11/4           Yes         11/4         11/4  | 10 20 100<br>Year 10 100<br>Maybe 50 100<br>Year 100<br>Year 100<br>100<br>100   
   
   
   | 10. 20. 10.0.<br>10. 20. 10.0.<br>10. 10. 10.<br>10. 10. 10.<br>10. 10. 10.<br>10. 10.<br>10. 10. 10.<br>10. 10. 10.<br>10. 10. 10.<br>10. 10. 10.<br>10. 10. 10.<br>10. 10. 10. 10.<br>10. 10. 10. 10. 10. 10.<br>10. 10. 10. 10. 10. 10. 10. 10. 10. 10.  
   
   
  | (i)         (b)         -40         MAA           (2)         Yrei         10         10           (3)         Yrei         10         10           (4)         Mayer         90         10A           (4)         Mayer         90         10A           (4)         Yrei         57         10A           (4)         10         70         10A           (4)         10         10A         10A   | 10         20         110         40         110         40         110         40         110         40         110  | 10         40         10.           Yes         0         10.           Yes         0         10.           Mappe         29         10.           Var         10         10.           Var         12.         10.           Var         13.         10.           Var         13.         10.           Var         11.         10.           Var         0         10.  
   | 10;         29;         10.0.           Ven;         31         N/A           Ven;         31         N/A           Ven;         32         10.0.           Ven;         32         10.0.           Ven;         39         10.0.           Ven;         39         10.0.           Ven;         39         10.0.          
Ven;         11         10.0.           Ven;         0         10.0.           Ven;         0         10.0.           Ven;         0         10.0.           Ven;         20         10.0.  | <ul> <li>40 10.4</li> <li>20 10.4</li> <li>21 10.4</li> <li>22 10.4</li> <li>23 10.4</li> <li>24 10.4</li> </ul>                 
   
  | 20 10 10 10 10 10 10 10 10 10 10 10 10 10   | <ul> <li>40 100</li> <li>40 100</li></ul>  | 88.<br>89. 199. 199. 199. 199. 199. 199. 199. 1   
   
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|   | 101 E1 E1 E1 OI AC O   | 52 00 00 00 10 10 20 10 10 10 10 10 10 10 10 10 10 10 10 10                      | 52 70 70 40 14 15 27 15 15 16 27 15 15 16 15 16 17 15 16 16 17 16 17 16 16 16 16 16 16 16 16 16 16 16 16 16 | JN         10         40         11         1.4         2.4           5.2         1         1         1         1.5         2.4           5.2         1         1         1         1.5         2.4           5.2         1         1         1         1.5         5.2           5.2         7         9         1/A         28         1.7         5.2   | 100 000 100 100 100 100 100 100 100 100   
   
   
   | 100         900         100         13         2.0           Year         91         100         24         5.2           Year         91         100         25         5.2           Mapbre         90         100         35         5.2           Mapbre         90         100         35         5.2  | 10         00         0.0         0.0         1         3.0         2.0           Yea         0         10         1.0         2.0         2.0         2.0           Yea         0         10         1.0         2.0         5.2         5.2           Yea         0         1.0         2.0         1.0         5.2         5.2           Yea         0         1.0         2.0         1.0         5.2         5.4           Yea         50         1.0         2.6         5.4         5.4         5.4           Yea         50         1.0         3.5         1.1         3.1         3.1           Yea         50         1.0         3.6         1.1         3.1         3.1   | TOD         NO         LA         LA         LA           Veri         1         1         3         2.4           Mapbe         20         1         1         5           Veri         21         1         3         5           Veri         21         1         3         1         3           Veri         20         1         3         1         3         3           Veri         20         1         1         3  | 10         20         10         1.3         2.4         100           Year         91         NA         1.4         2.5         Yea           Year         91         NA         2.8         3.4         700           Year         91         NA         2.8         3.4         700           Year         91         1.4         5.2         Yea           Wei         91         1.4A         2.8         5.4         Yea           Year         91         1.4A         3.6         1.4         Yea           Year         91         1.4         3.6         Yea         Yea           Year         91         1.4         3.6         Yea         Yea           Year         91         1.4         3.6         Yea         Yea           Year         91         1.6         1.6         Yea         Yea           Year         10         1.6         1.4         Yea         Yea           Year         91         1.7         3.1         Yea         Yea           Year         10         1.6         1.7         Yea         Yea           Year         <   
   
   
  | 10         10         13         3.0         10           Vet         0         14         52         Vet           Vet         0         NA         23         3.0         No           Vet         0         NA         23         3.2         No           Vet         0         NA         23         3.2         No           Vet         0         1         3         3.2         No           Vet         23         1         3         3         No           Vet         29         1         3         No         No           Vet         10         1         3         No         No           Vet         10         1         5         No         No           Vet         10         1         5         No         No           Vet         10         1         5         No         No <td>No.         Total         Model         M</td> <td>10         10         13         3.0         10           22         Yes         91         NA         13         3.0         10           23         Yes         91         NA         21         1.3         3.0         10           14         Magne         90         NA         21         1.3         3.0         10           14         Magne         90         NA         21         1.3         7.0         10           11         Yes         35         9         5.4         5.4         7.0         10           11         Ne         30         1.0         1.3         7.0         7.0         10           12         Yes         30         1.4         31         Yes         7.0         10           11         Ne         30         1.3         1.0         1.3         7.0         10           13         10         1.3         1.0         1.3         1.0         1.0         1.0           14         10         1.3         1.0         1.3         1.0         1.0         1.0           14         10         1.3         1.0         1.3</td> <td>10         10         1.3         2.4         10           Yes         0)         M/A         21         2.3         1.0           Yes         0)         M/A         21         2.3         1.0           Yes         0         M/A         21         2.3         Yes           Yes         9         M/A         21         5.2         Yes           Yes         97         N/A         23         5.4         Yes           Yes         97         N/A         35         Yes         Yes           Yes         0         1         35         Yes         Yes           Yes         10         1.5         5.2         Yes         Yes           Yes         10         1.5         5.3         Yes         Yes           Yes         10         1.5         1.4         Yes         Yes           Yes         10         1.5         1.4         Yes         Yes           Yes         10         1.5         1.4         Yes         Yes           Yes         1.4         1.4         1.4         Yes         Yes           Yes         1.4         <td< td=""><td>10         00         10         1         3         3.0         10           Ver         91         NA         13         3.0         3.0         10           Ver         91         NA         23         1.7         5.2         Ver           Ver         91         NA         23         1.7         5.2         Ver           Ver         91         1.7         5.3         Ver         Ver         Ver           Ver         91         1.7         5.3         Ver         Ver         Ver           Ver         92         1.4         5.3         Ver         Ver         Ver         Ver           10         93         1.7         5.3         Ver         Ver         Ver         Ver         Ver           10         1.1         1.3         1.1         1.1         Ver         Ver<!--</td--><td>0         1    
    1         1         1         1         1         1         1         1         1         1</td><td>00         000         101         13         3.4.0         100           91         14/A         21         3.4.0         100         100           92         14/A         23         54         6.4         22         Von           92         14/A         23         5         6.4         7.2         Von           93         14/A         23         1         22         Von         Von           94         14/A         23         1         24         Von         Von           106         14/A         23         1         23         Von         Von</td><td>1111111111111111111111111111111111111</td><td>International         1         3         3         3         10           IMA         21         1         3         3         1         10           IMA         21         1         3         3         1         10           IMA         21         1         2         3         1         10           IMA         21         1         2         1         1         1         1           IMA         23         1         3         1         3         1         1         1         1           IMA         20         1         2         1</td><td>1         1</td><td>1         1.0         2.0         100           21         1         2.0         100           23         1         5.2         100           26         1         5.2         100           26         1         5.2         100           26         1         5.2         100           26         1         5.2         100           26         1         5.2         100           20         1         5.2         100           20         1         5.2         100           20         1         5.2         100           21         1.0         1.0         100           21         1.0         1.0         100           21         1.0         1.0         100           21         1.0         1.0         100           21         1.0         1.0         100           21         1.0         1.0         1.0           22         1.0         1.0         1.0           23         1.0         1.0         1.0           23         1.0         1.0         1.0           1.1&lt;</td><td>1         2.0         100           21         1         2.0         100           21         1         1         2.0         100           25         1         1         2.0         100           25         1         1         2.0         100           26         1         1         2.0         100           26         1         1         2.0         100           26         1         1         2.0         100           26         1         1         2.0         100           26         1         1         1         1         1           27         1         1         1         1         1         1           27         1         1         2.0         1         <t< td=""><td>1         2.0         10           1         5.2         10           1         5.2         10           1         5.2         10           1         5.2         10           1         5.2         10           1         5.2         10           1         5.2         10           1         5.2         10           1         5.3         10           1         5.3         10           1         5.3         10           1         5.3         10           1         1.4         10           1.5         2.3         10           1.6         5.3         10           1.6         5.3         10           1.6         5.3         10           1.6         5.3         10           1.6         5.3         10           1.6         5.3         10           1.6         5.3         10           1.6         5.3         10           1.7         5.3         10           1.8         5.3         10           1.9         5.4<!--</td--><td>1         2.0         10           1         1         2.1         10           1         1         52         10           1         52         10         10           1         52         10         10           1         52         10         10           1         52         10         10           1         52         10         10           1         53         10         10           1         53         10         10           1         53         10         10           1         1         1         10           1         1         1         10           1         53         10         10           1         53         10         10           1         53         10         10           1         53         10         10           1         53         10         10           1         53         10         10           1         53         10         10</td><td>1         1         2.0         100           21         1         2.0         100           23         1         5.2         100           26         1         5.2         100           20         1         5.2         100           20         1         5.2         100           20         1         5.2         100           20         1         5.2         100           20         1         5.2         100           20         1         5.2         100           20         1         5.2         100           21         1         10         100           21         1         10         100           21         1         10         100           22         1         10         100           23         100         5.2         100           21         1         10         100           23         100         5.2         100           20         10         10         10           21         10         10         10           23         100</td></td></t<></td></td></td<><td>1         2         10         10         10           21         1         1         1         1         10           21         1         1         1         1         10           23         1         1         1         1         10           23         1         1         1         1         10           23         1         1         1         1         1         10           24         1</td><td>1         1         2         10         10           21         1         5         2         10           23         1         5         2         10           23         1         5         2         10           23         1         5         2         10           26         1         5         2         10           26         1         5         1         10           26         1         5         1         10           26         1         1         10         10           27         1         1         10         10           27         1         1         10         10           27         1         3         10         10           27         1         1         10         10           27         3         3         10         10           28         3         3         10         10           29         1         3         10         10           20         1         3         10         10           1         1         3<td>1.3         2.0         100           1.4         5.2         Wen           1.1         5.2         Wen           1.2         5.3         Wen           1.3         5.4         Wen           1.4         5.3         Wen           1.4         5.3         Wen           1.4         5.3         Wen           1.5         5.2         Nen           1.6         5.3         Wen           1.6         5.3         Wen          
1.6         5.3         Wen           1.6         5.3         Wen           1.7         5.3         Wen           1.8         5.3         Wen           1.9         5.3         Wen           1.1         5.3         Wen           1.1         5.3         Wen           1.1         5.3         Wen           1.1         5.3         Wen</td></td></td>  | No.         Total         Model         M  
   | 10         10         13         3.0         10           22         Yes         91         NA         13         3.0         10           23         Yes         91         NA         21         1.3         3.0         10           14         Magne         90         NA         21         1.3         3.0         10           14         Magne         90         NA         21         1.3         7.0         10           11         Yes         35         9         5.4         5.4         7.0         10           11         Ne         30         1.0         1.3         7.0         7.0         10           12         Yes         30         1.4         31         Yes         7.0         10           11         Ne         30         1.3         1.0         1.3         7.0         10           13         10         1.3         1.0         1.3         1.0         1.0         1.0           14         10         1.3         1.0         1.3         1.0         1.0         1.0           14         10         1.3         1.0         1.3   | 10         10         1.3         2.4         10           Yes         0)         M/A         21         2.3         1.0           Yes         0)         M/A         21         2.3         1.0           Yes         0         M/A         21         2.3         Yes           Yes         9         M/A         21         5.2         Yes           Yes         97         N/A         23         5.4         Yes           Yes         97         N/A         35         Yes         Yes           Yes         0         1         35         Yes         Yes           Yes         10         1.5         5.2         Yes         Yes           Yes         10         1.5         5.3         Yes         Yes           Yes         10         1.5         1.4         Yes         Yes           Yes         10         1.5         1.4         Yes         Yes           Yes         10         1.5         1.4         Yes         Yes           Yes         1.4         1.4         1.4         Yes         Yes           Yes         1.4 <td< td=""><td>10         00         10         1         3         3.0         10           Ver         91         NA         13         3.0         3.0         10           Ver         91         NA         23         1.7         5.2         Ver           Ver         91         NA         23         1.7         5.2         Ver           Ver         91         1.7         5.3         Ver         Ver         Ver           Ver         91         1.7         5.3         Ver         Ver         Ver           Ver         92         1.4         5.3         Ver         Ver         Ver         Ver           10         93         1.7         5.3         Ver         Ver         Ver         Ver         Ver           10         1.1         1.3         1.1         1.1         Ver         Ver<!--</td--><td>0         1</td><td>00         000         101         13         3.4.0         100           91         14/A         21         3.4.0         100         100           92         14/A         23         54         6.4         22         Von           92         14/A         23         5         6.4         7.2         Von           93         14/A         23         1         22         Von         Von           94         14/A         23         1         24         Von         Von           106         14/A         23         1         23         Von         Von</td><td>1111111111111111111111111111111111111</td><td>International         1         3         3         3         10           IMA         21         1         3         3         1         10           IMA         21         1         3         3         1         10           IMA         21         1         2         3         1         10           IMA         21         1         2         1         1         1         1           IMA         23         1         3         1         3         1         1         1         1           IMA         20         1         2         1</td><td>1         1</td><td>1         1.0         2.0         100           21         1         2.0         100           23         1         5.2         100           26         1         5.2         100           26         1         5.2         100           26         1         5.2         100           26         1         5.2         100           26         1         5.2         100           20         1         5.2         100           20         1         5.2         100           20         1         5.2         100           21         1.0         1.0         100           21         1.0         1.0         100           21         1.0         1.0         100           21         1.0         1.0         100           21         1.0         1.0         100           21         1.0         1.0         1.0           22         1.0         1.0         1.0           23         1.0         1.0         1.0           23         1.0         1.0         1.0           1.1&lt;</td><td>1         2.0         100           21         1         2.0         100           21         1         1         2.0         100           25         1         1         2.0      
  100           25         1         1         2.0         100           26         1         1         2.0         100           26         1         1         2.0         100           26         1         1         2.0         100           26         1         1         2.0         100           26         1         1         1         1         1           27         1         1         1         1         1         1           27         1         1         2.0         1         <t< td=""><td>1         2.0         10           1         5.2         10           1         5.2         10           1         5.2         10           1         5.2         10           1         5.2         10           1         5.2         10           1         5.2         10           1         5.2         10           1         5.3         10           1         5.3         10           1         5.3         10           1         5.3         10           1         1.4         10           1.5         2.3         10           1.6         5.3         10           1.6         5.3         10           1.6         5.3         10           1.6         5.3         10           1.6         5.3         10           1.6         5.3         10           1.6         5.3         10           1.6         5.3         10           1.7         5.3         10           1.8         5.3         10           1.9         5.4<!--</td--><td>1         2.0         10           1         1         2.1         10           1         1         52         10           1         52         10         10           1         52         10         10           1         52         10         10           1         52         10         10           1         52         10         10           1         53         10         10           1         53         10         10           1         53         10         10           1         1         1         10           1         1         1         10           1         53         10         10           1         53         10         10           1         53         10         10           1         53         10         10           1         53         10         10           1         53         10         10           1         53         10         10</td><td>1         1         2.0         100           21         1         2.0         100           23         1         5.2         100           26         1         5.2         100           20         1         5.2         100           20         1         5.2         100           20         1         5.2         100           20         1         5.2         100           20         1         5.2         100           20         1         5.2         100           20         1         5.2         100           21         1         10         100           21         1         10         100           21         1         10         100           22         1         10         100           23         100         5.2         100           21         1         10         100           23         100         5.2         100           20         10         10         10           21         10         10         10           23         100</td></td></t<></td></td></td<> <td>1         2         10         10         10           21         1         1         1         1         10           21         1         1         1         1         10           23         1         1         1         1         10           23         1         1         1         1         10           23         1         1         1         1         1         10           24         1</td> <td>1         1         2         10         10           21         1         5         2         10           23         1         5         2         10           23         1         5         2         10           23         1         5         2         10           26         1         5         2         10           26         1         5         1         10           26         1         5         1         10           26         1         1         10         10           27         1         1         10         10           27         1         1         10         10           27         1         3         10         10           27         1         1         10         10           27         3         3         10         10           28         3         3         10         10           29         1         3         10         10           20         1         3         10         10           1         1         3<td>1.3         2.0         100           1.4         5.2         Wen           1.1         5.2         Wen           1.2         5.3         Wen           1.3         5.4         Wen           1.4         5.3         Wen           1.4         5.3         Wen           1.4         5.3         Wen           1.5         5.2         Nen           1.6         5.3         Wen           1.6         5.3         Wen           1.6         5.3         Wen           1.6         5.3         Wen           1.7         5.3         Wen           1.8         5.3         Wen           1.9         5.3         Wen           1.1         5.3         Wen           1.1         5.3         Wen           1.1         5.3         Wen           1.1         5.3         Wen</td></td> | 10         00         10         1         3         3.0         10           Ver         91         NA         13         3.0         3.0         10           Ver         91         NA         23         1.7         5.2         Ver           Ver         91         NA         23         1.7         5.2         Ver           Ver         91         1.7         5.3         Ver         Ver         Ver           Ver         91         1.7         5.3         Ver         Ver         Ver           Ver         92         1.4         5.3         Ver         Ver         Ver         Ver           10         93         1.7         5.3         Ver         Ver         Ver         Ver         Ver           10         1.1         1.3         1.1         1.1         Ver         Ver </td <td>0         1</td> <td>00         000         101         13         3.4.0         100           91         14/A         21         3.4.0         100         100           92         14/A         23         54         6.4         22         Von           92         14/A         23         5         6.4         7.2         Von           93         14/A         23         1         22         Von         Von           94         14/A         23         1         24         Von         Von           106         14/A         23         1         23         Von         Von</td> <td>1111111111111111111111111111111111111</td> <td>International         1         3         3         3         10           IMA         21         1         3         3         1         10           IMA         21         1         3         3         1         10           IMA         21         1         2         3         1         10           IMA         21         1         2         1         1         1         1           IMA         23         1         3         1         3         1         1         1         1           IMA         20         1         2         1</td> <td>1         1         1         1         1         1         1         1         1         1         1         1         1      
  1         1</td> <td>1         1.0         2.0         100           21         1         2.0         100           23         1         5.2         100           26         1         5.2         100           26         1         5.2         100           26         1         5.2         100           26         1         5.2         100           26         1         5.2         100           20         1         5.2         100           20         1         5.2         100           20         1         5.2         100           21         1.0         1.0         100           21         1.0         1.0         100           21         1.0         1.0         100           21         1.0         1.0         100           21         1.0         1.0         100           21         1.0         1.0         1.0           22         1.0         1.0         1.0           23         1.0         1.0         1.0           23         1.0         1.0         1.0           1.1&lt;</td> <td>1         2.0         100           21         1         2.0         100           21         1         1         2.0         100           25         1         1         2.0         100           25         1         1         2.0         100           26         1         1         2.0         100           26         1         1         2.0         100           26         1         1         2.0         100           26         1         1         2.0         100           26         1         1         1         1         1           27         1         1         1         1         1         1           27         1         1         2.0         1         <t< td=""><td>1         2.0         10           1         5.2         10           1         5.2         10           1         5.2         10           1         5.2         10           1         5.2         10           1         5.2         10           1         5.2         10           1         5.2         10           1         5.3         10           1         5.3         10           1         5.3         10           1         5.3         10           1         1.4         10           1.5         2.3         10           1.6         5.3         10           1.6         5.3         10           1.6         5.3         10           1.6         5.3         10           1.6         5.3         10           1.6         5.3         10           1.6         5.3         10           1.6         5.3         10           1.7         5.3         10           1.8         5.3         10           1.9         5.4<!--</td--><td>1         2.0         10           1         1         2.1         10           1         1         52         10           1         52         10         10           1         52         10         10           1         52         10         10           1         52         10         10           1         52         10         10           1         53         10         10           1         53         10         10           1         53         10         10           1         1         1         10           1         1         1         10           1         53         10         10           1         53         10         10           1         53         10         10           1         53         10         10           1         53         10         10           1         53         10         10           1         53         10         10</td><td>1         1         2.0         100           21         1         2.0         100           23         1         5.2         100           26         1         5.2         100           20         1         5.2         100           20         1         5.2         100           20         1         5.2         100           20         1         5.2         100           20         1         5.2         100           20         1         5.2         100           20         1         5.2         100           21         1         10         100           21         1         10         100           21         1         10         100           22         1         10         100           23         100         5.2         100           21         1         10         100           23         100         5.2         100           20         10         10         10           21         10         10         10           23         100</td></td></t<></td> | 0         1   
   | 00         000         101         13         3.4.0         100           91         14/A         21         3.4.0         100         100           92         14/A         23         54         6.4         22         Von           92         14/A         23         5         6.4         7.2         Von           93         14/A         23         1         22         Von         Von           94         14/A         23         1         24         Von         Von           106         14/A         23         1         23         Von   | 1111111111111111111111111111111111111   
  | International         1         3         3         3         10           IMA         21         1         3         3         1         10           IMA         21         1         3         3         1         10           IMA         21         1         2         3         1         10           IMA         21         1         2         1         1         1         1           IMA         23         1         3         1         3         1         1         1         1           IMA         20         1         2         1  
  | 1          
   
   | 1         1.0         2.0         100           21         1         2.0         100           23         1         5.2         100           26         1         5.2         100           26         1         5.2         100           26         1         5.2         100           26         1         5.2         100           26         1         5.2         100           20         1         5.2         100           20         1         5.2         100           20         1         5.2         100           21         1.0         1.0         100           21         1.0         1.0         100           21         1.0         1.0         100           21         1.0         1.0         100           21         1.0         1.0         100           21         1.0         1.0         1.0           22         1.0         1.0         1.0           23         1.0         1.0         1.0           23         1.0         1.0         1.0           1.1<  | 1         2.0         100           21         1         2.0         100           21         1         1         2.0         100           25         1         1         2.0         100           25         1
        1         2.0         100           26         1         1         2.0         100           26         1         1         2.0         100           26         1         1         2.0         100           26         1         1         2.0         100           26         1         1         1         1         1           27         1         1         1         1         1         1           27         1         1         2.0         1 <t< td=""><td>1         2.0         10           1         5.2         10           1         5.2         10           1         5.2         10           1         5.2         10           1         5.2         10           1         5.2         10           1         5.2         10           1         5.2         10           1         5.3         10           1         5.3         10           1         5.3         10           1         5.3         10           1         1.4         10           1.5         2.3         10           1.6         5.3         10           1.6         5.3         10           1.6         5.3         10           1.6         5.3         10           1.6         5.3         10           1.6         5.3         10           1.6         5.3         10           1.6         5.3         10           1.7         5.3         10           1.8         5.3         10           1.9         5.4<!--</td--><td>1         2.0         10           1         1         2.1         10           1         1         52         10           1         52         10         10           1         52         10         10           1         52         10         10           1         52         10         10           1         52         10         10           1         53         10         10           1         53         10         10           1         53         10         10           1         1         1         10           1         1         1         10           1         53         10         10           1         53         10         10           1         53         10         10           1         53         10         10           1         53         10         10           1         53         10         10           1         53         10         10</td><td>1         1         2.0         100           21         1         2.0         100           23         1         5.2         100           26         1         5.2         100           20         1         5.2         100           20         1         5.2         100           20         1         5.2         100           20         1         5.2         100           20         1         5.2         100           20         1         5.2         100           20         1         5.2         100           21         1         10         100           21         1         10         100           21         1         10         100           22         1         10         100           23         100         5.2         100           21         1         10         100           23         100         5.2         100           20         10         10         10           21         10         10         10           23         100</td></td></t<>  | 1         2.0         10           1         5.2         10           1         5.2         10           1         5.2         10           1         5.2         10           1         5.2         10           1         5.2         10           1         5.2         10           1         5.2         10           1         5.3         10           1         5.3         10           1         5.3         10           1         5.3         10           1         1.4         10           1.5         2.3         10           1.6         5.3         10           1.6         5.3         10           1.6         5.3         10           1.6         5.3         10           1.6         5.3         10           1.6         5.3         10           1.6         5.3         10           1.6         5.3         10           1.7         5.3         10           1.8         5.3         10           1.9         5.4 </td <td>1         2.0         10           1         1         2.1         10           1         1         52         10           1         52         10         10           1         52         10         10           1         52         10         10           1         52         10         10           1         52         10         10           1         53         10         10           1         53         10         10           1         53         10         10           1         1         1         10           1         1         1         10           1         53         10         10           1         53         10         10           1         53         10         10           1         53         10         10           1         53         10         10           1         53         10         10           1         53         10         10</td> <td>1         1         2.0         100           21         1         2.0         100           23         1         5.2         100           26         1         5.2         100           20         1         5.2         100           20         1         5.2         100           20         1         5.2         100           20         1         5.2         100           20         1         5.2         100           20         1         5.2         100           20         1         5.2         100           21         1         10         100           21         1         10         100           21         1         10         100           22         1         10         100           23         100         5.2         100           21         1         10         100           23         100         5.2         100           20         10         10         10           21         10         10         10           23         100</td>  
  | 1         2.0         10           1         1         2.1         10           1         1         52         10           1         52         10         10           1         52         10         10           1         52         10         10           1         52         10         10           1         52         10         10           1         53         10         10           1         53         10         10           1         53         10         10           1         1         1         10           1         1         1         10           1         53         10         10           1         53         10         10           1         53         10         10           1         53         10         10           1         53         10         10           1         53         10         10           1         53         10         10   
   | 1         1         2.0         100           21         1         2.0         100           23         1         5.2         100           26         1         5.2         100           20         1         5.2         100           20         1         5.2         100           20         1         5.2         100           20         1         5.2         100           20         1         5.2         100           20         1         5.2         100           20         1         5.2         100           21         1         10         100           21         1         10         100           21         1         10         100           22         1         10         100           23         100         5.2         100           21         1         10         100           23         100         5.2         100           20         10         10         10           21         10         10         10           23         100  | 1         2         10         10         10           21         1         1         1         1         10           21         1         1         1         1         10           23         1         1         1         1         10           23         1         1         1         1         10           23         1         1         1         1         1         10           24         1   | 1         1         2         10         10           21         1         5         2         10           23         1         5         2         10           23         1         5         2         10           23         1         5         2         10           26         1         5         2         10           26         1         5         1         10           26         1         5         1         10           26         1         1         10         10           27         1         1         10         10           27         1         1         10         10           27         1         3         10         10           27         1         1         10         10           27         3         3         10         10           28         3         3         10         10           29         1         3         10         10           20         1         3         10         10           1         1         3 <td>1.3         2.0         100           1.4         5.2         Wen           1.1         5.2         Wen           1.2         5.3         Wen           1.3         5.4         Wen           1.4         5.3         Wen           1.4         5.3         Wen           1.4         5.3         Wen           1.5         5.2         Nen           1.6         5.3         Wen           1.6         5.3         Wen           1.6         5.3         Wen           1.6         5.3         Wen           1.7         5.3         Wen           1.8         5.3         Wen           1.9         5.3         Wen           1.1         5.3         Wen           1.1         5.3         Wen           1.1         5.3         Wen           1.1         5.3         Wen</td>   
  | 1.3         2.0         100           1.4         5.2         Wen           1.1         5.2         Wen           1.2         5.3         Wen           1.3         5.4         Wen           1.4         5.3         Wen           1.4         5.3         Wen           1.4         5.3         Wen           1.5         5.2         Nen           1.6         5.3         Wen           1.6         5.3         Wen           1.6         5.3         Wen           1.6         5.3         Wen           1.7         5.3         Wen           1.8         5.3         Wen           1.9         5.3         Wen           1.1         5.3         Wen           1.1         5.3         Wen           1.1         5.3         Wen           1.1         5.3         Wen   |

Date: Jun-18 Job Number: 224414 By: 2001

Client Fulton Hogan Land Development Project: Rosemerryn Subdivsior Swbject: Stages 19 to 24 Liquefaction Analysis

## RMA Assessment

# aurecon

1 - Very unlikely High High

 Most Likely Consequence
 5 - Very lkoly
 4 - Good Chance
 2 - Likelihood of occurrence

 A--Disastrous
 5 - Very lkoly
 4 - Good Chance
 3 - Likely
 2 - Unlikely

 B - Critical
 7 - Good Chance
 3 - Likely
 2 - Unlikely
 2 - Unlikely

 C - Statious
 7 - Good Chance
 7 - Unlikely
 7 - Unlikely
 2 - Unlikely

 C - Statious
 7 - Good Chance
 7 - Unlikely
 7 - Unlikely
 2 - Unlikely

 C - Statious
 7 - Good Chance
 7 - Unlikely
 7 - Unlikely
 7 - Unlikely

 C - Statious
 7 - Good Chance
 7 - Unlikely
 7 - Unlikely
 7 - Unlikely
 7 - Unlikely

Client	Fulton Hogan Land Developmed Project No
Prepared by	James Muirson Reviewed t

224464	Jan Kupec
Project No.	Reviewed by
Fulton Hogan Land Developme	James Muirson
	ed by

Risk Rating Matrix

						D - Significant E - Minor		High ofference	High Low	Low Low
IDENTIFY NATURAL HAZARD		ASSESS	ASSESS RISK Section 1A (a)	(a) & (b)		RESIDUAL RISK ASSESSMENT Section 1A (a) & (b)	<b>SSESSMENT Sed</b>	tion 1A (a) & (b)		
Risk Source (Hazard)	Damage	Likelihood	Consequence	Risk Rating	Control Measure (Risk Treatment)	Likelihood	Consequence	Risk Rating	Subsequent use of the land accelerate, worsen, or result in material damage resulting from hazard Section 1A (c)	Comments or Recommendations
Earthquake/Seismic										
Liquefaction induced ground damage (settlement, sand boils, cracking)	Liquefaction in major seismic events is likely bul is likely to be TC2 equivalent	3 - Likely	D - Significant	Moderate	Mitigation strategies in the form of strengthened structural foundations or ground improvement have been provided	1 - Very unlikely	E - Minor	Low	2	Development can proceed provided recommendations in this report are followed and appropriate guneering measures
Liquefaction induced lateral spreading Liquefaction induced lateral spreading is unlikely due to lack of free shorted laces	Liquefaction induced lateral spreading is unlikely due to the lack of free storing faces	1 - Very unlikely	E - Minor	ΓσΜ	No specific mitigation measure proposed at this starte	1 - Very unlikely	E - Minor	Low	No	
Seismic Induced Slope Instability (incl Mass Movement)	The site is relatively flat and as such is not likely to be at risk from seismically induced mass	1 - Very unlikely	E - Minor	Low	No specific miligation measure proposed al lhis stage	1 - Very unlikely	E - Minor	Low	No	
Seismic Induced Rockfall	No rockfall sources above site.	1 - Very unlikely	E - Minor	Low	No specific mitigation measure proposed at this stage	1 - Very unlikely	E - Minor	Low	No	
Seismic Induced Cliff Collapse	No cliff above site.	1 - Very unlikely	E - Minor	Low	No specific mitigation measure proposed al this starte	1 - Very unlikely	E - Minor	Low	No	
Fault Rupture	No known active faults near the site.	1 - Very unlikely	E - Minor	Low	No specific mitigation measure proposed at this stade	1 - Very unlikely	E - Minor	Law	No	
Landslip/Landslide/Land Instability/Subsidence	Subsidence									
Landslide/Landslip	No evidence of slips around the development slies and due to lack of slopes, slips are unlikely.	1 - Very unlikely	E - Minor	Low	N/A	1 - Very unlikely	E - Minor	Low	No	Development can proceed provided recommendations in this report are followed and appropriate engineering measures
Deep Sealed Landslide	No evidence of deep seated instability	1 - Very unlikely	E - Minor	Low	N/A	1 - Very unlikely	E - Minor	Low	No	implemented
Earth/Debris flows	No earthflow sources above site nor any evidence of previous earthflows affecting	1 - Very unlikely	E - Minor	Low	N/A	1 - Very unlikely	E - Minor	Low	No	
Rockfall or Topple	No rockfall sources above site	1 - Very unlikely	E - Minor	Low	N/A	1 - Very unlikely	E - Minor	Low	No	
Other										
Soft Ground Settlement	Potential for settlement of building foundations and other infrastructure due to the presence of soft sills, at depths of 2m to 3m.	2 - Unlikely	D - Significant	Low	Soft softs are reasonable depth so unlikely to cause settlement provided appropriate foundation design is undertaken and includes the use of enhanced stabs.	2 - Unlikely	E - Minor	Low	Ŝ	Development can proceed provided recommendations in this report are followed and appropriate engineering measures implemented.



Very unlikely
 High
 High

High

1 Cal

	Likelihood of occurrence	equence 5-Verylikely 4-Good chance 3-Likely 2	Exercine Extrema Exercise
	·	Risk Beting	Matrix A - Disastrous
	No. 224464	ed by Jan Kupec	
MA Section 106 (1 & 1A) Assessment – Quarryview Subdivision - 253852	ulton Hogan Land Developmet Project No. 224464	mes Muirson Reviewed by Jan Kupec	

						C - Serious D - Significent		High	Hgh Hgh	Low	Low
						E-MINO			CON	row	row
IDENTIFY NATURAL HAZARD		ASSESS	ASSESS RISK Section 1A (a) & (b)	) & (b)		RESIDUAL RISK ASSESSMENT Section 1A (a) & (b)	ASSESSMENT Sec	tion 1A (a) & (b)	Subsequent use of the land		
Risk Source (Hazard)	Damage	Likelihood	Consequence	Risk Rating	Control Measure (Risk Treatment)	Likelihood	Consequence	Risk Rating	Risk Rating in material damage resulting from hazard Section 1A (c)	t Comments or Re	commendations
Erosion	Due to finer nature of soil, erosion is possible either by concentrated stormwater runoff or subsurface seepages.	3 - Likely	E - Minor	Low	Adequate site stormwater control to be incorporated with site development and exposed soil covered with topsoil/vegetation.	2 - Unlikely	E - Minor	Low	2	As part of the civil design of the subdivision adequate stormwater and encion control will be required. If subsol seeps are encountered during site development then these will need to be assessed	design of the ale stormwater I wil be required. P encountered ment then these essed

### Document prepared by

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