TETRA TECH COFFEY

7 to 183 Two Chain Road Plan Change

Geotechnical Assessment Report

Two Chain Road Ltd

Reference: 773-CHCGE291116

24 August 2021

TWO CHAIN ROAD PLAN CHANGE

Geotechnical Assessment Report

Report reference number: 773-CHCGE291116
24 August 2021

PREPARED FOR

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PREPARED BY

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QUALITY INFORMATION

Revision history

Revision	Description	Date	Author	Reviewer	Approver
V0	GAR	24/08/21	CT	KWH	CT

Distribution

Report Status	No. of copies	Format	Distributed to	Date
Final	1	PDF	Bruce Van Duyn	24/08/21

EXECUTIVE SUMMARY[1]

Two Chain Road Ltd has engaged Tetra Tech Coffey (NZ) Limited to carry out a geotechnical assessment of suitability for the proposed Plan Change and future subdivision of 7 to 183 Two Chain Road, Rolleston, Canterbury. The purpose of this report is to support a Plan Change application for the construction of industrial Lots at the site.

The site investigations and preliminary liquefaction assessment indicates that the site is TC1-like. Other geotechnical hazards (erosion, slippage and inundation) are considered low to very low risk with appropriate future engineering design.

Our assessment has considered the items required by Section 106 of the RMA and in our opinion the site is considered geotechnically suitable for Plan Change and future subdivision. Further investigations and design will need to be carried out at the subdivision consent stage.

[1] This executive summary must be read in the context of the full report and the attached limitations.

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APPENDICES

1. INTRODUCTION

Two Chain Road Ltd has engaged Tetra Tech Coffey (NZ) Limited to carry out a geotechnical investigation and assessment of suitability for the proposed Plan Change and future subdivision of 7 to 183 Two Chain Road in Rolleston, Canterbury. The purpose of this report is to support a Plan Change application for the construction of industrial Lots at the site.

Our assessment has considered the items required by Section 106 of the RMA and in our opinion the site is considered geotechnically suitable for Plan Change and future subdivision. Further investigations and design will need to be carried out at the subdivision consent stage.

2. SCOPE

A scope of assessment work for the approximately 98 Ha total area of the site was developed and carried out by Tetra Tech Coffey, as outlined below:

- Review of previous geotechnical investigations including previous work on the site and surrounding area.
- Site walkover to assess geotechnical hazards.
- Assessment of the geotechnical hazards at the site per Section 106 of the RMA.
- Geotechnical analyses and reporting.

Tetra Tech Coffey have considered the following in the preparation of this report:

- Existing geotechnical investigation data available from the New Zealand Geotechnical Database (NZGD) and Environment Canterbury well database.
- Project correspondence with the wider Plan Change consultants engaged by Two Chain Road Ltd.

Reference has also been made to the MBIE Guidance Part D: Subdivisions, to confirm that the requirements outlined in these documents have been incorporated in this report.

3. PROPOSED DEVELOPMENT

The proposed Plan Change area comprises 13 land parcels totalling approximately 98 Ha located to the north of Rolleston. The Plan Change area is bordered by Two Chain Road, Walkers Road, and the Main South and Midland Lines (railways). State Highway 1 (SH1) is located to the southeast of the site, beyond the Main South Line.

The site is predominantly flat and is currently a mixture of grazing and rural residential properties.

We understand that the current proposal is to rezone the land for industrial usage.

4. SITE INVESTIGATION

The location of the geotechnical investigations carried out on / near the site to develop the ground model is provided in Figure 1 (in Appendix A) and are summarised below. Investigation logs are presented in Appendix B.

Table 1: Two Chain Road investigation data

Reference	Depth of test (metres below ground level)	Termination criteria	Reference	Depth of test (metres below ground level)	Termination criteria
S&R TP01	2.4	Target depth	M36/0026	56.1	Target depth
S&R TP06	3.0	Target depth	M36/0030	55.5	Target depth
S&R TP07	2.8	Target depth	M36/0084	35.0	Target depth
TP_153918	2.0	Target depth	M36/3064	55.4	Target depth
TP_153919	2.0	Target depth	M36/5330	46.0	Target depth
TP_153920	2.0	Target depth	M36/4984	54.0	Target depth
HA_34759	0.4	Refusal	M36/4985	48.0	Target depth
HA_82955	0.35	Refusal	M36/4986	48.0	Target depth
HA_153328	0.9	Refusal	M36/5120	43.0	Target depth
HA_48088	0.3	Refusal	M36/5139	39.5	Target depth
HA_48096	0.2	Refusal	M36/5525	47.0	Target depth
HA_48117	0.2	Refusal			

The test pit and hand auger logs have been sourced from the NZGD. ECan well logs have been sourced from https://www.ecan.govt.nz/data/well-search/. In addition to the tests noted in Table 1, more than 50 DCP tests and hand augered boreholes have been carried out around the site, however, these have not been included for clarity of the plans as they generally indicate very similar ground conditions.

5. SITE PERFORMANCE

5.1 GROUND MOTION

The site is not in an area mapped for ground damage effects as part of the Canterbury Earthquake Sequence response. A report commissioned by ECan[2] mapped the site as being in an area where 'damaging liquefaction is unlikely'. An extract from the ECan report is shown in Figure 1 below with the site location indicated.

[2] ECan (2012), Review of liquefaction hazard information in Eastern Canterbury, including Christchurch City, and parts of Selwyn, Waimakariri and Hurunui Districts, ref. R12/83

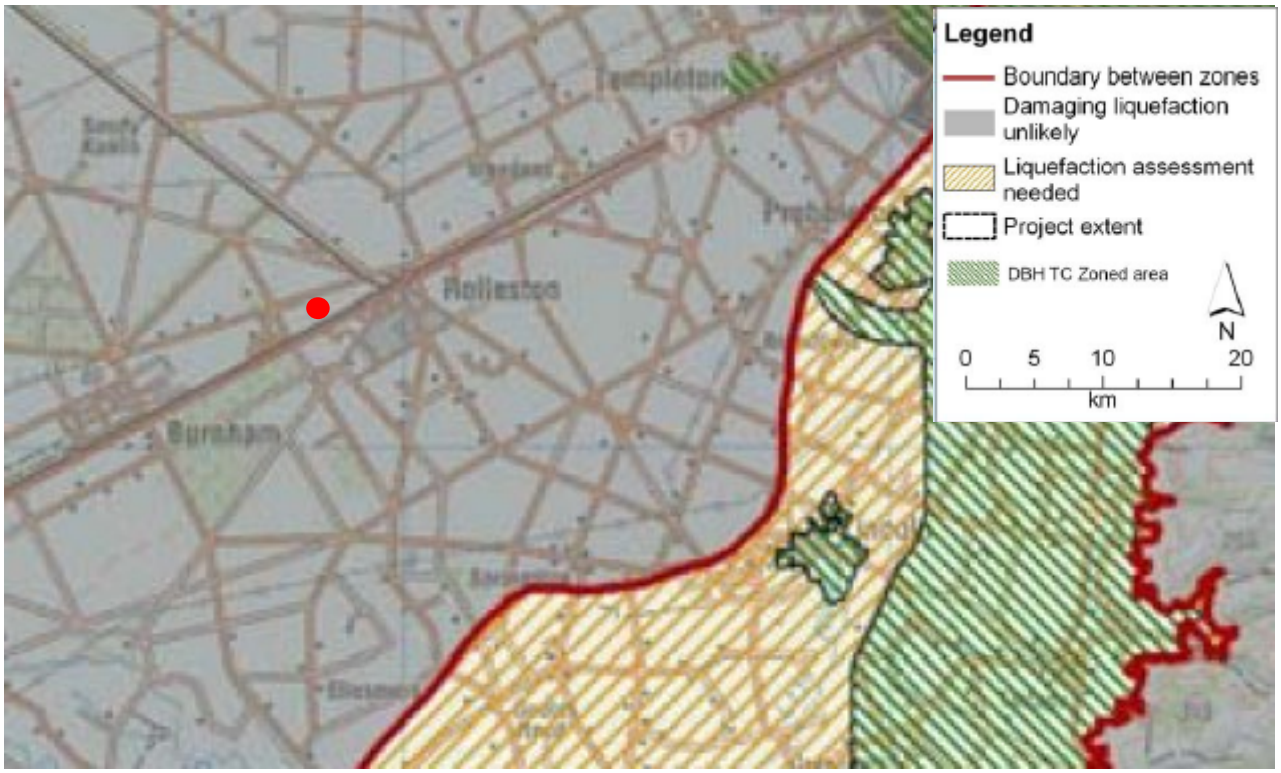


Figure 1: Extract from ECan liquefaction report (site location marked with red dot)

6. GROUND MODEL

6.1 GEOLOGY

The geological map[3] of the area indicates that the southwestern half of the site is underlain by "Brownish-grey river alluvium (Q2a)" and northeastern half is underlain by "Grey river alluvium beneath plains and low level terraces (Q1a)".

6.2 GROUNDWATER

Based on the nearby well logs, groundwater was encountered between 7.5m and 13mbgl. We consider these groundwater levels to be relatively consistent and representative of the general area.

6.3 SUBSURFACE PROFILE

A summary of the ground model for the site is provided below:

Table 2: 7 to 183 Two Chain Road ground profile

Description	Strength/ consistency	Thickness (m)	Depth to top of layer (mbgl)
Silt (topsoil)	N/A	0.15 to 0.2	0.0
Silt with some sand and gravel	Stiff to hard	0.3 to 0.65	0.15 to 0.35
Sandy Gravel, with minor silt lenses	Dense to very dense	>30	0.3 to 0.9

[3] Forsyth, P.J.; Barrell, D.J.A.; Jongens, R. (compilers) 2008: Geology of the Christchurch area: scale 1:250,000. Lower Hutt: GNS Science. Institute of Geological & Nuclear Sciences 1:250,000 geological map 16. 67 p. + 1 folded map

6.4 SITE SUB-SOIL CLASS

In accordance with NZS1170.5, Section 3.1.3, a subsoil classification of “Class D – Deep or soft soil sites” can be assumed for the site.

7. GEOTECHNICAL HAZARD ASSESSMENT

7.1 EROSION

The site has relatively flat topography and is bounded by existing roads and the rail lines. Provided appropriate stormwater systems are installed as part of the development, there will be few viable sources of erosion at this site.

7.2 FALLING DEBRIS

As there are no slopes or exposed hills or rock faces surrounding the site, there are no sources of falling debris at the site, or for the surrounding area.

7.3 SUBSIDENCE

7.3.1 Liquefaction induced settlement

Saturated, loose, uniform fine grained alluvial soils are subject to seismic (liquefaction-induced) settlement during a significant earthquake. Liquefaction typically affects saturated, loose granular soils ranging from sandy silts to sands, but seismic shaking can also result in strength losses in fine-grained, cohesive soils. Liquefaction does not occur in dense, well-graded alluvial gravel soils that are present at this site.

Due to the dense nature of the gravel encountered, liquefaction risk is considered to be negligible for this project. Although not relevant for industrial development, for comparison purposes, the site could be considered TC1-like.

7.3.2 Static settlement

Settlement is a crucial factor that can cause structure serviceability issues. Static load-induced settlement typically occurs in low-lying areas underlain by soft, compressible soils as a result of increased overburden loads. As the site is underlain by dense river gravels, static settlement is not deemed a hazard for the site provided any earthworks are carried out to the relevant standards.

7.4 SLIPPAGE

We have not observed any sources of land instability on the site and due to the flat site topography, we consider the risk of slope failure to be very low. The appropriate design of batter slopes near waterways will mitigate this risk further.

7.5 INUNDATION

In relation to stormwater inundation, we recommend that drainage design and management at the site be addressed by specialist consultants as it is beyond the scope of this report. We expect that with appropriate stormwater and flood control systems, the risk of inundation will be low.

8. CONCLUSIONS

We consider that the site is suitable for development subject to further investigation and design at the subdivision consent stage. Based on the mapped geology and on-site testing carried out to date, the site is considered TC1-like.

Additional geotechnical investigation will be required to refine the ground model and address any geotechnical risks for the proposed Lots once a subdivision plan has been further developed.

9. LIMITATIONS

This report has been prepared solely for the use of our client, Two Chain Road Ltd, their professional advisers and Selwyn District Council (SDC) in relation to the specific project described herein. No liability is accepted in respect of its use for any other purpose or by any other person or entity.

It is recommended that all other parties seek professional geotechnical advice to satisfy themselves as to its on-going suitability for their intended use.

As subsurface information has been obtained from discrete investigation locations, which by their nature only provide information about a relatively small volume of subsoils, there may be special conditions pertaining to this site which have not been disclosed by the investigation and which have not been taken into account in the report. If variations in the subsoils occur from those described or assumed to exist, then the matter should be referred to us immediately.

Please also refer to the enclosed *Important Information about Your Tetra Tech Coffey Report*.

10. CLOSURE

If you have queries or require further clarification regarding aspects of this report, please contact the undersigned.

For and on behalf of Tetra Tech Coffey

Prepared by

Chris Thompson
BSc (Tech)
Associate Engineering Geologist

Reviewed by

Kah-Weng Ho
BE (Hons) CMEngNZ
Senior Principal

IMPORTANT INFORMATION ABOUT YOUR TETRA TECH COFFEY REPORT

As a client of Tetra Tech Coffey you should know that site subsurface conditions cause more construction problems than any other factor. These notes have been prepared by Tetra Tech Coffey to help you interpret and understand the limitations of your report.

Your report is based on project specific criteria

Your report has been developed on the basis of your unique project specific requirements as understood by Tetra Tech Coffey and applies only to the site investigated. Project criteria typically include the general nature of the project; its size and configuration; the location of any structures on the site; other site improvements; the presence of underground utilities; and the additional risk imposed by scope-of-service limitations imposed by the client. Your report should not be used if there are any changes to the project without first asking Tetra Tech Coffey to assess how factors that changed subsequent to the date of the report affect the report's recommendations. Tetra Tech Coffey cannot accept responsibility for problems that may occur due to changed factors if they are not consulted.

Subsurface conditions can change

Subsurface conditions are created by natural processes and the activity of man. For example, water levels can vary with time, fill may be placed on a site and pollutants may migrate with time. Because a report is based on conditions which existed at the time of subsurface exploration, decisions should not be based on a report whose adequacy may have been affected by time. Consult Tetra Tech Coffey to be advised how time may have impacted on the project.

Interpretation of factual data

Site assessment identifies actual subsurface conditions only at those points where samples are taken and when they are taken. Data derived from literature and external data source review, sampling and subsequent laboratory testing are interpreted by geologists, engineers or scientists to provide an opinion about overall site conditions, their likely impact on the proposed development and recommended actions. Actual conditions may differ from those inferred to exist, because no professional, no matter how qualified, can reveal what is hidden by earth, rock and time. The actual interface between materials may be far more gradual or abrupt than assumed based on the facts obtained. Nothing can be done to change the actual site conditions which exist, but steps can be taken to reduce the impact of unexpected conditions. For this reason, owners should retain the services of Tetra Tech Coffey through the development stage, to identify variances, conduct additional tests if required, and recommend solutions to problems encountered on site.

Your report will only give preliminary recommendations

Your report is based on the assumption that the site conditions as revealed through selective point sampling are indicative of actual conditions throughout an area. This assumption cannot be substantiated until project implementation has commenced and therefore your report recommendations can only be regarded as preliminary. Only Tetra Tech Coffey, who prepared the report, is fully familiar with the background information needed to assess whether or not the report's recommendations are valid and whether or not changes should be considered as the project develops. If another party undertakes the implementation of the recommendations of this report there is a risk that the report will be misinterpreted and Tetra Tech Coffey cannot be held responsible for such misinterpretation.

Your report is prepared for specific purposes and persons

To avoid misuse of the information contained in your report it is recommended that you confer with Tetra Tech Coffey before passing your report on to another party who may not be familiar with the background and the purpose of the report. Your report should not be applied to any project other than that originally specified at the time the report was issued.

Interpretation by other design professionals

Costly problems can occur when other design professionals develop their plans based on misinterpretations of a report. To help avoid misinterpretations, retain Tetra Tech Coffey to work with other project design professionals who are affected by the report. Have Tetra Tech Coffey explain the report implications to design professionals affected by them and then review plans and specifications produced to see how they incorporate the report findings.

Data should not be separated from the report

The report as a whole presents the findings of the site assessment and the report should not be copied in part or altered in any way. Logs, figures, drawings, etc. are customarily included in our reports and are developed by scientists, engineers or geologists based on their interpretation of field logs (assembled by field personnel) and laboratory evaluation of field samples. These logs etc. should not under any circumstances be redrawn for inclusion in other documents or separated from the report in any way.

Geoenvironmental concerns are not at issue

Your report is not likely to relate any findings, conclusions, or recommendations about the potential for hazardous materials existing at the site unless specifically required to do so by the client. Specialist equipment, techniques, and personnel are used to perform a geoenvironmental assessment. Contamination can create major health, safety and environmental risks. If you have no information about the potential for your site to be contaminated or create an environmental hazard, you are advised to contact Tetra Tech Coffey for information relating to geoenvironmental issues.

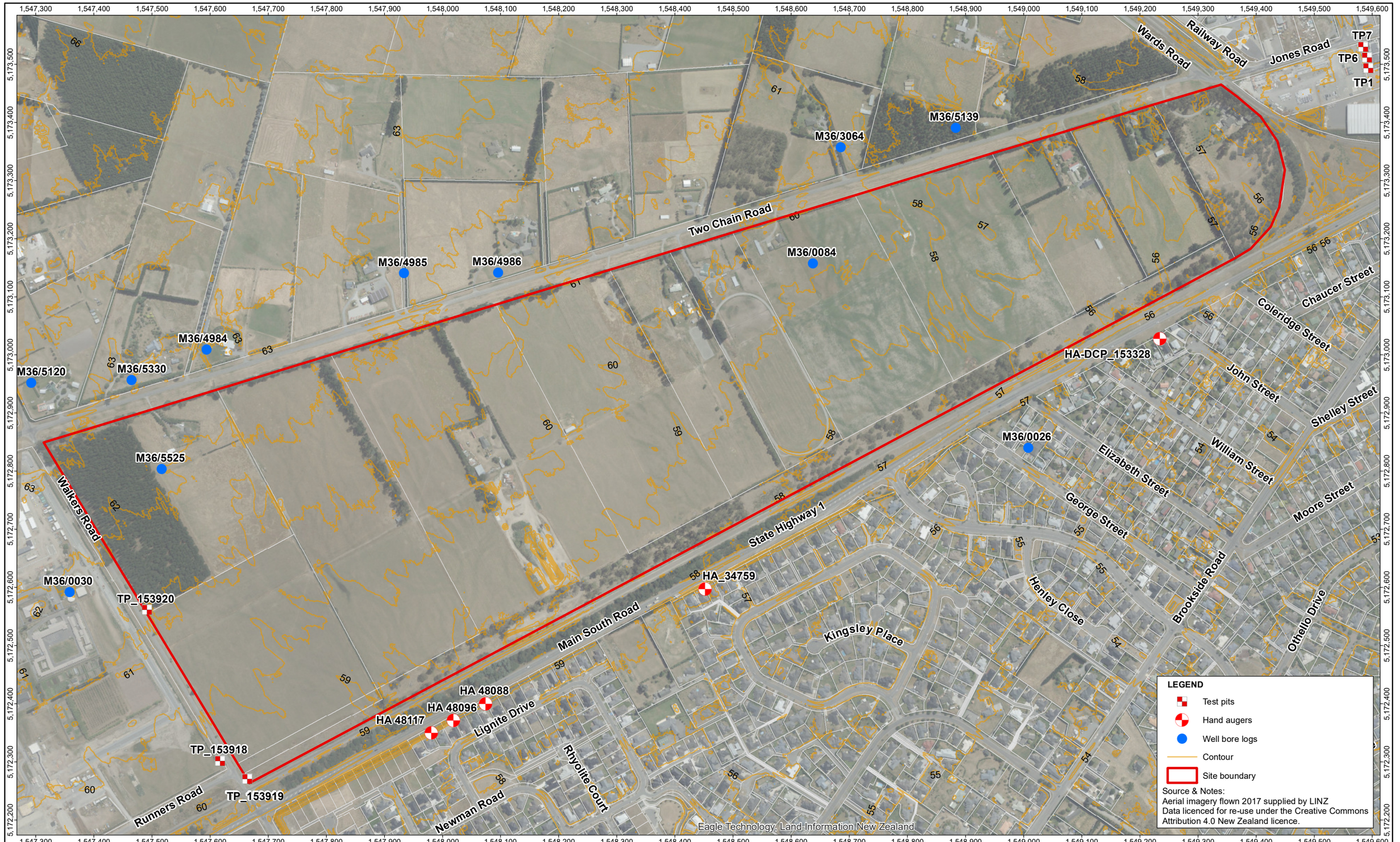
Rely on Tetra Tech Coffey for additional assistance

Tetra Tech Coffey is familiar with a variety of techniques and approaches that can be used to help reduce risks for all parties to a project, from design to construction. It is common that not all approaches will be necessarily dealt with in your site assessment report due to concepts proposed at that time. As the project progresses through design towards construction, speak with Tetra Tech Coffey to develop alternative approaches to problems that may be of genuine benefit both in time and cost.

Responsibility

Reporting relies on interpretation of factual information based on judgement and opinion and has a level of uncertainty attached to it, which is far less exact than the design disciplines. This has often resulted in claims being lodged against consultants, which are unfounded. To help prevent this problem, a number of clauses have been developed for use in contracts, reports and other documents. Responsibility clauses do not transfer appropriate liabilities from Tetra Tech Coffey to other parties but are included to identify where Tetra Tech Coffey's responsibilities begin and end. Their use is intended to help all parties involved to recognise their individual responsibilities. Read all documents from Tetra Tech Coffey closely and do not hesitate to ask any questions you may have.

APPENDIX A: SITE PLAN



revision	no.	description	drawn	approved	date
	A	ORIGINAL ISSUE	RZ	CT	22.07.21

SCALE 1:6,000 (A3) METRES (0 60 120 180 240)

Projection: NZGD 2000 New Zealand Transverse Mercator

drawn	RZ
approved	CT
date	22.07.2021
scale	AS SHOWN
original size	A3

TETRA TECH COFFEY

client:	TWO CHAIN ROAD LIMITED
project:	7 TO 183 TWO CHAIN ROAD
title:	TWO CHAIN ROAD TEST LOCATIONS
project no:	773-CHCGE291116
figure no:	01
rev:	A

MXD ref: 291116_02_GIS001_1

APPENDIX B: INVESTIGATION DATA

aurecon
www.aurecongroup.com

HAND AUGER RECORD

HOLE NO. **HA2**

PROJECT NO. **224926**

PROJECT **Stonebrook Stage 10 - Lot 196**

CLIENT **CDL LAND NZ LTD**	CO-ORDINATES (NZTM) **E 1548079 N 5172400**	SHEET **1** of **1**
METHOD **HA**		DATE from **08/10/2014** to **08/10/2014**
MACHINE & NO. **NA**	ORIENTATION **VERTICAL**	GROUND-LEVEL **+60.00** m RL

Water level	Tests	Samples (Type / Ref / Depth)	Reduced Level	Depth (m)	Legend	STRATA DESCRIPTION
				0.00		SUBORDINATE FRACTION, MAJOR FRACTION, MINOR FRACTION, COLOUR, STRUCTURE, STRENGTH, MOISTURE CONDITION GRADING, BEDDING, PLASTICITY, ETC.... *(NZ GEOTECHNICAL SOCIETY - FIELD DESCRIPTION OF SOIL AND ROCK)*
		HA 0.00	+59.70	0.30		**SILT**, some fine to coarse sand, minor fine to coarse gravel, dark brown. "Stiff", moist, low plasticity (TOPSOIL).
						End of Hand Auger at 0.30m, on 08/10/2014 *Termination Reason:* Due to Inferred Gravel.

- Small Disturbed Sample
- Large Disturbed Sample
- SPT Liner Sample
- Thin Wall Undisturbed Sample
- U100 Undisturbed Sample
- Pocket Penetrometer Test
- Piston Sample
- Water Level
- Impression Packer Test
- Standard Penetration Test
- Permeability Test
- Piezometer / Standpipe Tip
- Packer Test
- In-situ Vane Shear Test

LOGGED **M. TIWEKA**

DATE **08/10/2014**

CHECKED **R. SMITH**

DATE **09/10/2014**

REMARKS

Coordinates approximated from CERA public viewer using post-earthquake aerial imagery (24/12/2011) accurate to +/- 1.0m.

Ground level approximated from vertical LiDAR data accurate to +/- 1.0m; based on Lyttelton Vertical Datum.

Groundwater was not encountered.

Report ID: AGS4 HAND AUGER RECORD || Project: 224926 STONEBROOK.GPJ || Library: AGS 4_0.GLB || Date: 15 October 2014

Aurecon, Unit 1, 150 Cavendish Road, Casebrook Christchurch 8051. Tel: +64 3 375 0761 Fax: +64 3 379 6955 Christchurch@aurecongroup.com

NZGD ID: HA_48088

aurecon
www.aurecongroup.com

HAND AUGER RECORD

HOLE NO. **HA2**

PROJECT NO. **224926**

PROJECT **Stonebrook Stage 10 - Lot 199**

CLIENT **CDL LAND NZ LTD**	CO-ORDINATES (NZTM) **E 1548023 N 5172371**	SHEET **1** of **1**
METHOD **HA**		DATE from **08/10/2014** to **08/10/2014**
MACHINE & NO. **NA**	ORIENTATION **VERTICAL**	GROUND-LEVEL **+60.00** m RL

Water level	Tests	Samples (Type / Ref / Depth)	Reduced Level	Depth (m)	Legend	STRATA DESCRIPTION
		HA 0.00	+59.80	0.00 0.20		**SILT**, some fine to coarse sand, minor fine to coarse gravel, dark brown. "Very stiff", moist, low plasticity (TOPSOIL).
						End of Hand Auger at 0.20m, on 08/10/2014 *Termination Reason:* Due to Inferred Gravel.

STRATA DESCRIPTION
SUBORDINATE FRACTION, MAJOR FRACTION, MINOR FRACTION, COLOUR, STRUCTURE, STRENGTH, MOISTURE CONDITION GRADING, BEDDING, PLASTICITY, ETC....
(NZ GEOTECHNICAL SOCIETY - FIELD DESCRIPTION OF SOIL AND ROCK)

- Small Disturbed Sample
- Large Disturbed Sample
- SPT Liner Sample
- Thin Wall Undisturbed Sample
- U100 Undisturbed Sample
- Pocket Penetrometer Test
- Piston Sample
- Water Level
- Impression Packer Test
- Standard Penetration Test
- Permeability Test
- Piezometer / Standpipe Tip
- Packer Test
- In-situ Vane Shear Test

LOGGED **M. TIWEKA**

DATE **08/10/2014**

CHECKED **R. SMITH**

DATE **09/10/2014**

REMARKS

Coordinates approximated from CERA public viewer using post-earthquake aerial imagery (24/12/2011) accurate to +/- 1.0m.

Ground level approximated from vertical LiDAR data accurate to +/- 1.0m; based on Lyttelton Vertical Datum.

Groundwater was not encountered.

Report ID: AGS4 HAND AUGER RECORD || Project: 224926 STONEBROOK.GPJ || Library: AGS 4_0.GLB || Date: 15 October 2014

Aurecon, Unit 1, 150 Cavendish Road, Casebrook Christchurch 8051. Tel: +64 3 375 0761 Fax: +64 3 379 6955 Christchurch@aurecongroup.com

NZGD ID: HA_48096

aurecon
www.aurecongroup.com

HAND AUGER RECORD

HOLE NO. **HA2**

PROJECT NO. **224926**

PROJECT **Stonebrook Stage 10 - Lot 201**

CLIENT **CDL LAND NZ LTD**	CO-ORDINATES (NZTM) **E 1547985 N 5172350**	SHEET **1** of **1**
METHOD **HA**		DATE from **08/10/2014** to **08/10/2014**
MACHINE & NO. **NA**	ORIENTATION **VERTICAL**	GROUND-LEVEL **+60.00** m RL

Water level	Tests	Samples (Type / Ref / Depth)	Reduced Level	Depth (m)	Legend	STRATA DESCRIPTION
		HA / 0.00	+59.80	0.00 0.20		**SILT**, some fine to coarse sand, minor fine to coarse gravel, dark brown. "Very stiff", moist, low plasticity (TOPSOIL).
						End of Hand Auger at 0.20m, on 08/10/2014 *Termination Reason:* Due to Inferred Gravel.

STRATA DESCRIPTION
SUBORDINATE FRACTION, MAJOR FRACTION, MINOR FRACTION, COLOUR, STRUCTURE, STRENGTH, MOISTURE CONDITION GRADING, BEDDING, PLASTICITY, ETC....
(NZ GEOTECHNICAL SOCIETY - FIELD DESCRIPTION OF SOIL AND ROCK)

- Small Disturbed Sample
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- Permeability Test
- Piezometer / Standpipe Tip
- Packer Test
- In-situ Vane Shear Test

LOGGED **M. TIWEKA**

DATE **08/10/2014**

CHECKED **R. SMITH**

DATE **09/10/2014**

REMARKS

Coordinates approximated from CERA public viewer using post-earthquake aerial imagery (24/12/2011) accurate to +/- 1.0m.

Ground level approximated from vertical LiDAR data accurate to +/- 1.0m; based on Lyttelton Vertical Datum.

Groundwater was not encountered.

Report ID: AGS4 HAND AUGER RECORD || Project: 224926 STONEBROOK.GPJ || Library: AGS 4_0.GLB || Date: 15 October 2014

Aurecon, Unit 1, 150 Cavendish Road, Casebrook Christchurch 8051. Tel: +64 3 375 0761 Fax: +64 3 379 6955 Christchurch@aurecongroup.com

NZGD ID: HA_48117

REPORT OF INVESTIGATION: GA_6663

CONTRACTOR: GOLDER

MACHINE: Hand Auger / Dynamic Cone Penetrometer

COORDS: 1548454 mE 5172599 mN

LOCATION: Lot 155 Fairfield Way

SURFACE RL: 56.68 m DATUM: MSL

RECORDED: LW DATE: -

TEST DEPTH: 0.60 m

CHECKED: RS DATE: -

Formation	Graphic Log	Description	USC	Moisture Condition	Consistency / Density	Water Observations	Depth (m)	Blows per 100 mm	Backfill
		TOPSOIL with minor subrounded medium gravels, dark brown, soft, dry, some rootlets	OL	D	S	Groundwater not encountered	0.5	2 4 6 8 10 12 14 16 18 20 22 24	
		Clayey SILT, mixed with topsoil with minor subrounded gravels, dark-light brown, soft to firm, dry, low plasticity	ML		S-F			>>	
		End of hole at: 0.4 m						End of test at: 0.60 m	

Remarks:

DCP Termination: Refusal.

Notes:
Coordinates and elevation are estimates only.
This report of penetrometer must be read in conjunction with accompaning notes and abbreviations. It has been prepared for geotechnical purposes only, without attempt to assess possible contamination. Any references to potential contamination are for information only and not necessarily indicate the presence or absence of soil or groundwater contamination.
Hand auger: Logged in accordance with NZGS guideline "Field description of soil and rock" 2005.
DCP: Performed to NZS:4402,Test 6.5.2:1988.

NZGD ID: HA_34759

HAND AUGER AND SCALA LOG

Job No.:	**16158**
Hole No.:	**HA04/SP04**
Date:	11/05/2016
Logged By:	HH
Sheet:	1 of 1

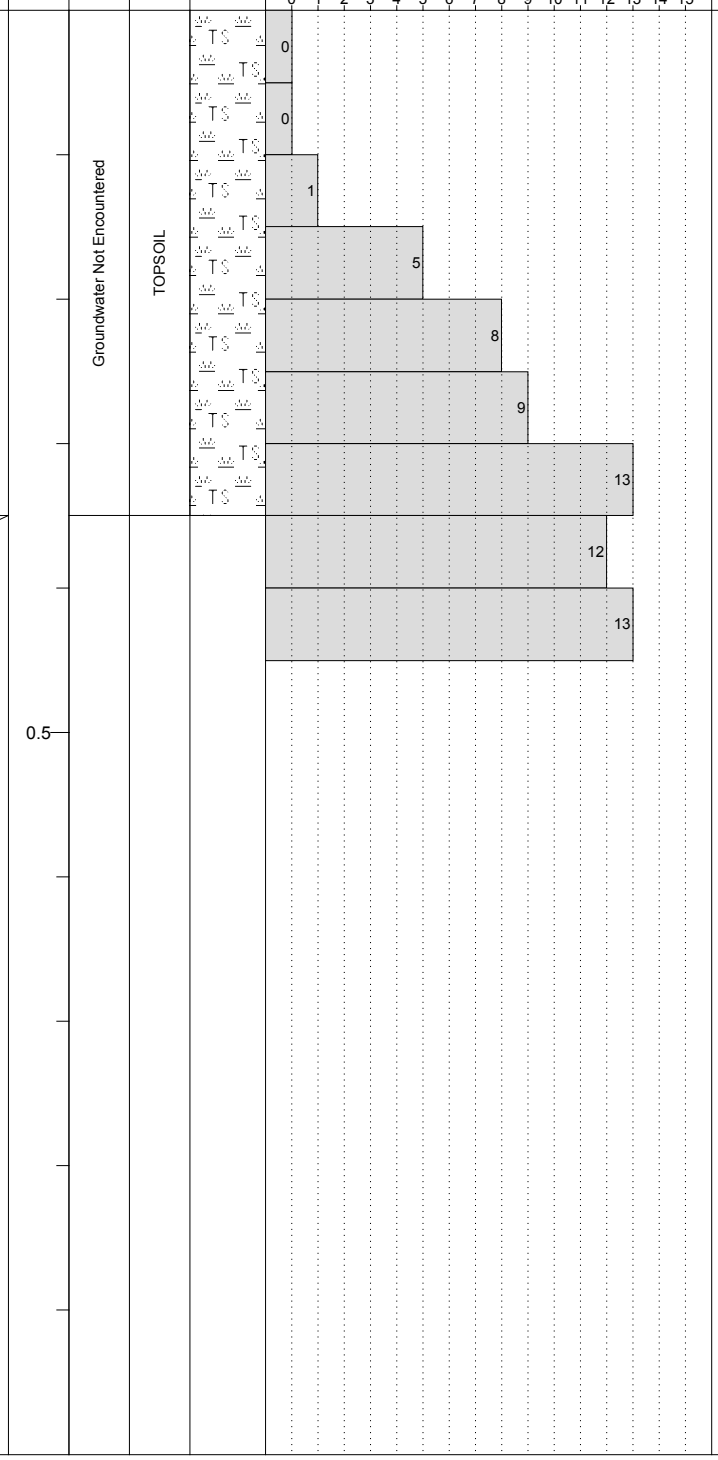
Client: Trident Group Ltd

Project: Residential Building

Location: 24 Chaucer Street, Rolleston, Christchurch

Coordinates: E 1549472.3, N 5173171.6

Subsurface Conditions	Depth (m)	Groundwater	Geological Unit	Graphic Log	Scala Penetrometer (blows / 50mm)	Vane Shear Strength (refer notes for details)
SILT with minor gravel and trace sand; light brown; dry; low plasticity. Gravel is fine to medium, subrounded. Sand is fine.		Groundwater Not Encountered	TOPSOIL	TS	0, 0, 1, 5, 8, 9, 13	
0.4m: End of hole (unable to penetrate)	0.5				12, 13	



Notes & Abbreviations

Soils logged in accordance with 'The guidelines for the classification and description of soil and rock for engineering purposes' December 2005, NZGS. Co-ordinates are in NZTM unless otherwise specified.

Water

- ▼ Standing Water Level
- ▽ Water Level At Time Of Drilling
- ◁– Out Flow –▷ In Flow

Shear Vane

Corrected as per NZGS Guidelines
Vane No.:
UTP = Unable To Penetrate
+ = Peak Exceeded
- = No Result

Other Comments

KGA GEOTECHNICAL

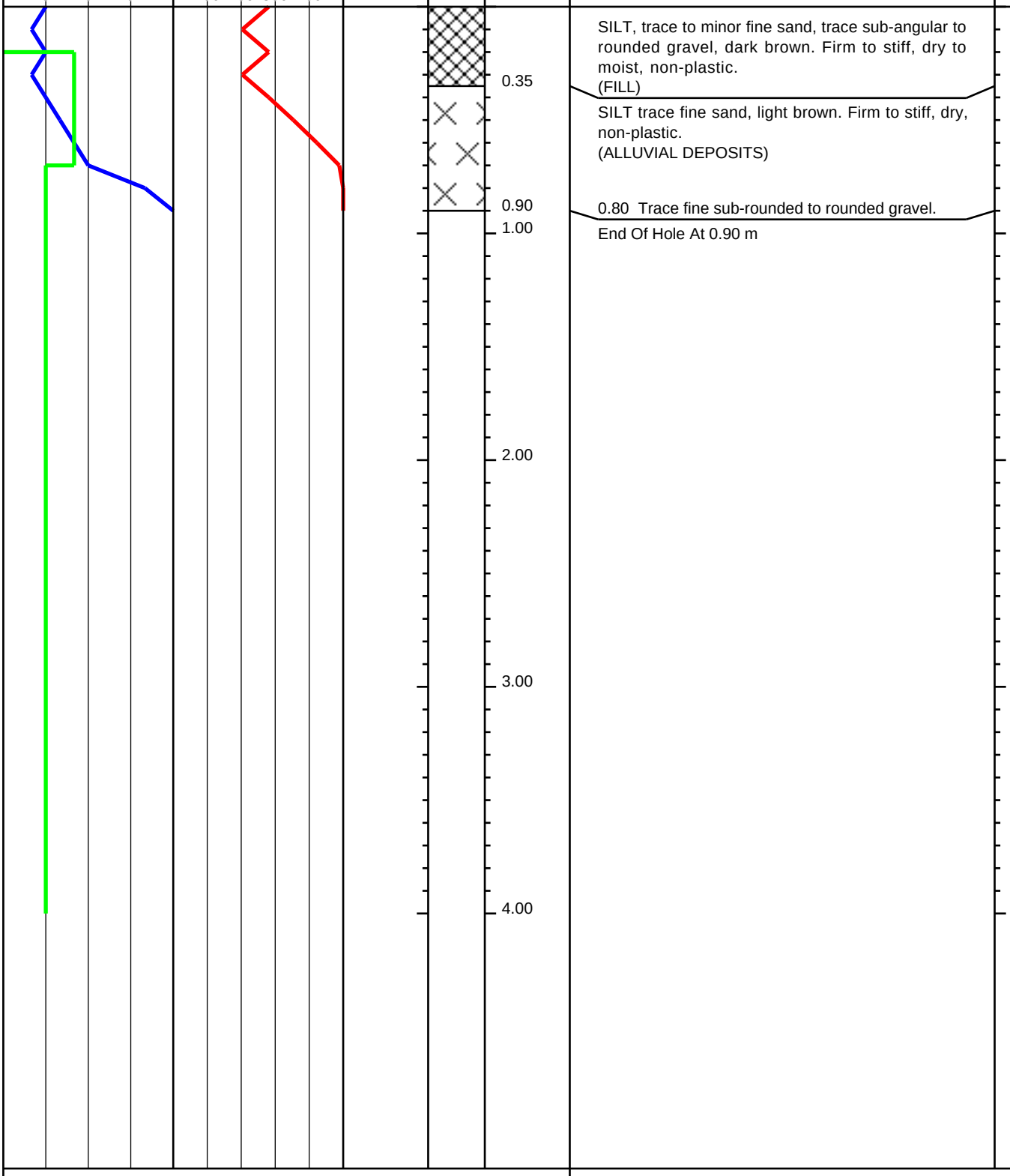
Produced with Core-GS

Printed: 11/05/2016 11:45:51 a.m.

NZGD ID: HA-DCP_82955

CGW Consulting Engineers

Project Title: 25 John Street, Rolleston			
Project Number: 20687	Client: Theresa Phelam	HA/DCP02	
GL (mAOD):	N Coord: 0	E Coord: 0	
Date: 13/10/2020	Method: Hand Auger/DCP	Logged By: AM	Scale: 1:25 Sheet 1 Of 1



KEY

D - Disturbed Sample
B - Bulk Sample
W - Water Sample
V - Hand Shear Vane kPa

▽ - Groundwater Strike
▼ - Groundwater Level

REMARKS

No Groundwater Encountered
Terminated due to
gravel obstruction.

NZGD ID: HA-DCP_153328

Soil & Rock Consultants
GEOTECHNICAL & ENVIRONMENTAL ENGINEERS

CLIENT: Lincoln Amor

PROJECT: 847 Jones Rd, Rolleston

Test Pit No: TP01

Sheet 1 of 1

Drill Type:	8t Excavator	Project No:	C14652	Logged By:	MG
Drilled By:	Soil & Rock Consultants	Coordinates:	1549602 E, 5173496 N	Reviewed By:	MLB
Date Started:	16/12/14	Ground Elevation:	55m LINZ Topo	Surface Conditions:	Near level, grass
Date Finished:	16/12/14	Water Level:	Groundwater not encountered	Shear Vane Number:	N/A

STRATIGRAPHY	DEPTH (m)	GRAPHIC LOG	Soil description in accordance with the NZ Geotechnical Society Inc 2005 "Guidelines for Field Description of Soil and Rock in Engineering Use"
Fill	0.0		SILT, some fine to medium sub-rounded to rounded gravel, trace to minor fine to medium sand, greyish brown, medium dense to dense, dry to moist, non-plastic
Alluvial Deposits	0.5		Silty fine to coarse sub-rounded to rounded GRAVEL, minor fine to medium sand, greyish brown, dense to very dense, moist
			minor to some fine to medium sand
	1.0		Sandy fine to coarse sub-rounded to rounded GRAVEL, trace to minor silt, trace sub-rounded to rounded cobble, brownish grey, very dense, moist
			trace silt
			greyish brown
	1.5		moist to wet
			minor sub-rounded to rounded cobble
	2.0		wet
	2.5		END OF TEST PIT. 2.4 METRES. [Target Depth]
	3.0		

WATER LEVEL (m)

SCALA PENETROMETER TEST METHOD NZS4402: 1986 test 6.5.2

DEPTH (m)	(Blows/100mm) 0	5	10	15
0.0	0			
	4			
				18
0.5				25
1.0				
1.5				
2.0				
2.5				
3.0				

LABORATORY TESTS

COMMENTS:

TEST PIT LOG C14652_TP1-10.GPJ S+R_2012-AGS - REVISED.GDT 18/12/14

PO Box 5486, Papanui, Christchurch 8542. Phone: 03-352-4519
www.soilandrock.co.nz

NZGD ID: TP_48855

Soil & Rock Consultants
GEOTECHNICAL & ENVIRONMENTAL ENGINEERS

CLIENT: Lincoln Amor

PROJECT: 847 Jones Rd, Rolleston

Test Pit No: TP06

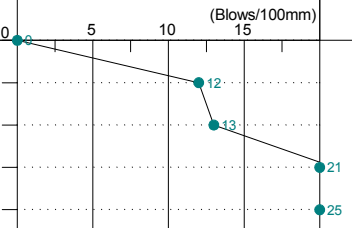
Sheet 1 of 1

Drill Type:	8t Excavator	Project No:	C14652	Logged By:	MG
Drilled By:	Soil & Rock Consultants	Coordinates:	1549591 E, 5173520 N	Reviewed By:	MLB
Date Started:	16/12/14	Ground Elevation:	55m LINZ Topo	Surface Conditions:	Near level, grass
Date Finished:	16/12/14	Water Level:	Groundwater not encountered	Shear Vane Number:	N/A

STRATIGRAPHY	DEPTH (m)	GRAPHIC LOG	Soil description in accordance with the NZ Geotechnical Society Inc 2005 "Guidelines for Field Description of Soil and Rock in Engineering Use"
Fill	0.0		SILT, trace to minor fine to medium sub-rounded to rounded gravel, trace fine sand, brown, loose to medium dense, dry to moist, non-plastic
			minor to some sub rounded to rounded gravel
Alluvial Deposits	0.5		Sandy fine to coarse sub-rounded to rounded GRAVEL, trace to minor silt, trace sub-rounded to rounded cobble, greyish brown, dense to very dense, moist
			trace silt
	1.0		
			trace to minor sub-rounded to rounded cobble
	1.5		moist to wet
	2.0		wet
	2.5		
	3.0		END OF TEST PIT. 3.0 METRES. [Target Depth]

WATER LEVEL (m)

SCALA PENETROMETER TEST METHOD NZS4402: 1986 test 6.5.2



LABORATORY TESTS

COMMENTS:

TEST PIT LOG C14652_TP1-10.GPJ S+R_2012-AGS - REVISED.GDT 18/12/14

PO Box 5486, Papanui, Christchurch 8542. Phone: 03-352-4519
www.soilandrock.co.nz

NZGD ID: TP_48855

Soil & Rock Consultants
GEOTECHNICAL & ENVIRONMENTAL ENGINEERS

CLIENT: Lincoln Amor

PROJECT: 847 Jones Rd, Rolleston

Test Pit No: TP07

Sheet 1 of 1

Drill Type:	8t Excavator	Project No:	C14652	Logged By:	MG
Drilled By:	Soil & Rock Consultants	Coordinates:	1549587 E, 5173527 N	Reviewed By:	MLB
Date Started:	16/12/14	Ground Elevation:	55m LINZ Topo	Surface Conditions:	Near level, grass
Date Finished:	16/12/14	Water Level:	Groundwater not encountered	Shear Vane Number:	N/A

STRATIGRAPHY	DEPTH (m)	Soil description in accordance with the NZ Geotechnical Society Inc 2005 "Guidelines for Field Description of Soil and Rock in Engineering Use"
Fill	0.0	SILT, trace fine to medium sub-rounded to rounded gravel, trace fine sand, brown, dense, dry to moist, non-plastic
Alluvial Deposits	0.5	Silty fine to coarse sub-rounded to rounded GRAVEL, trace to minor fine sand, greyish brown, dense to very dense, dry to moist
	1.0	Sandy fine to coarse sub-rounded to rounded GRAVEL, trace cobble, trace silt, greyish brown, dense to very dense, moist
	1.5	moist to wet
	2.0	wet
		trace to minor sub rounded cobble
	2.5	trace sub rounded to rounded cobble
	3.0	END OF TEST PIT. 2.8 METRES. [Target Depth]

WATER LEVEL (m)

SCALA PENETROMETER TEST METHOD NZS4402: 1986 test 6.5.2

(Blows/100mm)

DEPTH (m)	0	5	10	15
0.0	0			
0.5		12	13	24 25
1.0				
1.5				
2.0				
2.5				
3.0				

LABORATORY TESTS

COMMENTS:

TEST PIT LOG C14652_TP1-10.GPJ S+R_2012-AGS - REVISED.GDT 18/12/14

PO Box 5486, Papanui, Christchurch 8542. Phone: 03-352-4519
www.soilandrock.co.nz

NZGD ID: TP_48855

Log Key Sheet

WATER

Water level on date shown

METHOD *(shows drilling method)*

OB	open barrel
Wash	wash boring
TT	triple tube
UT	thin walled undisturbed tube
SPT	standard penetration test – open nose sampler
Nc	standard penetration test – solid nose sampler
MA	machine auger
PS	piston sample
PCT	percussion – top drive
PCB	percussion – bottom drive
Conc	concentrics
Sonic	sonic
HA	hand auger
VE	vacuum excavation

SAMPLES

Dx	Disturbed sample, number x
Bx	Bulk sample, number x
Ux(d)	Undisturbed sample, number x, tube diameter d in mm
Wx	Water sample, number x

MOISTURE

Dry, looks and feels dry
Moist, no free water on hand when remoulding
Wet, free water on hand when remoulding
Saturated, soil below water table

SOIL AND ROCK DESCRIPTIONS

Soil and Rock Descriptions are generally as described in the NZ Geotechnical Society "Field Description of Soil and Rock – Guideline for the Field Classification and Description of Soil and Rock for Engineering Purposes", dated December 2005.
Vane Shear Strength measurements in accordance with the NZ Geotechnical Society "Guideline for hand held shear vane test" dated August 2001.

IN SITU TESTS

SV	= 40/10	In situ shear strength and remoulded shear strength respectively, as measured by Geotechnics/ Pilcon Shear Vane
τ	= 50/12	Vane shear strength and remoulded vane shear strength respectively, corrected to BS1377
UTP	=	Unable To Penetrate with Shear Vane
N	= 15	SPT uncorrected blow count for 300mm penetration
N_c	= 50+	SPT uncorrected blow count for 300 mm penetration using solid nose sampler

★	**Laboratory Test(s) carried out:**
AL	Atterberg limits
UU	Unconsolidated undrained triaxial
PSD	Particle size
CU	Consolidated undrained triaxial
CONS	Consolidation
COMP	Compaction
UCS	Unconfined compression

WEATHERING

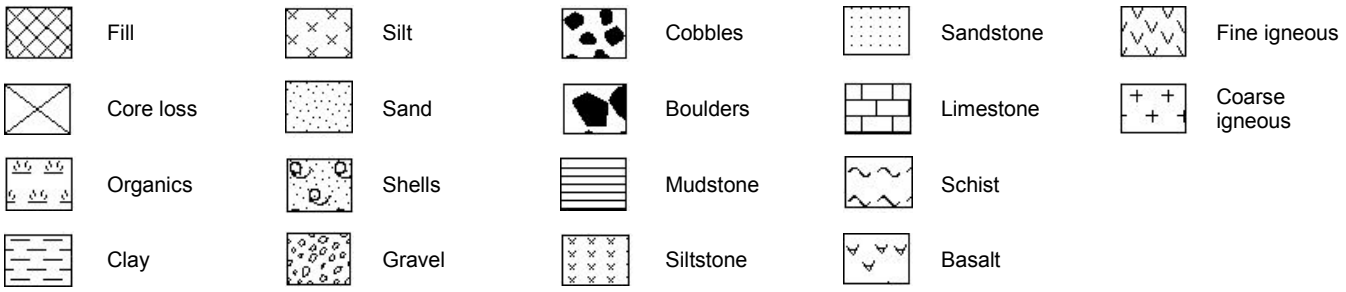
CW	Completely weathered
HW	Highly weathered
MW	Moderately weathered
SW	Slightly weathered
UW	Unweathered

CONSISTENCY

Cohesive Soils	Undrained Shear Strength (kPa)
Very soft	<12
Soft	12 to 25
Firm	25 to 50
Stiff	50 to 100
Very stiff	100 to 200
Hard	>200

Non-cohesive Soils	SPT – Uncorrected
Very loose	0 to 4
Loose	4 to 10
Medium dense	10 to 30
Dense	30 to 50
Very dense	>50

GRAPHIC LOG (1 or a combination of the following)



ORGANIC SOILS

Von Post Degree of Humification

H1	Completely unconverted and mud-free peat, when pressed gives clear water and plant structure is visible.
H2	Practically unconverted and mud-free peat, when pressed gives almost clear water and plant structure is visible.
H3	Very slightly decomposed or very slightly muddy peat, when pressed gives marked muddy water, no peat substance passes through the fingers and plant structure is less visible.
H4	Slightly decomposed or slightly muddy peat, when pressed gives marked muddy water and plant structure is less visible.
H5	Moderately decomposed or very muddy peat with growth structure evident but slightly obliterated.
H6	Moderately decomposed or very muddy peat with indistinct growth structure.
H7	Fairly well decomposed or very muddy peat but the growth structure can just be seen.
H8	Well decomposed or very muddy peat with very indistinct growth structure.
H9	Practically decomposed or mud-like peat in which almost no growth structure is evident.
H10	Completely decomposed or mud peat where no growth structure can be seen, entire substance passes through the fingers when pressed.

Beca

TEST PIT No: TP01

TEST PIT LOG

SHEET 1 of 1

PROJECT:	Walkers Rd Widening DD	JOB NUMBER:	3335348/400
SITE LOCATION:	Walkers Road, Rolleston	CLIENT:	Selwyn District Council (SDC)

CIRCUIT:	NZTM2000	TEST PIT LOCATION:	West side of Walkers Rd - near the corner with Runners Rd
COORDINATES:	N 5,172,311 m	R L:	59 m
	E 1,547,620 m	DATUM:	NZVD
		COORDINATE ORIGIN:	hhGPS
		ACCURACY:	±5m

DEPTH (m)	SAMPLES	GRAPHIC LOG	SOIL / ROCK DESCRIPTION	GEOLOGICAL UNIT	SV	τ (kPa)	WATER LEVEL	R L (m)
0			Soft fine to coarse sandy SILT, minor organics; brown; moist, non-plastic. Organics: rootlets. [TOPSOIL].					
			Stiff fine to coarse sandy SILT, some fine to coarse gravels, trace organics, trace cobbles; brown; moist, non-plastic. Gravel/ Cobbles: rounded to well-rounded, slightly weathered, greywacke. Organics: rootlets.					
0.5			Tightly packed cobbly fine to coarse GRAVEL, some fine to coarse SAND, minor silt, trace organics; brown; moist, well graded. Gravel/ Cobbles: subrounded to rounded, slightly weathered, greywacke. Organics: rootlets.					58.5
1.0	B1		From 0.80m: no organics.	Quaternary Alluvium				58.0
1.5								57.5
2.0			END OF LOG @ 2 m					57.0
2.5								56.5
3.0								56.0
3.5								55.5
4.0								55.0
4.5								54.5

DATE EXCAVATED:	28/10/20	CONTRACTOR:	HEB Construction
LOGGED BY:	VVC	EQUIPMENT:	Hydrovacuum
SHEAR VANE No:	N/A	METHOD:	WB

COMMENTS:
Test pit terminated at target depth. Test pit wall stability good. Groundwater not encountered. Coordinates obtained using a handheld GPS.

FOR EXPLANATION OF SYMBOLS AND ABBREVIATIONS SEE KEY SHEET

A4 Scale 1:25

Log Key Sheet

WATER

Water level on date shown

METHOD *(shows drilling method)*

OB	open barrel
Wash	wash boring
TT	triple tube
UT	thin walled undisturbed tube
SPT	standard penetration test – open nose sampler
Nc	standard penetration test – solid nose sampler
MA	machine auger
PS	piston sample
PCT	percussion – top drive
PCB	percussion – bottom drive
Conc	concentrics
Sonic	sonic
HA	hand auger
VE	vacuum excavation

SAMPLES

Dx	Disturbed sample, number x
Bx	Bulk sample, number x
Ux(d)	Undisturbed sample, number x, tube diameter d in mm
Wx	Water sample, number x

MOISTURE

Dry, looks and feels dry
Moist, no free water on hand when remoulding
Wet, free water on hand when remoulding
Saturated, soil below water table

SOIL AND ROCK DESCRIPTIONS

Soil and Rock Descriptions are generally as described in the NZ Geotechnical Society "Field Description of Soil and Rock – Guideline for the Field Classification and Description of Soil and Rock for Engineering Purposes", dated December 2005.
Vane Shear Strength measurements in accordance with the NZ Geotechnical Society "Guideline for hand held shear vane test" dated August 2001.

IN SITU TESTS

SV	= 40/10	In situ shear strength and remoulded shear strength respectively, as measured by Geotechnics/ Pilcon Shear Vane
τ	= 50/12	Vane shear strength and remoulded vane shear strength respectively, corrected to BS1377
UTP	=	Unable To Penetrate with Shear Vane
N	= 15	SPT uncorrected blow count for 300mm penetration
N_c	= 50+	SPT uncorrected blow count for 300 mm penetration using solid nose sampler

★	**Laboratory Test(s) carried out:**
AL	Atterberg limits
UU	Unconsolidated undrained triaxial
PSD	Particle size
CU	Consolidated undrained triaxial
CONS	Consolidation
COMP	Compaction
UCS	Unconfined compression

WEATHERING

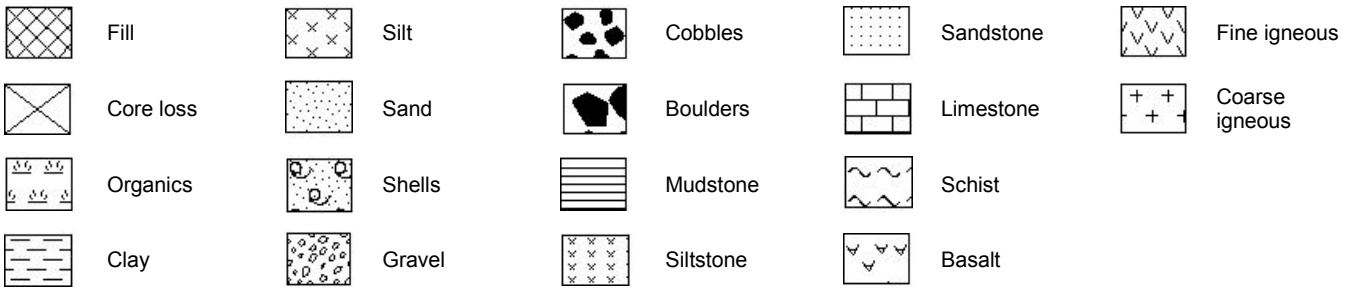
CW	Completely weathered
HW	Highly weathered
MW	Moderately weathered
SW	Slightly weathered
UW	Unweathered

CONSISTENCY

Cohesive Soils	Undrained Shear Strength (kPa)
Very soft	<12
Soft	12 to 25
Firm	25 to 50
Stiff	50 to 100
Very stiff	100 to 200
Hard	>200

Non-cohesive Soils	SPT – Uncorrected
Very loose	0 to 4
Loose	4 to 10
Medium dense	10 to 30
Dense	30 to 50
Very dense	>50

GRAPHIC LOG (1 or a combination of the following)



ORGANIC SOILS

Von Post Degree of Humification

H1	Completely unconverted and mud-free peat, when pressed gives clear water and plant structure is visible.
H2	Practically unconverted and mud-free peat, when pressed gives almost clear water and plant structure is visible.
H3	Very slightly decomposed or very slightly muddy peat, when pressed gives marked muddy water, no peat substance passes through the fingers and plant structure is less visible.
H4	Slightly decomposed or slightly muddy peat, when pressed gives marked muddy water and plant structure is less visible.
H5	Moderately decomposed or very muddy peat with growth structure evident but slightly obliterated.
H6	Moderately decomposed or very muddy peat with indistinct growth structure.
H7	Fairly well decomposed or very muddy peat but the growth structure can just be seen.
H8	Well decomposed or very muddy peat with very indistinct growth structure.
H9	Practically decomposed or mud-like peat in which almost no growth structure is evident.
H10	Completely decomposed or mud peat where no growth structure can be seen, entire substance passes through the fingers when pressed.

Beca

TEST PIT No: TP02

TEST PIT LOG

SHEET 1 of 1

PROJECT:	Walkers Rd Widening DD	JOB NUMBER:	3335348/400
SITE LOCATION:	Walkers Road, Rolleston	CLIENT:	Selwyn District Council (SDC)

CIRCUIT:	NZTM2000	TEST PIT LOCATION:	East side of Walkers Rd - between Runners Rd and the rail track		
COORDINATES:	N 5,172,266 m	R L:	59 m	COORDINATE ORIGIN:	hhGPS
	E 1,547,662 m	DATUM:	NZVD	ACCURACY:	±5m

DEPTH (m)	SAMPLES	GRAPHIC LOG	SOIL / ROCK DESCRIPTION	GEOLOGICAL UNIT	SV	τ (kPa)	WATER LEVEL	R L (m)
0.0			Stiff fine sandy SILT, trace organics; brown; moist, non-plastic. Organics: rootlets. [TOPSOIL]					59.0
0.5			Firm fine to medium sandy SILT, some fine to coarse gravel, trace cobbles, trace organics; brown; moist, non-plastic. Gravel/ Cobbles: subrounded to well-rounded, slightly weathered, greywacke. Organics: rootlets.	Quaternary Alluvium				58.5
1.0	B2		Tightly packed cobbly fine to coarse GRAVEL, some fine to coarse SAND, minor silt; brown; moist, well graded. Gravel/ Cobbles: subrounded to well-rounded, slightly weathered, greywacke.					58.0
1.5								57.5
2.0			END OF LOG @ 2 m					57.0
2.5								56.5
3.0								56.0
3.5								55.5
4.0								55.0
4.5								54.5

DATE EXCAVATED:	28/10/20	CONTRACTOR:	HEB Construction	COMMENTS:
LOGGED BY:	DD	EQUIPMENT:	Hydrovacuum	Test pit terminated at target depth. Test pit wall stability good. Groundwater not encountered. Coordinates obtained using a handheld GPS.
SHEAR VANE No:	N/A	METHOD:	WB	

FOR EXPLANATION OF SYMBOLS AND ABBREVIATIONS SEE KEY SHEET

A4 Scale 1:25

Log Key Sheet

WATER

Water level on date shown

METHOD *(shows drilling method)*

OB	open barrel
Wash	wash boring
TT	triple tube
UT	thin walled undisturbed tube
SPT	standard penetration test – open nose sampler
Nc	standard penetration test – solid nose sampler
MA	machine auger
PS	piston sample
PCT	percussion – top drive
PCB	percussion – bottom drive
Conc	concentrics
Sonic	sonic
HA	hand auger
VE	vacuum excavation

SAMPLES

Dx	Disturbed sample, number x
Bx	Bulk sample, number x
Ux(d)	Undisturbed sample, number x, tube diameter d in mm
Wx	Water sample, number x

MOISTURE

Dry, looks and feels dry
Moist, no free water on hand when remoulding
Wet, free water on hand when remoulding
Saturated, soil below water table

SOIL AND ROCK DESCRIPTIONS

Soil and Rock Descriptions are generally as described in the NZ Geotechnical Society "Field Description of Soil and Rock – Guideline for the Field Classification and Description of Soil and Rock for Engineering Purposes", dated December 2005.
Vane Shear Strength measurements in accordance with the NZ Geotechnical Society "Guideline for hand held shear vane test" dated August 2001.

IN SITU TESTS

SV	= 40/10	In situ shear strength and remoulded shear strength respectively, as measured by Geotechnics/ Pilcon Shear Vane
τ	= 50/12	Vane shear strength and remoulded vane shear strength respectively, corrected to BS1377
UTP	=	Unable To Penetrate with Shear Vane
N	= 15	SPT uncorrected blow count for 300mm penetration
N_c	= 50+	SPT uncorrected blow count for 300 mm penetration using solid nose sampler

★	**Laboratory Test(s) carried out:**
AL	Atterberg limits
UU	Unconsolidated undrained triaxial
PSD	Particle size
CU	Consolidated undrained triaxial
CONS	Consolidation
COMP	Compaction
UCS	Unconfined compression

WEATHERING

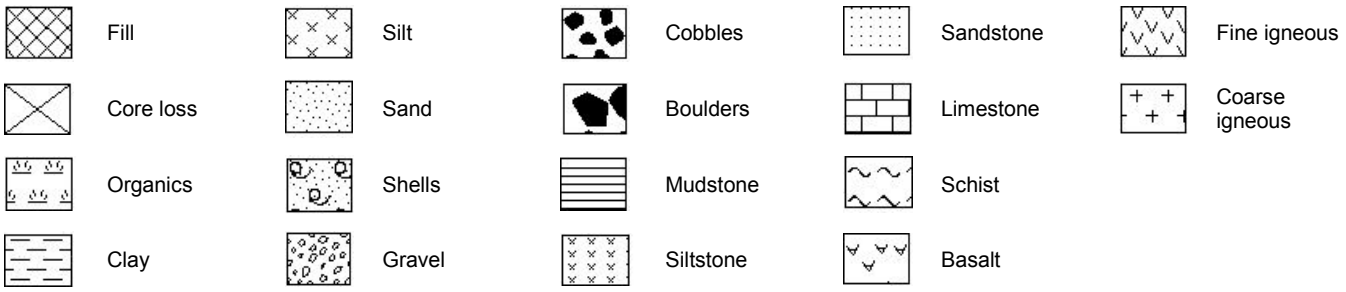
CW	Completely weathered
HW	Highly weathered
MW	Moderately weathered
SW	Slightly weathered
UW	Unweathered

CONSISTENCY

Cohesive Soils	Undrained Shear Strength (kPa)
Very soft	<12
Soft	12 to 25
Firm	25 to 50
Stiff	50 to 100
Very stiff	100 to 200
Hard	>200

Non-cohesive Soils	SPT – Uncorrected
Very loose	0 to 4
Loose	4 to 10
Medium dense	10 to 30
Dense	30 to 50
Very dense	>50

GRAPHIC LOG (1 or a combination of the following)



ORGANIC SOILS

Von Post Degree of Humification

H1	Completely unconverted and mud-free peat, when pressed gives clear water and plant structure is visible.
H2	Practically unconverted and mud-free peat, when pressed gives almost clear water and plant structure is visible.
H3	Very slightly decomposed or very slightly muddy peat, when pressed gives marked muddy water, no peat substance passes through the fingers and plant structure is less visible.
H4	Slightly decomposed or slightly muddy peat, when pressed gives marked muddy water and plant structure is less visible.
H5	Moderately decomposed or very muddy peat with growth structure evident but slightly obliterated.
H6	Moderately decomposed or very muddy peat with indistinct growth structure.
H7	Fairly well decomposed or very muddy peat but the growth structure can just be seen.
H8	Well decomposed or very muddy peat with very indistinct growth structure.
H9	Practically decomposed or mud-like peat in which almost no growth structure is evident.
H10	Completely decomposed or mud peat where no growth structure can be seen, entire substance passes through the fingers when pressed.

Beca

TEST PIT LOG

TEST PIT No: TP03

SHEET 1 of 1

PROJECT:	Walkers Rd Widening DD	JOB NUMBER:	3335348/400
SITE LOCATION:	Walkers Road, Rolleston	CLIENT:	Selwyn District Council (SDC)

CIRCUIT:	NZTM2000	TEST PIT LOCATION:	East side of Walkers Rd - next to the farm access gate
COORDINATES:	N 5,172,558 m	R L:	61 m
	E 1,547,492 m	DATUM:	NZVD
		COORDINATE ORIGIN:	hhGPS
		ACCURACY:	±5m

DEPTH (m)	SAMPLES	GRAPHIC LOG	SOIL / ROCK DESCRIPTION	GEOLOGICAL UNIT	SV	τ (kPa)	WATER LEVEL	R L (m)
			Soft fine to coarse sandy SILT, minor organics, trace fine gravel; brown; moist, non-plastic. Organics: rootlets. Gravel: subangular, slightly weathered, greywacke. [TOPSOIL]					
			Stiff fine to coarse sandy SILT, some fine to coarse gravel, trace organics, trace cobbles; brown; moist, non-plastic. Gravel/ Cobbles: rounded to well-rounded, slightly weathered, greywacke. Organics: rootlets.					
0.5			Tightly packed fine to coarse gravelly COBBLES, some fine to coarse sand, minor silt, trace organics; brown; moist, well graded. Gravel/ Cobbles: rounded, slighlty weathered, greywacke. Organics: rootlets.					60.5
1.0	B3		From 1.0m: no organics.	Quaternary Alluvium				60.0
1.5								59.5
2.0			END OF LOG @ 2 m					59.0
2.5								58.5
3.0								58.0
3.5								57.5
4.0								57.0
4.5								56.5

DATE EXCAVATED:	29/10/20	CONTRACTOR:	HEB Construction
LOGGED BY:	VVC	EQUIPMENT:	Hydrovacuum
SHEAR VANE No:	N/A	METHOD:	WB

COMMENTS:
Test pit terminated at target depth. Test pit wall stability good. Groundwater not encountered. Coordinates obtained using a handheld GPS.

FOR EXPLANATION OF SYMBOLS AND ABBREVIATIONS SEE KEY SHEET

A4 Scale 1:25

Borelog for well M36/0026

Grid Reference (NZTM): 1549008 mE, 5172830 mN
Location Accuracy: 2 - 15m
Ground Level Altitude: 55.8 m +MSD Accuracy: < 0.5 m
Driller: McMillan T T
Drill Method: Cable Tool
Borelog Depth: 56.1 m Drill Date: 07-Jan-1971

Environment Canterbury Regional Council
Kaunihera Taiao ki Waitaha

Scale(m)	Water Level	Depth(m)	Full Drillers Description	Formation Code
		0.30m	Earth and clay	
		0.30m	Earth and clay Clay and gravel	
		1.80m		
		1.80m	Clay and gravel Open large and small gravels	
5				
		6.69m		
		6.69m	Open large and small gravels Gravel, clay and sand	
10				
		11.90m		
		11.90m	Gravel, clay and sand Open gravels	
		13.70m		
		13.70m	Open gravels Slightly claybound gravels	
15				
		16.20m		
		16.20m	Slightly claybound gravels Claybound gravels	
20				
		20.70m		
		20.70m	Claybound gravels Gravel, clay and sand	
		22.60m		
		22.60m	Gravel, clay and sand Broken claybound gravels	
25				
		28.29m		
		28.29m	Broken claybound gravels Medium Brown gravels and sand	
		29.00m		
		29.00m	Medium Brown gravels and sand Large broken gravels	
30				
		30.50m		
		30.50m	Large broken gravels Brown gravel, sand and clay	
		34.09m		
		34.09m	Brown gravel, sand and clay Claybound gravels	
35				
		36.59m		
		36.59m	Claybound gravels Small to medium Brown gravels	
		37.79m		
		37.79m	Small to medium Brown gravels Very sandy small gravels and thick claywash	
		39.29m		
		39.29m	Very sandy small gravels and thick claywash Gravel sand and clay	
40				
45				
		46.59m		
		46.59m	Gravel sand and clay Gravel sand and claywash	
50				
		51.79m		
		51.79m	Gravel sand and claywash Gravel, sand and thick claywash	
55				
		54.90m		
		54.90m	Gravel, sand and thick claywash Gravel clay and sand	
		56.09m		

Borelog for well M36/0030

Grid Reference (NZTM): 1547355 mE, 5172595 mN
Location Accuracy: 2 - 15m
Ground Level Altitude: 58.9 m +MSD Accuracy: < 0.5 m
Driller: Ministry of Works
Drill Method: Cable Tool
Borelog Depth: 55.5 m Drill Date: 06-Nov-1974

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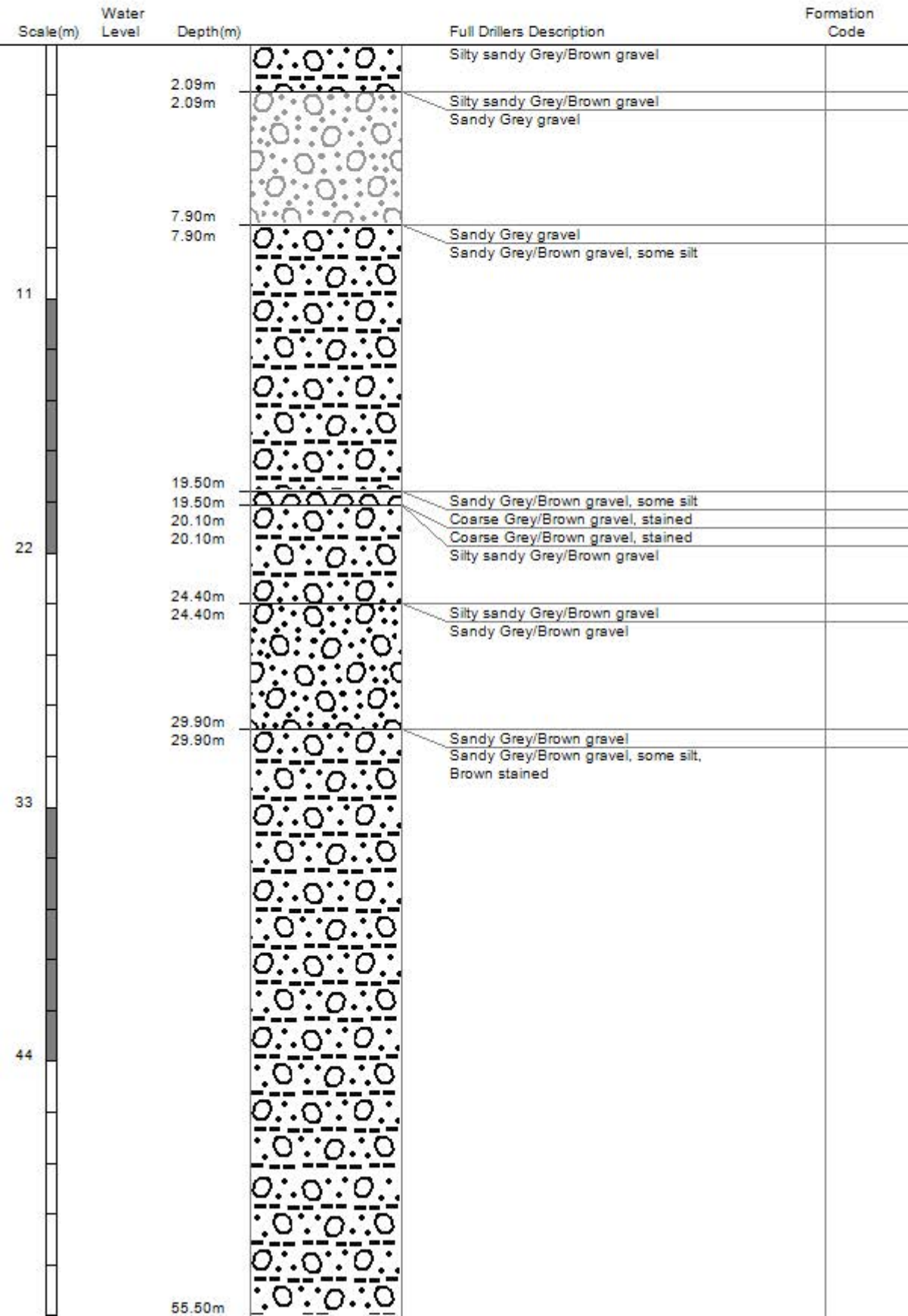

Borelog for well M36/0084

Grid Reference (NZTM): 1548628 mE, 5173180 mN
Location Accuracy: 50 - 300m
Ground Level Altitude: 58.2 m +MSD Accuracy: < 0.5 m
Driller: A M Bisley & Co
Drill Method: Cable Tool
Borelog Depth: 35.0 m Drill Date: 17-Jun-1980

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Scale(m)	Water Level	Depth(m)	Full Drillers Description	Formation Code
			Soil	
		0.60m		
		0.60m	Soil	
			Brown clay	
		1.50m		
		1.50m	Brown clay	
			Medium Brown gravel	
5				
		9.50m		
		9.50m	Medium Brown gravel	
10			Brown clay	
		14.90m		
		14.90m	Brown clay	
			Fine Brown gravel	
		15.50m		
15		15.50m	Fine Brown gravel	
			Clay and Brown gravel	
20				
		21.60m		
		21.60m	Clay and Brown gravel	
			Fine to medium Brown gravel	
25				
		25.90m		
		25.90m	Fine to medium Brown gravel	
			Clay and medium Brown gravel	
		29.90m		
30		29.90m	Clay and medium Brown gravel	
			Fine Brown gravel	
		35.00m		

Borelog for well M36/3064

Grid Reference (NZTM): 1548688 mE, 5173350 mN
Location Accuracy: 2 - 15m
Ground Level Altitude: 59.0 m +MSD Accuracy: < 0.5 m
Driller: A M Bisley & Co
Drill Method: Cable Tool
Borelog Depth: 55.4 m Drill Date: 05-Aug-1985

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Scale(m)	Water Level	Depth(m)	Full Drillers Description	Formation Code
		0.40m	Topsoil	
		0.40m	Topsoil	
		1.20m	Yellow clay	
		1.20m	Yellow clay	
			Medium Brown and Grey gravel and clay	
5				
10				
15				
		18.79m		
		18.79m	Medium Brown and Grey gravel and clay	
20			Tight Brown gravel and clay	
		21.20m		
		21.20m	Tight Brown gravel and clay	
			Small Brown gravel and clay	
25				
		27.79m	Small Brown gravel and clay	
		27.79m	Medium Brown and Grey gravel and sand	
30		29.90m		
		29.90m	Medium Brown and Grey gravel and sand	
			Medium Brown and Grey gravel, sand and clay	
35				
		36.79m		
		36.79m	Medium Brown and Grey gravel, sand and clay	
			Tight Brown and Grey gravel and clay	
40				
		41.29m		
		41.29m	Tight Brown and Grey gravel and clay	
			Medium Brown and Grey gravel and sand	
		44.29m		
45		44.29m	Medium Brown and Grey gravel and sand	
		45.20m		
		45.20m	Tight Grey gravel and clay	
			Tight Grey gravel and clay	
			Medium Brown and Grey gravel and sand	
		46.50m		
		46.50m	Medium Brown and Grey gravel and sand	
		47.90m	Fine sand, occasional stone	
		47.90m	Fine sand, occasional stone	
50			Medium Brown and Grey gravel, sand and clay	
		51.09m		
		51.09m	Medium Brown and Grey gravel, sand and clay	
			Medium Brown and Grey gravel and sand	
55		55.40m		

Borelog for well M36/4984

Grid Reference (NZTM): 1547598 mE, 5173010 mN
Location Accuracy: 2 - 15m
Ground Level Altitude: 60.0 m +MSD Accuracy: < 2.5 m
Driller: McMillan Drilling Ltd
Drill Method: Unknown
Borelog Depth: 54.0 m Drill Date: 30-May-1997

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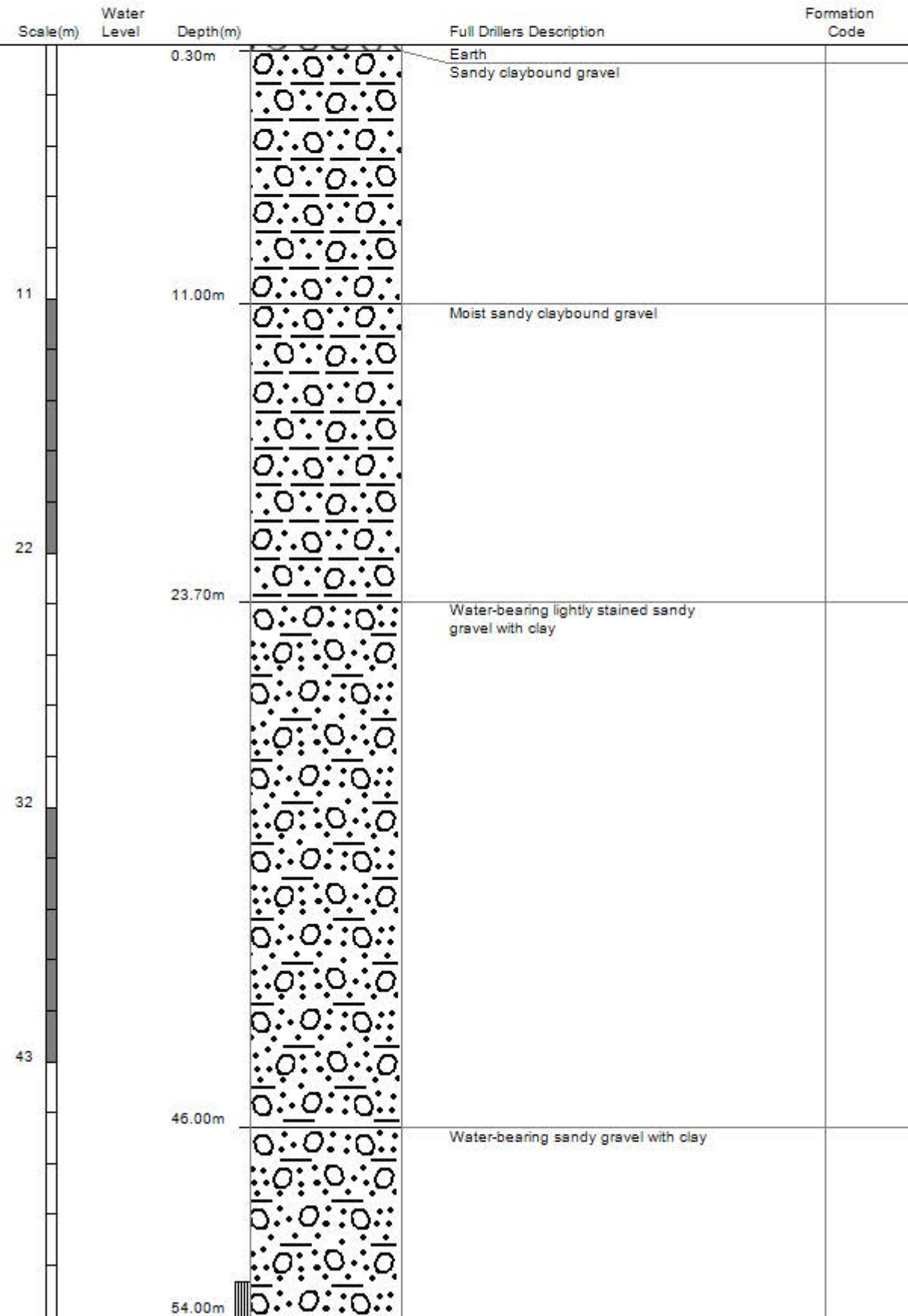

Borelog for well M36/4985

Grid Reference (NZTM): 1547938 mE, 5173140 mN
Location Accuracy: 10 - 50m
Ground Level Altitude: 60.5 m +MSD Accuracy: < 0.5 m
Driller: McMillan Drilling Ltd
Drill Method: Unknown
Borelog Depth: 48.0 m Drill Date: 04-Jun-1997

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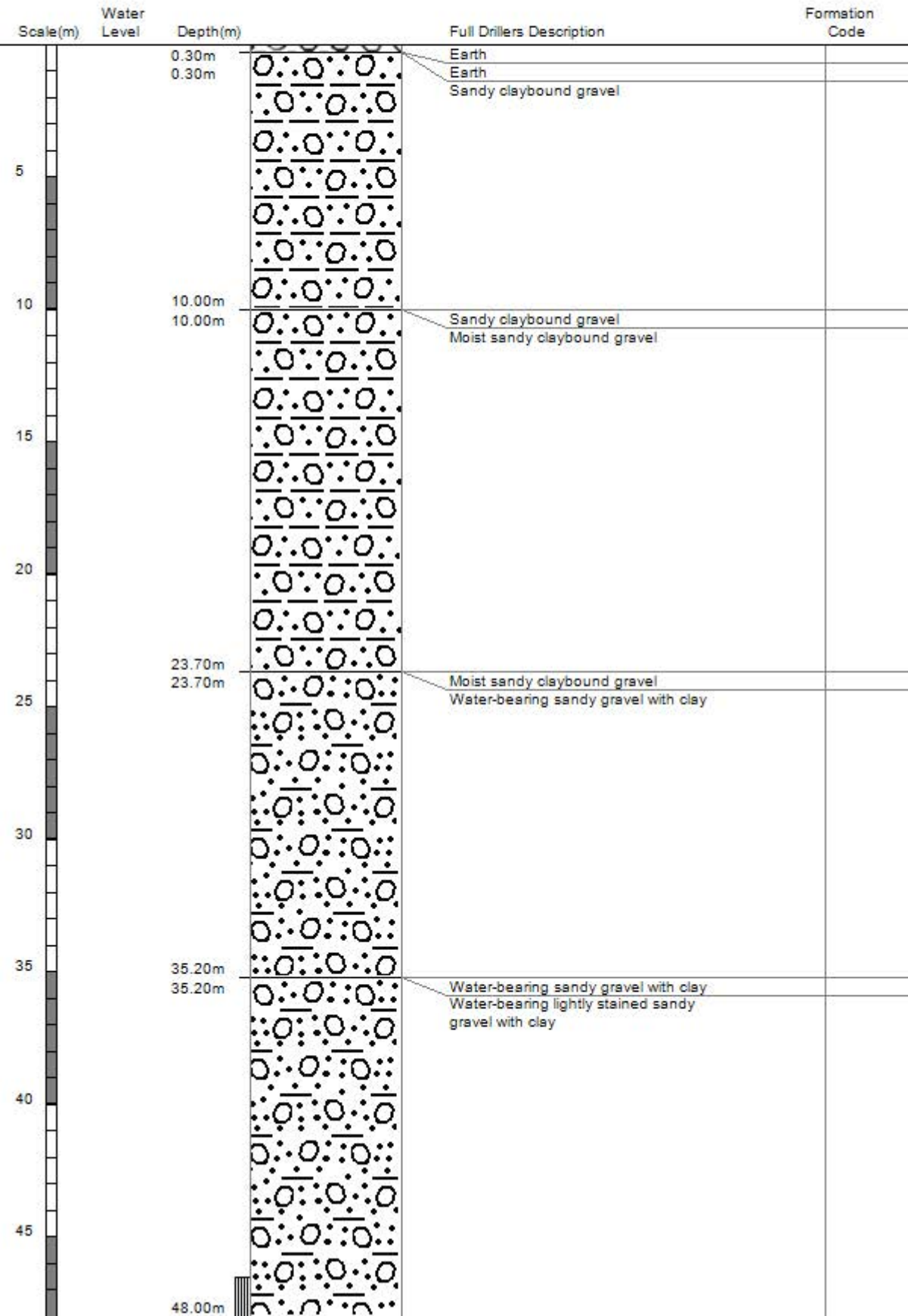
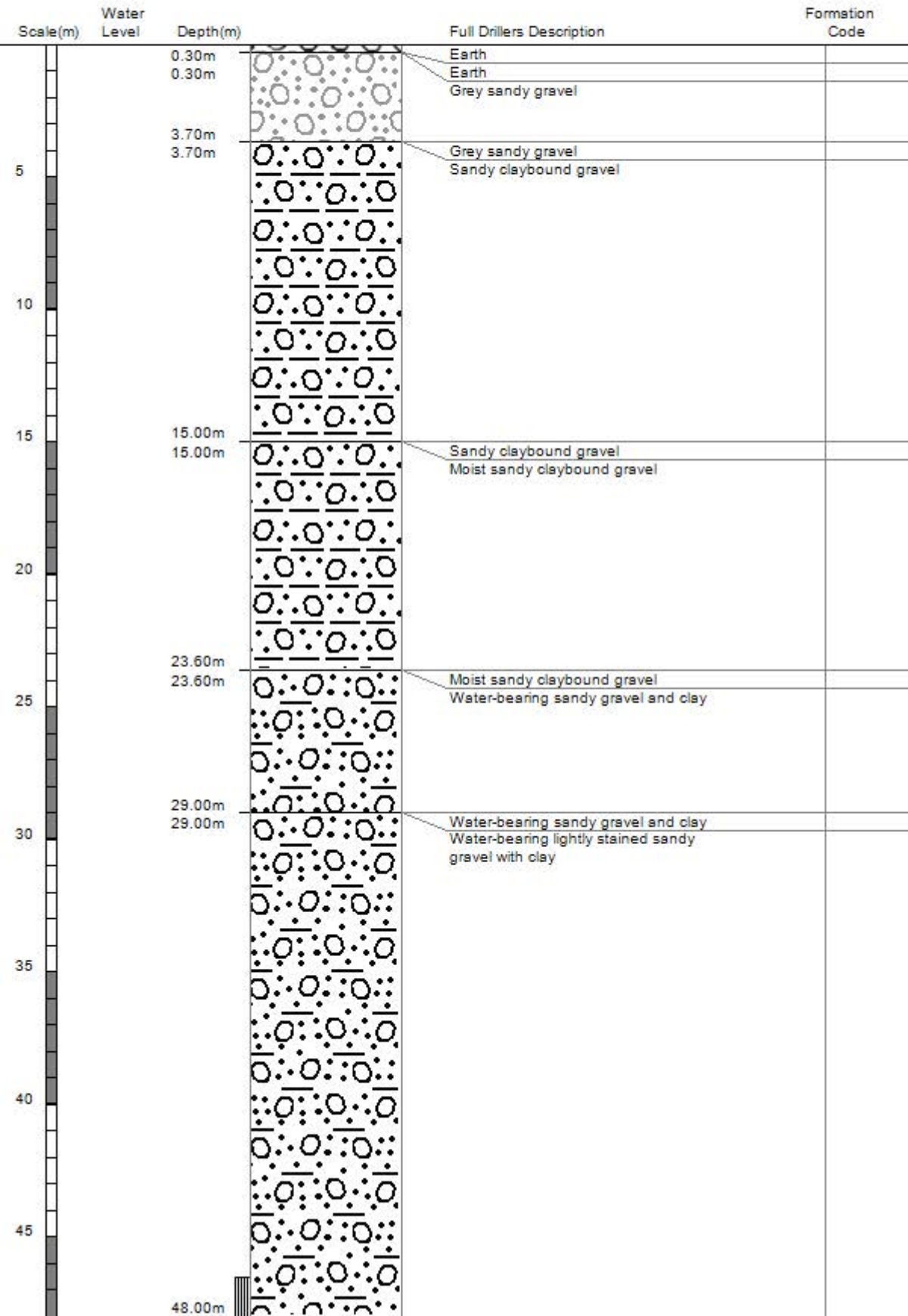


Borelog for well M36/4986

Grid Reference (NZTM): 1548099 mE, 5173143 mN
Location Accuracy: 2 - 15m
Ground Level Altitude: 59.8 m +MSD Accuracy: < 0.5 m
Driller: McMillan Drilling Ltd
Drill Method: Unknown
Borelog Depth: 48.0 m Drill Date: 01-May-1997

Environment Canterbury Regional Council
Kaunihera Taiao ki Waitaha



Borelog for well M36/5120

Grid Reference (NZTM): 1547289 mE, 5172950 mN
Location Accuracy: 50 - 300m
Ground Level Altitude: 61.8 m +MSD Accuracy: < 0.5 m
Driller: Smiths Welldrilling
Drill Method: Rotary Rig
Borelog Depth: 43.0 m Drill Date: 21-Aug-1996

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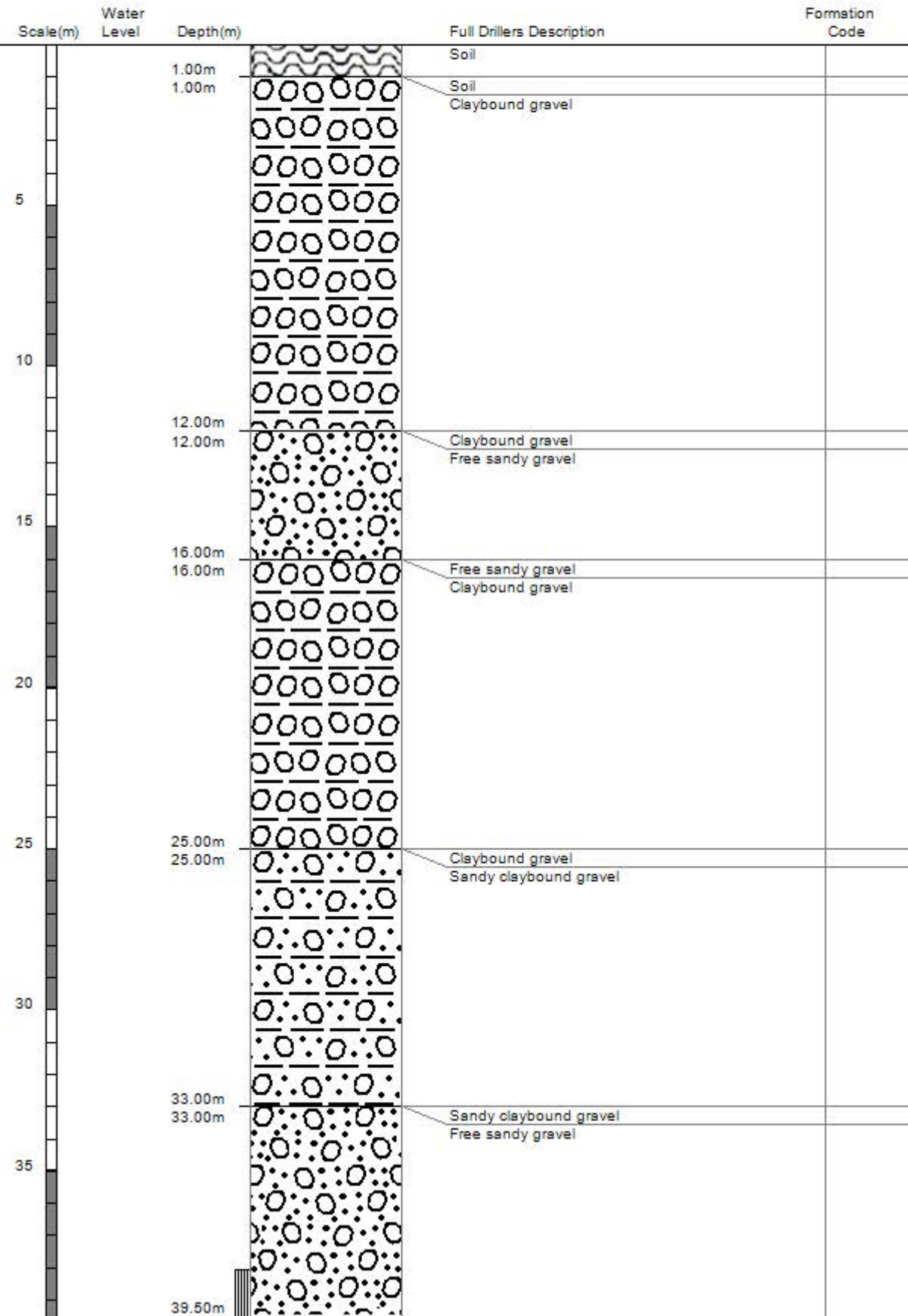
Scale(m)	Water Level	Depth(m)	Full Drillers Description	Formation Code
		0.30m	Soil	
		0.30m	Soil	
		1.00m	Claybound gravel	
		1.00m	Claybound gravel	
			Large gravel	
5		5.00m		
		5.00m	Large gravel	
			Claybound gravel	
10				
		14.00m		
		14.00m	Claybound gravel	
			Free sandy gravel	
15				
		16.00m		
		16.00m	Free sandy gravel	
			Claybound gravel	
20				
		22.00m		
		22.00m	Claybound gravel	
			Free sandy gravel	
		24.00m		
		24.00m	Free sandy gravel	
25			Claybound gravel	
30				
		34.00m		
		34.00m	Claybound gravel	
			Claybound sandy gravel	
35				
40		40.00m		
		40.00m	Claybound sandy gravel	
			Free sandy gravel	
		43.00m		

Borelog for well M36/5139

Grid Reference (NZTM): 1548878 mE, 5173390 mN
Location Accuracy: 50 - 300m
Ground Level Altitude: 58.3 m +MSD Accuracy: < 0.5 m
Driller: Smiths Welldrilling
Drill Method: Rotary/Percussion
Borelog Depth: 39.5 m Drill Date: 19-Aug-1996

Environment Canterbury Regional Council
Kaunihera Taiao ki Waitaha



Borelog for well M36/5330

Grid Reference (NZTM): 1547468 mE, 5172960 mN
Location Accuracy: 50 - 300m
Ground Level Altitude: 61.0 m +MSD Accuracy: < 0.5 m
Driller: Smiths Welldrilling
Drill Method: Rotary Rig
Borelog Depth: 46.0 m Drill Date: 27-Aug-1997

Environment Canterbury Regional Council
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Scale(m)	Water Level	Depth(m)	Full Drillers Description	Formation Code
		0.30m	Soil	
		0.30m	Soil	
			Claybound gravel	
5		6.00m		
		6.00m	Claybound gravel	
			Free sandy gravel	
		8.00m		
		8.00m	Free sandy gravel	
			Claybound gravel	
10				
15		16.00m		
		16.00m	Claybound gravel	
			Claybound sandy gravel	
20		24.00m		
		24.00m	Claybound sandy gravel	
			Claybound gravel	
25				
30		34.00m		
		34.00m	Claybound gravel	
			Claybound sandy gravel	
35				
40		41.00m		
		41.00m	Claybound sandy gravel	
			Free sandy gravel	
45		46.00m		

Borelog for well M36/5525

Grid Reference (NZTM): 1547518 mE, 5172810 mN
Location Accuracy: 50 - 300m
Ground Level Altitude: 59.6 m +MSD Accuracy: < 0.5 m
Driller: Smiths Welldrilling
Drill Method: Rotary Rig
Borelog Depth: 47.0 m Drill Date: 28-Feb-1998

Environment Canterbury Regional Council
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