Geotechnical Assessment Report

Ryans Road Fast Track

Carter Group Ltd

Reference: 773-CHCGE377712

7 February 2025

GEOTECHNICAL ASSESSMENT REPORT

Ryans Road Fast Track

Report reference number: 773-CHCGE377712
7 February 2025

PREPARED FOR

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QUALITY INFORMATION

Revision history

Revision	Description	Date	Author	Reviewer	Approver
V1	GAR	07/02/2025	HB / AJ	CT	CT
V0	GAR	09/12/2024	HB / AJ	AG	CT

Distribution

Report Status	No. of copies	Format	Distributed to	Date
V1	1	PDF	Tim Carter	07/02/2025

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1. INTRODUCTION

Carter Group Limited has engaged Tetra Tech Coffey (NZ) Ltd (Tetra Tech Coffey) to provide a preliminary geotechnical assessment report, alongside an environmental detailed site investigation (DSI), to support the proposed development at 104 Ryans Road, Yaldhurst, Christchurch.

This report should be read in conjunction with the aforementioned DSI[1].

The purpose of our work is to evaluate the surface and subsurface conditions and to comment on the site's geotechnical and environmental suitability for a Fast-track application. This evaluation references the New Zealand Geotechnical Society and Ministry of Business, Innovation and Employment (MBIE) Modules[2], including updates and clarifications, as well as other relevant industry documents, as appropriate. Additionally, it provides geotechnical design information for the site suitable for preliminary civil and structural design at the site.

1.1 SCOPE OF WORK

In accordance with our proposal dated 13 November 2024, and based on correspondence with Carter Group Ltd during the proposal stage, the following items have been considered in the preparation of this report:

- Geotechnical and environmental desktop study.
- Shallow ground investigation involving test pits to 3m below ground level (bgl).
- Shallow soil sampling in fields and around buildings for environmental testing.
- Laboratory testing of environmental samples.
- Provision of a geotechnical assessment report to support the Fast-track application
- Provision of an environmental assessment report to support the Fast-track application

2. SITE DETAILS

2.1 SITE DESCRIPTION

The proposed site of the Fast-track application is 104 Ryans Road, legally known as Pt Lot 3 DP 22679, Lot 4 DP 22679 and Pt Lot 1 DP 2837, with a combined total land area of approximately 55.5 Hectares (Ha). The site is situated on the north side of Ryans Road, adjacent to Christchurch International Airport. The site is currently zoned and used for rural purposes.

104 Ryans Road is currently occupied by a single house and several sheds of varying sizes all of which are in the southeast corner of the property. The site is generally flat with a gentle slope from west to east and the majority of the site is grassed with some vegetation around the property.

Based on our review of the proposed subdivision layout plan[3] we understand that the subdivision will likely comprise 12 large lots ranging from 1.01Ha to 4.76Ha and 114 smaller lots ranging from 1,000m^2 to 2,563m^2. The referenced lot layout plan has been presented in Appendix A and the geological setting of the site is presented in Figure 1 below.

[1] Tetra Tech Coffey: Detailed Site Investigation, ref. 773-CHCGE377712 dated 7 February 2025.
[2] MBIE / NZGS: Earthquake Geotechnical Engineering Practice Module 1, 2, 3, 4, 5 and 6.
[3] Capture Land Development Consultants: Proposed Subdivision of Part Lot 3 and Lot 4 DP 22679 and Part Lot 1 DP 2837, Drawing RC-PG110 Rev A dated 12/12/2024

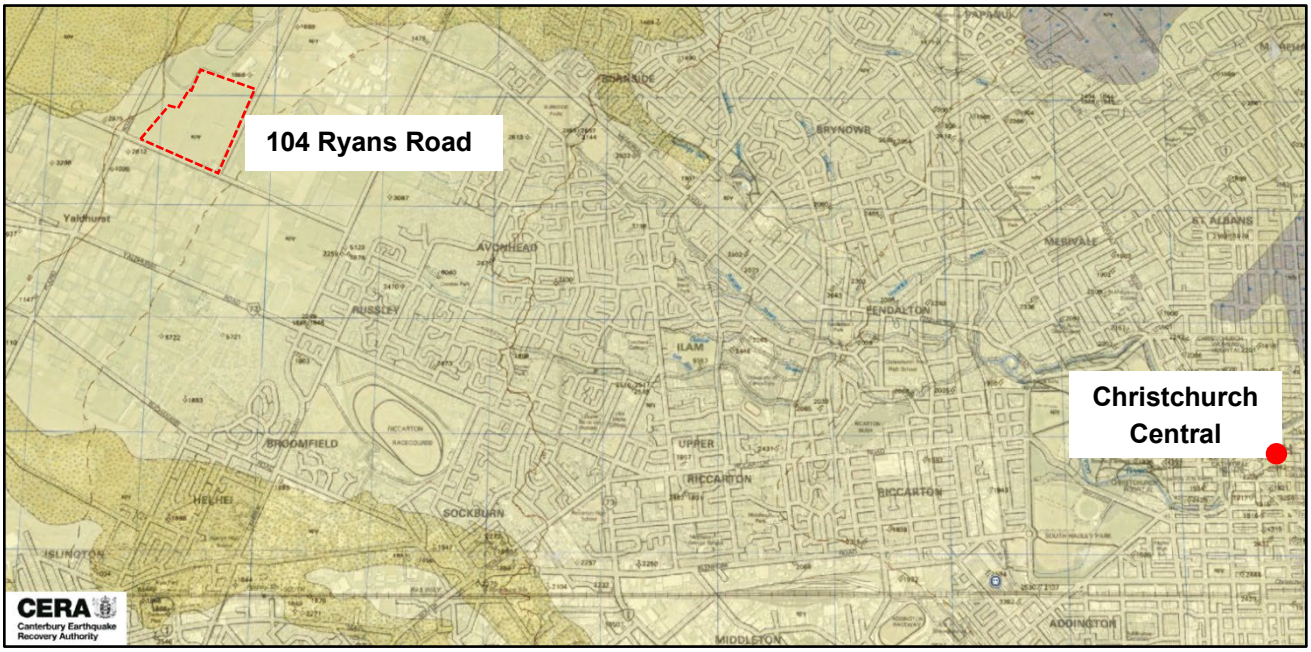


Figure 1: Site geographical location within Christchurch (approximate site boundary shown as red dash).

The site-specific, surface geology is mapped[4] as “Dominantly alluvial sand and silt overbank deposits”.

2.2 FLOOD HAZARD

Flood management areas (FMAs) are identified by the Christchurch City Council (CCC) in the District Plan and are areas that are prone to flooding as a result of major tidal or rainfall events and / or are vulnerable to the effects of rising sea levels. The site is not in a Flood Management Area.

The Christchurch City Council Floor Level Map[5] shows that the site does not have a completed floor level assessment but is not in a known flood management area. Pattle Delamore Partners (PDP) have been engaged to provide comment on flood risk for the project.

2.3 CONTAMINATED LAND CONSIDERATIONS

Tetra Tech Coffey has reviewed the Environment Canterbury (ECan) Listed Land Use Register (LLUR). This review did not identify Hazardous Activities and Industries List (HAIL); however, due to the proposed subdivision, an environmental investigation has been carried out. Further information is provided in the Tetra Tech Coffey DSI report.

[4] Brown, L.J.; Weeber, J.H. 1992: Geology of the Christchurch urban area. Scale 1:25 000 Institute of Geological & Nuclear Sciences geological map 1. 1 sheet + 104 p. Institute of Geological & Nuclear Sciences Limited, Lower Hutt, New Zealand.
[5] https://ccc.govt.nz/services/water-and-drainage/stormwater-and-drainage/flooding/floorlevelmap

3. GROUND MODEL

3.1 EXISTING DATA

A review of the geotechnical investigation data available on the New Zealand Geotechnical Database (NZGD) and Canterbury Maps well search has been carried out and relevant information included in our assessment. The test locations are presented in Figure 2, the logs are presented in Appendix B and summarised in Table 1 below.

Table 1: Existing geotechnical data summary (NZGD)

Test name	Termination depth (mbgl)	Reason for termination	Test name	Termination depth (mbgl)	Reason for termination
TP-204709	3.0	Target Depth	TP-206404	3.0	Target Depth
TP-204710	3.0	Target Depth	BH-206406	15.63	Target Depth

Although our search identified ECan wells within the site boundaries, upon review none of the well locations had associated well logs. We have undertaken a wider search outside of the property boundary. From this search we have identified a selection of ECan well locations which do have associated borelogs.

The ECan well IDs, explored depth and a description of the proximity of the test to site are shown in Table 2 below.

Table 2: Existing ECan well logs summary (Canterbury Maps)

Test ID	Termination depth (mbgl)	Proximity to site
M35/9913	30.00	~70m to the south of the centre of the southern site boundary (within property on opposite side of Ryans Road)
M35/9560	36.00	~100m south of the southern site boundary (~120m southwest of the intersection of Ryans Road and Grays Road)
M35/5709	21.35	~300m northeast of northern property boundary (located within property on southeast side of Grays Road and George Bellew Road intersection)
M35/1666	24.00	~230m to the north of the northern site boundary (within Christchurch Airport)

The above logs show that gravel was generally present below a surficial sand / silt layer (up to 3.0m thick) to the maximum explored depth of at least 21mbgl in each of the four ECan well logs we reviewed. We have considered this information as useful to confirm the continuity and presence of gravel across the site. However , we have not included the locations on the site plan of the tests outside of the property boundary nor have we attached the well logs. This information can be provided on request or found using ECan's well search webpage[6].

[6] https://www.ecan.govt.nz/data/well-search/

3.2 SITE INVESTIGATION

Tetra Tech Coffey carried out a site specific investigation on 11 and 12 November 2024, which comprised test pits to depths ranging from 1.4 to 5.4 mbgl. The test pit logs are presented in Appendix B and summarised in Table 3 below with a location plan presented in Figure 2 below.

Table 3: Tetra Tech Coffey on-site geotechnical investigation data summary

Test name	Termination depth (mbgl)	Reason for termination	Test name	Termination depth (mbgl)	Reason for termination
TP-01	3.7	Target Stratum	TP-14	3.8	Target Stratum
TP-02	4.7	Target Stratum	TP-15	3.7	Machine Limit
TP-03	4.2	Target Stratum	TP-16	3.5	Machine Limit
TP-04A	3.5	Machine Limit	TP-17	4.4	Target Stratum
TP-04B	5	Target Stratum	TP-18	4.2	Target Stratum
TP-05	5	Target Stratum	TP-19	4.6	Target Stratum
TP-06	4.3	Target Stratum	TP-20	3.5	Target Stratum
TP-07	4.5	Target Stratum	TP-21	3.5	Target Stratum
TP-08	3.9	Target Stratum	TP-22	1.4	Target Stratum
TP-09	3.9	Target Stratum	TP-23	4.6	Target Stratum
TP-10	3.5	Machine Limit	TP-24	3.6	Machine Limit
TP-11	4.3	Target Stratum	TP-24B	5.4	Target Stratum
TP-12	4.5	Target Stratum	TP-25	3.4	Target Stratum
TP-13	4.2	Target Stratum	-	-	-

Figure 2: Site boundaries and test pit investigation (with depth to gravel) and soakage test locations.

3.3 GROUND CONDITIONS

The site stratigraphy has been derived from the geotechnical investigations referenced above and is based on the material descriptions of the logged soils. The site has relatively uniform layers as outlined in Table 4. Silty lenses were observed within the sand layer and it is expected that silt content is variable throughout this layer across the site.

A borehole located immediately adjacent the northeast corner of the site (BH-206406) indicates gravels extend to at least 15.6mbgl.

Table 4: Ground model

Layer	Top of layer (mbgl)	Base of layer (mbgl)	Thickness (m)	Density
Topsoil	0.0	0.25 - 0.3	< 0.3	N/A
SAND	0.25 - 0.3	~1.0 - 4.0*	1.0 - 3.5	Loose to medium dense
Sandy GRAVEL	~3.5 - 4.0	Unknown	> 14.0	Dense to Very dense
*Depth to gravel between 1.0 and 2.0mbgl in TP-20, TP-21 and TP-22, more typically between 3.0 and 5.0mbgl across the remainder of the site				

The subsurface conditions appear to be consistent with the published geological information.

3.4 GROUNDWATER CONDITIONS

Groundwater was not encountered in any of the site-specific test pits, and there are no monitored wells onsite. However, there are two ECan wells nearby (approx. 0.5km and 1.0km from site boundaries). The borehole located immediately adjacent the northeast corner of the site (BH-206406) also observed the depth to groundwater. Table 5 summarises these values.

Table 5: Observed depth to groundwater.

Source	Depth to Groundwater (mbgl)
M35/1111	16.76
M35/3614	12.35
BH-206406	12.10

For design, a conservative groundwater level of 10mbgl is recommended.

3.5 SOAKAGE TEST DESCRIPTION AND FINDINGS

Soakage tests were conducted at the site to investigate the infiltration rate of the underlying gravel material to inform the civil engineering design at the site.

The soakage testing was conducted by filling excavated test pits with 2,500L of water. The top level of the water was recorded initially and then at specified time intervals thereafter.

The soakage testing targeted the silty and sandy gravel beneath the overlying sand. Prior to testing loose silt and sand was removed from the base of the excavation to gain the most representative gravel infiltration rate values. Test results are presented in Appendix C and summarised in Table 6 below.

Table 6: Tetra Tech Coffey onsite soakage test summary.

Location	Average Expected Infiltration Rate		Depth of hole	Depth into gravel
	mm/hr	m/s	m	m
TP-01B	125	3.47E-05	3.2	0.4
TP-04B	600	1.67E-04	5	1.6
TP-20	6,000	1.67E-03	3.5	1.3
TP-24B	50	1.39E-05	5.4	0.6

We note that the variation in infiltration rates described above can largely be attributed to the silt content within the gravel layers.

We consider that the TP-20 results are a best-case scenario where very low proportion of silt is present within the gravels while TP-01 and TP-24 are likely to have had a higher proportion of fine sand and silt within the gravels influencing the drainage properties of the soil.

We note that the embedment of the test into the underlying gravel for TP-01 and TP-24 were 0.4m and 0.6m whereas TP-04 and TP-20 were embedded 1.6m and 1.3m respectively. Considering this we anticipate that TP-01 and TP-24 may have achieved faster infiltration rates if the test embedment was increased.

For civil design we consider that the infiltration rate described in TP-04 is likely to be achievable provided that sufficient embedment into the gravel layer is undertaken. We recommend that Tetra Tech Coffey is engaged to observe the construction of any to ground stormwater systems to comment on the suitability of the “target soakage layer”.

As an illustration of the stratigraphy in TP-04 we have provided a markup of a test pit photo showing the generalised layer in Figure 3 below.

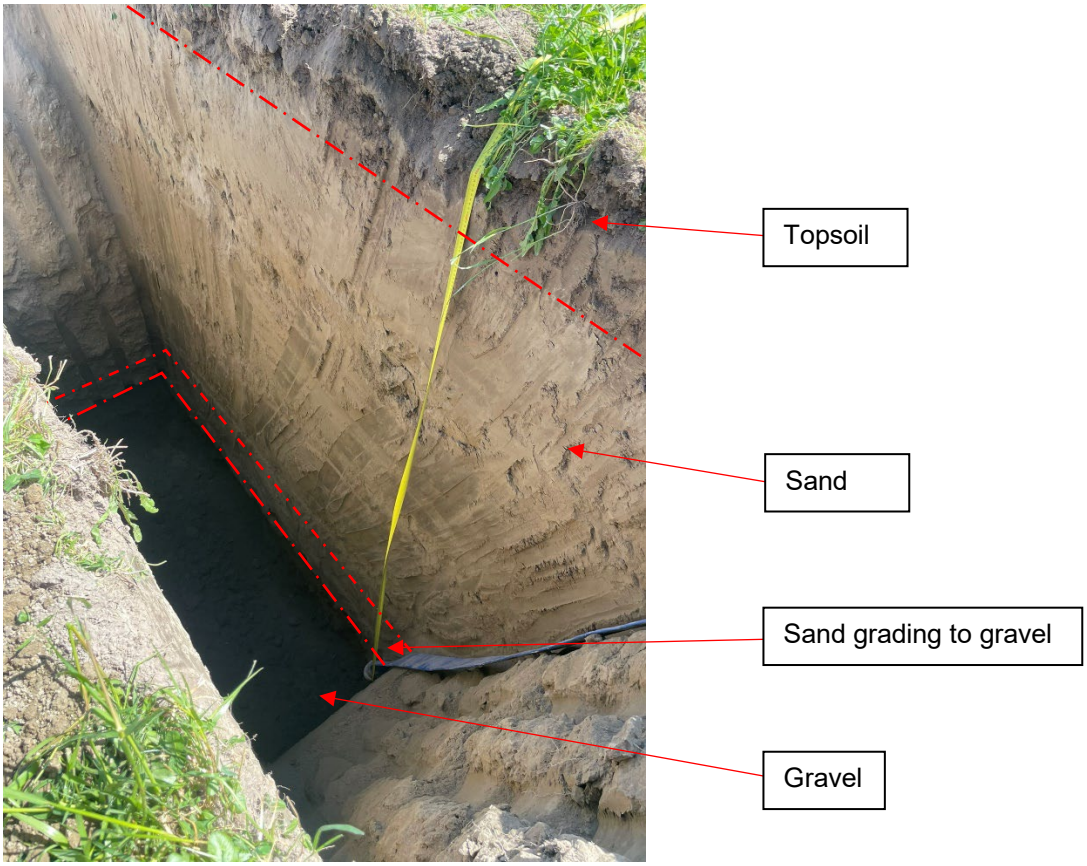


Figure 3: TP-04 with markup of stratigraphy.

4. GEOTECHNICAL ASSESSMENT

4.1 SITE SUBSOIL CLASS

In accordance with NZS1170.5, Section 3.1.3, a site subsoil classification of "*Class D – Deep or soft soil sites*" may be assumed for this site.

4.2 GEOTECHNICAL HAZARD ASSESSMENT

4.2.1 Erosion

The site has relatively flat topography and is bounded by grassed semi-rural residential or industrial/airport land. Provided appropriate stormwater systems are installed as part of the development, there will be few viable sources of erosion at this site.

4.2.2 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, so it not considered a concern.

4.2.3 Subsidence

4.2.3.1 Liquefaction-Induced Settlement

We have reviewed the Canterbury Maps "Christchurch Liquefaction Information" webpage[7] for the site. This review identified the site as being mapped in an area where "Liquefaction damage is unlikely – low liquefaction vulnerability".

In additional to the above our on-site testing has indicated unsaturated soils above dense gravels with ground water estimated at greater than 10mbgl.

Based on the above information we consider that the risk of liquefaction induced ground settlements at the site is low.

4.2.3.2 Static Settlement

The ground investigation data at the site suggests that the site soils are generally inorganic, sand over dense gravel. Based on this information we consider that the risk of static settlement of new buildings at the site would fall within those described by the New Zealand Building Code provided that the structural design for each of the new structures follows the recommendations of a lot specific geotechnical report which specifically targets the design criteria of the proposed structure.

4.2.4 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.

4.2.5 Inundation

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

4.3 EARTHWORKS COMMENTARY

4.3.1 Earthworks

Where earthworks are to be carried out, topsoil should be stripped from earthworks areas and clean topsoil stockpiled for later use. Prior to filling, confirmation by Tetra Tech Coffey personnel of suitable stripping of topsoil will be required. Proof rolling to compact the subgrade soils may be required prior to fill placement, this instruction will be provided by Tetra Tech Coffey if required, during construction.

Where fill material is encountered at the site during earthworks, it is recommended that this fill is excavated, checked for suitability and, if required, replaced with engineered fill according to NZS 4431:2022. This process also applies to any soft layers of organic silts, topsoil or other unsuitable material. It is recommended that any such excavation works, and placement of engineered fill be observed, tested, and/or approved by Tetra Tech Coffey personnel during construction.

Laboratory compaction tests within the past 6 months to assess the maximum dry density (MDD) of proposed fill materials will be required prior to commencement of earthworks, which is a common earthworks requirement. A target MDD of 95% should be assumed as compaction criteria.

[7] https://apps.canterburymaps.govt.nz/ChristchurchLiquefactionViewer/

Prior to construction Tetra Tech Coffey should be contacted to comment on the final civil earthworks design prior to construction and to provide specific requirements for the staging and verification of placed engineered fill material.

4.3.2 Post earthworks reporting

After the completion of earthworks, Tetra Tech Coffey will prepare an Earthworks Completion Report summarising the earthworks and confirming recommendations for foundations.

4.3.3 CBR (California bearing ratio) for Pavement Design

Tetra Tech Coffey completed DCP (dynamic cone penetration) tests to 0.9mbgl adjacent to each of the Tetra Tech Coffey test pit locations referenced in this report. The test pits described the natural soils below topsoil as inorganic sand, silty sand and sandy silt with the DCP tests indicating typically 2 blows / 100mm across the site.

Using the Austroads Pavement Design Manual 2012 correlation this equates to a CBR of approximately 3.5% within the natural soils below topsoil at the site.

We consider that provided that the pavement subgrade is proof rolled using a heavy vibrating roller (8 tonne or greater) that the subgrade soils would provide a higher CBR value than the 3.5% stated above. Conservatively we consider that a CBR of 6.0% could be achieved during construction although we recommend that further DCP testing is completed during construction on the rolled surface to confirm that adequate compaction has been achieved if the higher CBR value of 6% is assumed for civil design.

5. STATEMENT OF PROFESSIONAL OPINION

Our assessment has considered the items required by Section 106 of the RMA and in our opinion the site is considered geotechnically suitable for a subdivision development and future commercial construction subject to a lot specific geotechnical reporting which targets the design criteria for each new structure at the site.

Our Statement of Professional Opinion is presented in Appendix D.

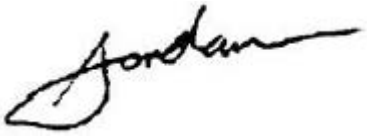
6. CLOSURE

This report has been prepared solely for the use of Carter Group Ltd, their professional advisors and the Christchurch City Council (CCC) 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.

The subsurface information has been obtained solely from discrete test locations, which by their nature only provide information about a relatively small volume of subsoils, as such, 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 are assumed to exist, then the matter should be referred back to us immediately.

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

Prepared by



Andrew Jordan
BSc, CMEngNZ (PEngGeol)
Associate Engineering Geologist

Reviewed by

Chris Thompson
BSc(Tech) MEngNZ
Associate Engineering Geologist

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: SUBDIVISION LAYOUT

LEGEND :

AIRPORT DESIGNATION

3.0m WIDE PLANTING STRIP ALONG RYANS AND GRAYS ROAD FRONTAGES

NOTES :

1. SCHEME PLAN ONLY, AREAS & DIMENSIONS ARE APPROXIMATE & SUBJECT TO FINAL SURVEY.
2. LOTS 200-201 ARE TO BE VESTED AS LOCAL PURPOSE UTILITY RESERVES (STORMWATER)
3. LOTS 300-301 ARE TO BE VESTED AS ROAD
4. LOT 400 IS TO BE VESTED AS LOCAL PURPOSE UTILITY RESERVE (WATER)
5. LOT 500 IS A BALANCE LOT.

ROADS TO BE VESTED

LOT 300 AREA = 22,444m²
LOT 301 AREA = 32,338m²
LOT 302 AREA = 18m²

REV	DATE	REVISION DETAILS	ISSUED
A	12/12/24	FOR INFO	TL

CAPTURE
Land Development Consultants

CLIENT
ROLLESTON INDUSTRIAL DEVELOPMENTS LIMITED

PROJECT
104 RYANS ROAD, HAREWOOD

PROPOSED SUBDIVISION OF PART LOT 3 & LOT 4 DP 22679 & PART LOT 1 DP 2837
(COMPRISED IN RT'S CB13A/1098 & CB7A/401)

STATUS	SCALE	SIZE
FOR INFORMATION	1:4000	A3

PROJECT	DRAWING NO	REVISION
1252	RC-PG110	A

c:_cam jobs\1252 - carter group ryans road\rc plans\1252 rc sheet 110

APPENDIX B: SITE TESTING

revision	no.	description	drawn	approved	date
	1	Test pit locations, depth to gravel & soakage	J.M	J.M	13/11/24
	2	Client name correction	N.C	C.T	07/01/25

TETRA TECH COFFEY

drawn	J. Monk
approved	J. Monk
date	13/11/24
scale	1:4000
original page size	A3

N

client: Carter Group Limited

project: Ryans Road Fast Track

title: Test pit locations, depth to gravel & soakage

project no: 773-CHCGE377712 | drawing no: 1 | rev: 2

TETRA TECH COFFEY

Engineering Log - Excavation

		Excavation ID.	***TP-01A***
		sheet:	1 of 1
		project no.	***773-CHCGE377712***
client:	***Rolleston Industrial Developments Ltd***	date excavated:	***11 Nov 2024***
principal:	***-***	date completed:	***12 Nov 2024***
project:	***Ryans Road Fast Track***	logged by:	***N.Cash***
location:	***Ryans Road, Yaldhurst, Christchurch***	checked by:	***A.Jordan***

position: Not Specified | surface elevation: Not Specified | pit orientation: E-W | DCP id.: -

equipment type: >10t Excavator | excavation method: - | excavation dimensions: 3.3 m long 0.9 m wide | vane id.: -

excavation information | **material substance**

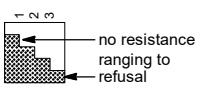
method	support	penetration (1 2 3)	water	samples & field tests	RL (m)	depth (m)	graphic log	soil group symbol	material description (SOIL NAME: plasticity or particle characteristics, colour, secondary and minor components)	moisture condition	consistency / relative density	vane shear (kPa) ⊕ remoulded ⊙ peak (50 100 150 200)	DCP (blows/100 mm) (2 4 6 8 10)	soil origin, structure and additional observations
E	N		Not Observed			0.0		ML	**SILT**: low plasticity, dark brown, with trace of fine grained sand and rootlets.	M				**TOPSOIL**
								SW	**SAND**: fine to medium grained, pale brown, with trace of silt.		L			**SPRINGSTON**
						1.0								
						2.0								
						3.0		GW	**Sandy GRAVEL**: medium to coarse grained, grey-brown, with trace of cobbles.					
						4.0			Test pit TP-01A terminated at 3.7 m Target stratum					
						5.0								

CDF_0_10_00.4_LIBRARY.GLB rev:CDF_0_10_00.4 2021-09-30 Log_COF EXCAVATION + PSP/DCP_773-CHCGE377712GINT.GPJ <<DrawingFile>> 03/12/2024 10:16

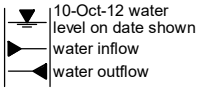
method
- N natural exposure
- X existing excavation
- BH backhoe bucket
- B bulldozer blade
- R ripper
- E excavator
- HT hand tools

support
- N none
- S shoring

penetration



water



samples & field tests
- D disturbed sample
- B bulk disturbed sample
- E environmental sample
- U## undisturbed sample ##mm diameter
- HP hand penetrometer (kPa)
- VS vane shear peak/remouded (kPa)

soil group symbol & material description
based on AS 1726:2017

moisture condition
- D dry
- M moist
- W wet
- S saturated
- Wp plastic limit
- Wl liquid limit

consistency / relative density
- VS very soft
- S soft
- F firm
- St stiff
- VSt very stiff
- H hard
- Fb friable
- VL very loose
- L loose
- MD medium dense
- D dense
- VD very dense

TETRA TECH COFFEY

Engineering Log - Excavation

Excavation ID.	***TP-02***
sheet:	1 of 1
project no.	***773-CHCGE377712***
client:	***Rolleston Industrial Developments Ltd***
date excavated:	***11 Nov 2024***
principal:	***-***
date completed:	***12 Nov 2024***
project:	***Ryans Road Fast Track***
logged by:	***N.Cash***
location:	***Ryans Road, Yaldhurst, Christchurch***
checked by:	***A.Jordan***

position: Not Specified | surface elevation: Not Specified | pit orientation: E-W | DCP id.: -

equipment type: >10t Excavator | excavation method: - | excavation dimensions: 4.5 m long 1.1 m wide | vane id.: -

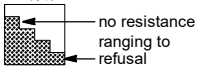
excavation information | **material substance**

method	support	penetration (1 2 3)	water	samples & field tests	RL (m)	depth (m)	graphic log	soil group symbol	material description (SOIL NAME: plasticity or particle characteristics, colour, secondary and minor components)	moisture condition	consistency / relative density	vane shear (kPa) ⊕ remoulded ⊙ peak (50 100 150 200)	DCP (blows/100 mm) (2 4 6 8 10)	soil origin, structure and additional observations
E	N		Not Observed			0.0		ML	**SILT**: low plasticity, dark brown, with trace of fine grained sand and rootlets.	M				**TOPSOIL**
								ML	**Sandy SILT**: low plasticity, grey-brown.		F			**SPRINGSTON**
						1.0		SW	**SAND**: fine to medium grained, grey-brown.					
						2.0								
						3.0								
						4.0		GW	**Sandy GRAVEL**: fine to coarse grained, grey-brown.					
									Test pit TP-02 terminated at 4.7 m Target stratum					
						5.0								

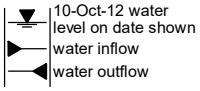
method
- N natural exposure
- X existing excavation
- BH backhoe bucket
- B bulldozer blade
- R ripper
- E excavator
- HT hand tools

support
- N none
- S shoring

penetration



water



samples & field tests
- D disturbed sample
- B bulk disturbed sample
- E environmental sample
- U## undisturbed sample ##mm diameter
- HP hand penetrometer (kPa)
- VS vane shear peak/remouded (kPa)

soil group symbol & material description
based on AS 1726:2017

moisture condition
- D dry
- M moist
- W wet
- S saturated
- Wp plastic limit
- Wl liquid limit

consistency / relative density
- VS very soft
- S soft
- F firm
- St stiff
- VSt very stiff
- H hard
- Fb friable
- VL very loose
- L loose
- MD medium dense
- D dense
- VD very dense

TETRA TECH COFFEY

Engineering Log - Excavation

		Excavation ID.	***TP-03***
		sheet:	1 of 1
		project no.	***773-CHCGE377712***
client:	***Rolleston Industrial Developments Ltd***	date excavated:	***12 Nov 2024***
principal:	***-***	date completed:	***12 Nov 2024***
project:	***Ryans Road Fast Track***	logged by:	***J.Monk***
location:	***Ryans Road, Yaldhurst, Christchurch***	checked by:	***A.Jordan***

position: Not Specified | surface elevation: Not Specified | pit orientation: E-W | DCP id.: -

equipment type: >10t Excavator | excavation method: - | excavation dimensions: 4.0 m long 1.0 m wide | vane id.: -

excavation information | **material substance**

method	support	penetration (1 2 3)	water	samples & field tests	RL (m)	depth (m)	graphic log	soil group symbol	material description (SOIL NAME: plasticity or particle characteristics, colour, secondary and minor components)	moisture condition	consistency / relative density	vane shear (kPa) ⊕ remoulded ⊙ peak (50 100 150 200)	DCP (blows/100 mm) (2 4 6 8 10)	soil origin, structure and additional observations
E	N		Not Observed			0.0		ML	**SILT**: low plasticity, dark brown, with trace of rootlets.	M				**TOPSOIL**
								SW	**SAND**: fine to medium grained, pale brown with orange staining, and some silt.		L			**SPRINGSTON**
						1.0								
						2.0								
						3.0								
								GW	**GRAVEL**: medium to coarse grained, pale brown-grey, with some silt and minor fine-grained sand.					
						4.0								
									Test pit TP-03 terminated at 4.2 m Target stratum					
						5.0								

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method
- N natural exposure
- X existing excavation
- BH backhoe bucket
- B bulldozer blade
- R ripper
- E excavator
- HT hand tools

support
- N none
- S shoring

penetration
1 2 3 — no resistance ranging to refusal

water
- 10-Oct-12 water level on date shown
- water inflow
- water outflow

samples & field tests
- D disturbed sample
- B bulk disturbed sample
- E environmental sample
- U## undisturbed sample ##mm diameter
- HP hand penetrometer (kPa)
- VS vane shear peak/remouded (kPa)

soil group symbol & material description
based on AS 1726:2017

moisture condition
- D dry
- M moist
- W wet
- S saturated
- Wp plastic limit
- Wl liquid limit

consistency / relative density
- VS very soft
- S soft
- F firm
- St stiff
- VSt very stiff
- H hard
- Fb friable
- VL very loose
- L loose
- MD medium dense
- D dense
- VD very dense

TETRA TECH COFFEY

Engineering Log - Excavation

		Excavation ID.	***TP-04A***
		sheet:	1 of 1
		project no.	***773-CHCGE377712***
client:	***Rolleston Industrial Developments Ltd***	date excavated:	***11 Nov 2024***
principal:	***-***	date completed:	***12 Nov 2024***
project:	***Ryans Road Fast Track***	logged by:	***N.Cash***
location:	***Ryans Road, Yaldhurst, Christchurch***	checked by:	***A.Jordan***

position: Not Specified | surface elevation: Not Specified | pit orientation: E-W | DCP id.: -

equipment type: >10t Excavator | excavation method: - | excavation dimensions: 2.7 m long 0.9 m wide | vane id.: -

excavation information | **material substance**

method	support	penetration (1 2 3)	water	samples & field tests	RL (m)	depth (m)	graphic log	soil group symbol	material description (SOIL NAME: plasticity or particle characteristics, colour, secondary and minor components)	moisture condition	consistency / relative density	vane shear (kPa) ⊕ remoulded ⊙ peak (50 100 150 200)	DCP (blows/100 mm) (2 4 6 8 10)	soil origin, structure and additional observations
E	N		Not Observed			0.0		ML	**SILT**: low plasticity, dark brown, with trace of fine grained sand and rootlets.	M				**TOPSOIL**
								SW	**SAND**: fine to medium grained, pale brown with orange staining, and trace of silt.		MD			**SPRINGSTON**
						1.0			1.5 to 2.0 m: with some silt					
						2.0								
						3.0								
						4.0			Test pit TP-04A terminated at 3.5 m Machine limit					
						5.0								

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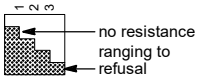
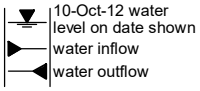
method
- N natural exposure
- X existing excavation
- BH backhoe bucket
- B bulldozer blade
- R ripper
- E excavator
- HT hand tools

support
- N none
- S shoring

penetration



water



samples & field tests
- D disturbed sample
- B bulk disturbed sample
- E environmental sample
- U## undisturbed sample ##mm diameter
- HP hand penetrometer (kPa)
- VS vane shear peak/remouded (kPa)

soil group symbol & material description based on AS 1726:2017

moisture condition
- D dry
- M moist
- W wet
- S saturated
- Wp plastic limit
- Wl liquid limit

consistency / relative density
- VS very soft
- S soft
- F firm
- St stiff
- VSt very stiff
- H hard
- Fb friable
- VL very loose
- L loose
- MD medium dense
- D dense
- VD very dense

TETRA TECH COFFEY

Engineering Log - Excavation

		Excavation ID.	***TP-04B***
		sheet:	1 of 1
		project no.	***773-CHCGE377712***
client:	***Rolleston Industrial Developments Ltd***	date excavated:	***12 Nov 2024***
principal:	***-***	date completed:	***12 Nov 2024***
project:	***Ryans Road Fast Track***	logged by:	***J.Monk***
location:	***Ryans Road, Yaldhurst, Christchurch***	checked by:	***A.Jordan***

position: Not Specified | surface elevation: Not Specified | pit orientation: E-W | DCP id.: -

equipment type: >10t Excavator | excavation method: - | excavation dimensions: 4.2 m long 0.9 m wide | vane id.: -

excavation information | **material substance**

method	support	penetration (1 2 3)	water	samples & field tests	RL (m)	depth (m)	graphic log	soil group symbol	material description (SOIL NAME: plasticity or particle characteristics, colour, secondary and minor components)	moisture condition	consistency / relative density	vane shear (kPa) ⊕ remoulded ⊙ peak (50 100 150 200)	DCP (blows/100 mm) (2 4 6 8 10)	soil origin, structure and additional observations
E	N		Not Observed			0.0		ML	**SILT**: low plasticity, dark brown, with trace of rootlets.	M				**TOPSOIL**
								SW	**SAND**: fine to medium grained, pale brown, with some silt.		L			**SPRINGSTON**
						1.0								
						2.0			2.5 m: becomes silty SAND					
						3.0								
								GW	**Sandy GRAVEL**: fine to coarse grained, grey, with some cobbles.					
						4.0								
						5.0			Test pit TP-04B terminated at 5.0 m Target stratum					

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method
- N natural exposure
- X existing excavation
- BH backhoe bucket
- B bulldozer blade
- R ripper
- E excavator
- HT hand tools

support
- N none
- S shoring

penetration
1 2 3 — no resistance ranging to refusal

water
10-Oct-12 water level on date shown
water inflow
water outflow

samples & field tests
- D disturbed sample
- B bulk disturbed sample
- E environmental sample
- U## undisturbed sample ##mm diameter
- HP hand penetrometer (kPa)
- VS vane shear peak/remouded (kPa)

soil group symbol & material description
based on AS 1726:2017

moisture condition
- D dry
- M moist
- W wet
- S saturated
- Wp plastic limit
- Wl liquid limit

consistency / relative density
- VS very soft
- S soft
- F firm
- St stiff
- VSt very stiff
- H hard
- Fb friable
- VL very loose
- L loose
- MD medium dense
- D dense
- VD very dense

TETRA TECH COFFEY

Engineering Log - Excavation

		Excavation ID.	***TP-05***
		sheet:	1 of 1
		project no.	***773-CHCGE377712***
client:	***Rolleston Industrial Developments Ltd***	date excavated:	***11 Nov 2024***
principal:	***-***	date completed:	***12 Nov 2024***
project:	***Ryans Road Fast Track***	logged by:	***N.Cash***
location:	***Ryans Road, Yaldhurst, Christchurch***	checked by:	***A.Jordan***

position: Not Specified | surface elevation: Not Specified | pit orientation: N-S | DCP id.: -

equipment type: >10t Excavator | excavation method: - | excavation dimensions: 4.5 m long 1.1 m wide | vane id.: -

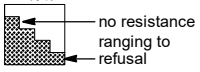
excavation information | **material substance**

method	support	penetration (1 2 3)	water	samples & field tests	RL (m)	depth (m)	graphic log	soil group symbol	material description (SOIL NAME: plasticity or particle characteristics, colour, secondary and minor components)	moisture condition	consistency / relative density	vane shear (kPa) ⊕ remoulded ⊙ peak (50 100 150 200)	DCP (blows/100 mm) (2 4 6 8 10)	soil origin, structure and additional observations
E	N		Not Observed			0.0		ML	**SILT**: low plasticity, dark brown, with trace of silt and rootlets.	M				**TOPSOIL**
								SM	**SILTY SAND**: fine grained, grey-brown with orange staining.		L			**SPRINGSTON**
						1.0								
						2.0		SW	**SAND**: fine to medium grained, grey-brown with orange staining, and with trace of silt.					
						3.0								
						4.0								
								GW	**Sandy GRAVEL**: fine to coarse grained, grey-brown, with trace of cobbles.					
						5.0			Test pit TP-05 terminated at 5.0 m Target stratum					

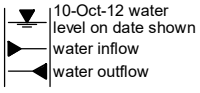
method
- N natural exposure
- X existing excavation
- BH backhoe bucket
- B bulldozer blade
- R ripper
- E excavator
- HT hand tools

support
- N none
- S shoring

penetration



water



samples & field tests
- D disturbed sample
- B bulk disturbed sample
- E environmental sample
- U## undisturbed sample ##mm diameter
- HP hand penetrometer (kPa)
- VS vane shear peak/remouded (kPa)

soil group symbol & material description
based on AS 1726:2017

moisture condition
- D dry
- M moist
- W wet
- S saturated
- Wp plastic limit
- Wl liquid limit

consistency / relative density
- VS very soft
- S soft
- F firm
- St stiff
- VSt very stiff
- H hard
- Fb friable
- VL very loose
- L loose
- MD medium dense
- D dense
- VD very dense

TETRA TECH COFFEY

Engineering Log - Excavation

		Excavation ID.	***TP-06***
		sheet:	1 of 1
		project no.	***773-CHCGE377712***
client:	***Rolleston Industrial Developments Ltd***	date excavated:	***11 Nov 2024***
principal:	***-***	date completed:	***12 Nov 2024***
project:	***Ryans Road Fast Track***	logged by:	***N.Cash***
location:	***Ryans Road, Yaldhurst, Christchurch***	checked by:	***A.Jordan***

position: Not Specified | surface elevation: Not Specified | pit orientation: E-W | DCP id.: -

equipment type: >10t Excavator | excavation method: - | excavation dimensions: 4.5 m long 1.1 m wide | vane id.: -

excavation information | **material substance**

method	support	penetration (1 2 3)	water	samples & field tests	RL (m)	depth (m)	graphic log	soil group symbol	material description (SOIL NAME: plasticity or particle characteristics, colour, secondary and minor components)	moisture condition	consistency / relative density	vane shear (kPa) ⊕ remoulded ⊙ peak (50 100 150 200)	DCP (blows/100 mm) (2 4 6 8 10)	soil origin, structure and additional observations
E	N		Not Observed			0.0		ML	**SILT**: low plasticity, dark brown, with trace of sand and rootlets.	M				**TOPSOIL**
								ML	**Sandy SILT**: low plasticity, grey-brown with orange mottling.		L - MD			**SPRINGSTON**
						1.0								
						2.0		SW	**SAND**: fine to medium grained, grey-brown, with minor silt.					
						3.0								
						4.0		GW	**Sandy GRAVEL**: fine to coarse grained, grey-brown with black staining, and with trace of silt.					
									Test pit TP-06 terminated at 4.3 m Target stratum					
						5.0								

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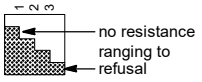
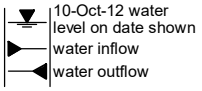
method
- N natural exposure
- X existing excavation
- BH backhoe bucket
- B bulldozer blade
- R ripper
- E excavator
- HT hand tools

support
- N none
- S shoring

penetration



water



samples & field tests
- D disturbed sample
- B bulk disturbed sample
- E environmental sample
- U## undisturbed sample ##mm diameter
- HP hand penetrometer (kPa)
- VS vane shear peak/remouded (kPa)

soil group symbol & material description
based on AS 1726:2017

moisture condition
- D dry
- M moist
- W wet
- S saturated
- Wp plastic limit
- Wl liquid limit

consistency / relative density
- VS very soft
- S soft
- F firm
- St stiff
- VSt very stiff
- H hard
- Fb friable
- VL very loose
- L loose
- MD medium dense
- D dense
- VD very dense

TETRA TECH COFFEY

Engineering Log - Excavation

		Excavation ID.	***TP-07***
		sheet:	1 of 1
		project no.	***773-CHCGE377712***
client:	***Rolleston Industrial Developments Ltd***	date excavated:	***11 Nov 2024***
principal:	***-***	date completed:	***12 Nov 2024***
project:	***Ryans Road Fast Track***	logged by:	***N.Cash***
location:	***Ryans Road, Yaldhurst, Christchurch***	checked by:	***A.Jordan***

position: Not Specified | surface elevation: Not Specified | pit orientation: N-S | DCP id.: -

equipment type: >10t Excavator | excavation method: - | excavation dimensions: 4.5 m long 1.1 m wide | vane id.: -

excavation information | **material substance**

method	support	penetration (1 2 3)	water	samples & field tests	RL (m)	depth (m)	graphic log	soil group symbol	material description (SOIL NAME: plasticity or particle characteristics, colour, secondary and minor components)	moisture condition	consistency / relative density	vane shear (kPa) ⊕ remoulded ⊙ peak (50 100 150 200)	DCP (blows/100 mm) (2 4 6 8 10)	soil origin, structure and additional observations
E	N		Not Observed			0.0		ML	**SILT**: low plasticity, dark brown, with trace of fine grained sand and rootlets.	M				**TOPSOIL**
								SW	**SAND**: fine to medium grained, grey-brown, with trace to minor silt.		L			**SPRINGSTON**
						1.0		ML	**SILT**: low plasticity, brown, with some fine grained sand.					
						2.0		SW	**SAND**: fine to medium grained, grey-brown, with trace of silt.					
						3.0		GW	**Sandy GRAVEL**: fine to coarse grained, grey-brown, with trace of cobbles.					
						4.0			Test pit TP-07 terminated at 4.5 m Target stratum					
						5.0								

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method
- N natural exposure
- X existing excavation
- BH backhoe bucket
- B bulldozer blade
- R ripper
- E excavator
- HT hand tools

support
- N none
- S shoring

penetration
1 2 3 — no resistance ranging to refusal

water
- 10-Oct-12 water level on date shown
- water inflow
- water outflow

samples & field tests
- D disturbed sample
- B bulk disturbed sample
- E environmental sample
- U## undisturbed sample ##mm diameter
- HP hand penetrometer (kPa)
- VS vane shear peak/remouded (kPa)

soil group symbol & material description
based on AS 1726:2017

moisture condition
- D dry
- M moist
- W wet
- S saturated
- Wp plastic limit
- Wl liquid limit

consistency / relative density
- VS very soft
- S soft
- F firm
- St stiff
- VSt very stiff
- H hard
- Fb friable
- VL very loose
- L loose
- MD medium dense
- D dense
- VD very dense

TETRA TECH COFFEY

Engineering Log - Excavation

		Excavation ID.	***TP-08***
		sheet:	1 of 1
		project no.	***773-CHCGE377712***
client:	***Rolleston Industrial Developments Ltd***	date excavated:	***12 Nov 2024***
principal:	***-***	date completed:	***12 Nov 2024***
project:	***Ryans Road Fast Track***	logged by:	***J.Monk***
location:	***Ryans Road, Yaldhurst, Christchurch***	checked by:	***A.Jordan***

position: Not Specified | surface elevation: Not Specified | pit orientation: E-W | DCP id.: -

equipment type: >10t Excavator | excavation method: - | excavation dimensions: 4.3 m long 0.9 m wide | vane id.: -

excavation information | **material substance**

method	support	penetration (1 2 3)	water	samples & field tests	RL (m)	depth (m)	graphic log	soil group symbol	material description (SOIL NAME: plasticity or particle characteristics, colour, secondary and minor components)	moisture condition	consistency / relative density	vane shear (kPa) ⊕ remoulded ⊙ peak (50 100 150 200)	DCP (blows/100 mm) (2 4 6 8 10)	soil origin, structure and additional observations
E	N		Not Observed			0.0		ML	**SILT**: low plasticity, dark brown, with trace of rootlets.	M				**TOPSOIL**
								SW	**SAND**: fine to medium grained, pale brown with orange staining, with minor silt.		L			**SPRINGSTON**
						1.0			0.9 to 1.0 m: fine-grained SAND lens, grey					
									1.4 to 1.5 m: fine-grained SAND lens, grey					
						2.0			1.6 to 2.2 m: fine grained silty SAND					
						3.0		GW	**GRAVEL**: medium to coarse grained, pale brown-grey, with some sand and minor cobbles and silt.					
						4.0			Test pit TP-08 terminated at 3.9 m Target stratum					
						5.0								

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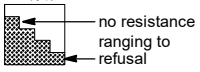
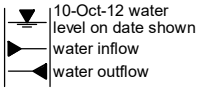
method
- N natural exposure
- X existing excavation
- BH backhoe bucket
- B bulldozer blade
- R ripper
- E excavator
- HT hand tools

support
- N none
- S shoring

penetration



water



samples & field tests
- D disturbed sample
- B bulk disturbed sample
- E environmental sample
- U## undisturbed sample ##mm diameter
- HP hand penetrometer (kPa)
- VS vane shear peak/remouded (kPa)

soil group symbol & material description
based on AS 1726:2017

moisture condition
- D dry
- M moist
- W wet
- S saturated
- Wp plastic limit
- Wl liquid limit

consistency / relative density
- VS very soft
- S soft
- F firm
- St stiff
- VSt very stiff
- H hard
- Fb friable
- VL very loose
- L loose
- MD medium dense
- D dense
- VD very dense

TETRA TECH COFFEY

Engineering Log - Excavation

		Excavation ID.	***TP-09***
		sheet:	1 of 1
		project no.	***773-CHCGE377712***
client:	***Rolleston Industrial Developments Ltd***	date excavated:	***12 Nov 2024***
principal:	***-***	date completed:	***12 Nov 2024***
project:	***Ryans Road Fast Track***	logged by:	***J.Monk***
location:	***Ryans Road, Yaldhurst, Christchurch***	checked by:	***A.Jordan***

position: Not Specified | surface elevation: Not Specified | pit orientation: E-W | DCP id.: -

equipment type: >10t Excavator | excavation method: - | excavation dimensions: 4.0 m long 0.9 m wide | vane id.: -

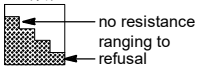
excavation information | **material substance**

method	support	penetration (1 2 3)	water	samples & field tests	RL (m)	depth (m)	graphic log	soil group symbol	material description (SOIL NAME: plasticity or particle characteristics, colour, secondary and minor components)	moisture condition	consistency / relative density	vane shear (kPa) ⊕ remoulded ⊙ peak (50 100 150 200)	DCP (blows/100 mm) (2 4 6 8 10)	soil origin, structure and additional observations
E	N		Not Observed			0.0		ML	**SILT**: low plasticity, dark brown, with trace of rootlets.	M				**TOPSOIL**
								SW	**SAND**: fine to medium grained, pale brown with orange staining.		MD			**SPRINGSTON**
						1.0		SM	**SILTY SAND**: fine to medium grained, brown with orange staining.					
						2.0			2.0 to 3.2 m: becoming sandy SILT					
						3.0		GW	**GRAVEL**: medium to coarse grained, pale grey-brown, with some silt and some sand.					
						4.0			Test pit TP-09 terminated at 3.9 m Target stratum					
						5.0								

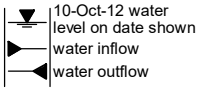
method
- N natural exposure
- X existing excavation
- BH backhoe bucket
- B bulldozer blade
- R ripper
- E excavator
- HT hand tools

support
- N none
- S shoring

penetration



water



samples & field tests
- D disturbed sample
- B bulk disturbed sample
- E environmental sample
- U## undisturbed sample ##mm diameter
- HP hand penetrometer (kPa)
- VS vane shear peak/remouded (kPa)

soil group symbol & material description
based on AS 1726:2017

moisture condition
- D dry
- M moist
- W wet
- S saturated
- Wp plastic limit
- Wl liquid limit

consistency / relative density
- VS very soft
- S soft
- F firm
- St stiff
- VSt very stiff
- H hard
- Fb friable
- VL very loose
- L loose
- MD medium dense
- D dense
- VD very dense

TETRA TECH COFFEY

Engineering Log - Excavation

		Excavation ID.	***TP-10***
		sheet:	1 of 1
		project no.	***773-CHCGE377712***
client:	***Rolleston Industrial Developments Ltd***	date excavated:	***11 Nov 2024***
principal:	***-***	date completed:	***12 Nov 2024***
project:	***Ryans Road Fast Track***	logged by:	***N.Cash***
location:	***Ryans Road, Yaldhurst, Christchurch***	checked by:	***A.Jordan***

position: Not Specified | surface elevation: Not Specified | pit orientation: E-W | DCP id.: -

equipment type: >10t Excavator | excavation method: - | excavation dimensions: 3.6 m long 0.9 m wide | vane id.: -

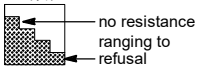
excavation information | **material substance**

method	support	penetration (1 2 3)	water	samples & field tests	RL (m)	depth (m)	graphic log	soil group symbol	material description (SOIL NAME: plasticity or particle characteristics, colour, secondary and minor components)	moisture condition	consistency / relative density	vane shear (remoulded ⊕ / peak ⊙) (kPa) 50 100 150 200	DCP (blows/100 mm) 2 4 6 8 10	soil origin, structure and additional observations
E	N		Not Observed			0.0		ML	**SILT**: low plasticity, dark brown, with trace of fine-grained sand. 0.2 m: with trace of burnt wood					**TOPSOIL**
								SW	**SAND**: fine to medium grained, pale brown with orange staining, and trace of silt.		L			**SPRINGSTON**
						1.0								
						2.0								
						3.0								
									Test pit TP-10 terminated at 3.5 m Machine limit					
						4.0								
						5.0								

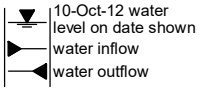
method
- N natural exposure
- X existing excavation
- BH backhoe bucket
- B bulldozer blade
- R ripper
- E excavator
- HT hand tools

support
- N none
- S shoring

penetration



water



samples & field tests
- D disturbed sample
- B bulk disturbed sample
- E environmental sample
- U## undisturbed sample ##mm diameter
- HP hand penetrometer (kPa)
- VS vane shear peak/remouded (kPa)

soil group symbol & material description based on AS 1726:2017

moisture condition
- D dry
- M moist
- W wet
- S saturated
- Wp plastic limit
- Wl liquid limit

consistency / relative density
- VS very soft
- S soft
- F firm
- St stiff
- VSt very stiff
- H hard
- Fb friable
- VL very loose
- L loose
- MD medium dense
- D dense
- VD very dense

TETRA TECH COFFEY

Engineering Log - Excavation

		Excavation ID.	***TP-11***
		sheet:	1 of 1
		project no.	***773-CHCGE377712***
client:	***Rolleston Industrial Developments Ltd***	date excavated:	***11 Nov 2024***
principal:	***-***	date completed:	***12 Nov 2024***
project:	***Ryans Road Fast Track***	logged by:	***N.Cash***
location:	***Ryans Road, Yaldhurst, Christchurch***	checked by:	***A.Jordan***

position: Not Specified | surface elevation: Not Specified | pit orientation: NE-SW | DCP id.: -

equipment type: >10t Excavator | excavation method: - | excavation dimensions: 3.7 m long 0.9 m wide | vane id.: -

excavation information | **material substance**

method	support	penetration 1 2 3	water	samples & field tests	RL (m)	depth (m)	graphic log	soil group symbol	material description (SOIL NAME: plasticity or particle characteristics, colour, secondary and minor components)	moisture condition	consistency / relative density	vane shear (kPa) remoulded ⊕ peak ⊙ 50 100 150 200	DCP (blows/100 mm) 2 4 6 8 10	soil origin, structure and additional observations
E	N		Not Observed			0.0		ML	**SILT**: low plasticity, dark brown, with trace of fine-grained sand and rootlets.	M				**TOPSOIL**
								SM	**SILTY SAND**: fine grained, pale brown with orange staining.		L			**SPRINGSTON**
						1.0								
						2.0		SW	**SAND**: fine to medium grained, pale grey-brown with orange staining, and trace of silt.					
						3.0								
						4.0		GW	**Sandy GRAVEL**: fine to coarse grained, grey-brown with orange staining, and trace of cobbles.					
									Test pit TP-11 terminated at 4.3 m Target stratum					
						5.0								

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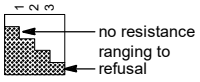
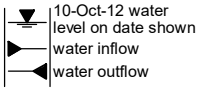
method
- N natural exposure
- X existing excavation
- BH backhoe bucket
- B bulldozer blade
- R ripper
- E excavator
- HT hand tools

support
- N none
- S shoring

penetration



water



samples & field tests
- D disturbed sample
- B bulk disturbed sample
- E environmental sample
- U## undisturbed sample ##mm diameter
- HP hand penetrometer (kPa)
- VS vane shear peak/remouded (kPa)

soil group symbol & material description
based on AS 1726:2017

moisture condition
- D dry
- M moist
- W wet
- S saturated
- Wp plastic limit
- Wl liquid limit

consistency / relative density
- VS very soft
- S soft
- F firm
- St stiff
- VSt very stiff
- H hard
- Fb friable
- VL very loose
- L loose
- MD medium dense
- D dense
- VD very dense

TETRA TECH COFFEY

Engineering Log - Excavation

		Excavation ID.	***TP-12***
		sheet:	1 of 1
		project no.	***773-CHCGE377712***
client:	***Rolleston Industrial Developments Ltd***	date excavated:	***12 Nov 2024***
principal:	***-***	date completed:	***12 Nov 2024***
project:	***Ryans Road Fast Track***	logged by:	***J.Monk***
location:	***Ryans Road, Yaldhurst, Christchurch***	checked by:	***A.Jordan***

position: Not Specified | surface elevation: Not Specified | pit orientation: E-W | DCP id.: -

equipment type: >10t Excavator | excavation method: - | excavation dimensions: 4.6 m long 0.9 m wide | vane id.: -

excavation information | **material substance**

method	support	penetration (1 2 3)	water	samples & field tests	RL (m)	depth (m)	graphic log	soil group symbol	material description (SOIL NAME: plasticity or particle characteristics, colour, secondary and minor components)	moisture condition	consistency / relative density	vane shear (kPa) ⊕ remoulded ⊙ peak (50 100 150 200)	DCP (blows/100 mm) (2 4 6 8 10)	soil origin, structure and additional observations
E	N		Not Observed			0.0		ML	**SILT**: low plasticity, dark brown, with trace of rootlets.	M				**TOPSOIL**
								SW	**SAND**: fine to medium grained, pale brown with orange staining, and some silt.		L			**SPRINGSTON**
						1.0								
						2.0								
						3.0								
						4.0		GW	**GRAVEL**: medium to coarse grained, pale brown-grey, with some sand and minor silt.					
									Test pit TP-12 terminated at 4.5 m Target stratum					
						5.0								

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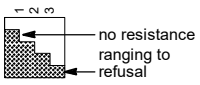
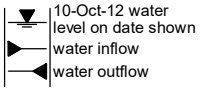
method
- N natural exposure
- X existing excavation
- BH backhoe bucket
- B bulldozer blade
- R ripper
- E excavator
- HT hand tools

support
- N none
- S shoring

penetration



water



samples & field tests
- D disturbed sample
- B bulk disturbed sample
- E environmental sample
- U## undisturbed sample ##mm diameter
- HP hand penetrometer (kPa)
- VS vane shear peak/remouded (kPa)

soil group symbol & material description
based on AS 1726:2017

moisture condition
- D dry
- M moist
- W wet
- S saturated
- Wp plastic limit
- Wl liquid limit

consistency / relative density
- VS very soft
- S soft
- F firm
- St stiff
- VSt very stiff
- H hard
- Fb friable
- VL very loose
- L loose
- MD medium dense
- D dense
- VD very dense

TETRA TECH COFFEY

Engineering Log - Excavation

		Excavation ID.	***TP-13***
		sheet:	1 of 1
		project no.	***773-CHCGE377712***
client:	***Rolleston Industrial Developments Ltd***	date excavated:	***12 Nov 2024***
principal:	***-***	date completed:	***12 Nov 2024***
project:	***Ryans Road Fast Track***	logged by:	***J.Monk***
location:	***Ryans Road, Yaldhurst, Christchurch***	checked by:	***A.Jordan***

position: Not Specified | surface elevation: Not Specified | pit orientation: E-W | DCP id.: -

equipment type: >10t Excavator | excavation method: - | excavation dimensions: 4.0 m long 1.0 m wide | vane id.: -

excavation information | **material substance**

method	support	penetration (1 2 3)	water	samples & field tests	RL (m)	depth (m)	graphic log	soil group symbol	material description (SOIL NAME: plasticity or particle characteristics, colour, secondary and minor components)	moisture condition	consistency / relative density	vane shear (kPa) ⊕ remoulded ⊙ peak (50 100 150 200)	DCP (blows/100 mm) (2 4 6 8 10)	soil origin, structure and additional observations
E	N		Not Observed			0.0		ML	**SILT**: low plasticity, dark brown, with trace of rootlets.	M				**TOPSOIL**
								SW	**SAND**: fine grained, pale brown, with some silt. 0.5 to 3.8 m: variable silt up to sandy SILT		L			**SPRINGSTON**
						1.0			1.0 to 1.1 m: SAND, fine-grained, grey					
						2.0								
						3.0								
						4.0		GW	**GRAVEL**: fine to coarse grained, pale brown-grey.					
									Test pit TP-13 terminated at 4.2 m Target stratum					
						5.0								

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method
- N natural exposure
- X existing excavation
- BH backhoe bucket
- B bulldozer blade
- R ripper
- E excavator
- HT hand tools

support
- N none
- S shoring

penetration
1 2 3 — no resistance ranging to refusal

water
10-Oct-12 water level on date shown
water inflow
water outflow

samples & field tests
- D disturbed sample
- B bulk disturbed sample
- E environmental sample
- U## undisturbed sample ##mm diameter
- HP hand penetrometer (kPa)
- VS vane shear peak/remouded (kPa)

soil group symbol & material description
based on AS 1726:2017

moisture condition
- D dry
- M moist
- W wet
- S saturated
- Wp plastic limit
- Wl liquid limit

consistency / relative density
- VS very soft
- S soft
- F firm
- St stiff
- VSt very stiff
- H hard
- Fb friable
- VL very loose
- L loose
- MD medium dense
- D dense
- VD very dense

TETRA TECH COFFEY

Engineering Log - Excavation

		Excavation ID.	***TP-14***
		sheet:	1 of 1
		project no.	***773-CHCGE377712***
client:	***Rolleston Industrial Developments Ltd***	date excavated:	***12 Nov 2024***
principal:	***-***	date completed:	***12 Nov 2024***
project:	***Ryans Road Fast Track***	logged by:	***J.Monk***
location:	***Ryans Road, Yaldhurst, Christchurch***	checked by:	***A.Jordan***

position: Not Specified | surface elevation: Not Specified | pit orientation: E-W | DCP id.: -

equipment type: >10t Excavator | excavation method: - | excavation dimensions: 4.1 m long 1.0 m wide | vane id.: -

excavation information | **material substance**

method	support	penetration (1 2 3)	water	samples & field tests	RL (m)	depth (m)	graphic log	soil group symbol	material description (SOIL NAME: plasticity or particle characteristics, colour, secondary and minor components)	moisture condition	consistency / relative density	vane shear (kPa) ⊕ remoulded ⊙ peak (50 100 150 200)	DCP (blows/100 mm) (2 4 6 8 10)	soil origin, structure and additional observations
E	N		Not Observed			0.0		ML	**SILT**: low plasticity, dark brown, with trace of rootlets.	D - M				**TOPSOIL**
								SW	**SAND**: fine to medium grained, pale brown.	M	MD			**SPRINGSTON**
						1.0								
						2.0								
								ML	**SILT**: low plasticity, pale brown with orange mottling.					
						3.0		GW	**GRAVEL**: medium to coarse grained, pale grey-brown, with some silt.					
									Test pit TP-14 terminated at 3.8 m Target stratum					
						4.0								
						5.0								

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method
- N natural exposure
- X existing excavation
- BH backhoe bucket
- B bulldozer blade
- R ripper
- E excavator
- HT hand tools

support
- N none
- S shoring

penetration
1 2 3 — no resistance ranging to refusal

water
- 10-Oct-12 water level on date shown
- water inflow
- water outflow

samples & field tests
- D disturbed sample
- B bulk disturbed sample
- E environmental sample
- U## undisturbed sample ##mm diameter
- HP hand penetrometer (kPa)
- VS vane shear peak/remouded (kPa)

soil group symbol & material description
based on AS 1726:2017

moisture condition
- D dry
- M moist
- W wet
- S saturated
- Wp plastic limit
- Wl liquid limit

consistency / relative density
- VS very soft
- S soft
- F firm
- St stiff
- VSt very stiff
- H hard
- Fb friable
- VL very loose
- L loose
- MD medium dense
- D dense
- VD very dense

TETRA TECH COFFEY

Engineering Log - Excavation

		Excavation ID.	***TP-15***
		sheet:	1 of 1
		project no.	***773-CHCGE377712***
client:	***Rolleston Industrial Developments Ltd***	date excavated:	***11 Nov 2024***
principal:	***-***	date completed:	***12 Nov 2024***
project:	***Ryans Road Fast Track***	logged by:	***N.Cash***
location:	***Ryans Road, Yaldhurst, Christchurch***	checked by:	***A.Jordan***

position: Not Specified | surface elevation: Not Specified | pit orientation: NE-SW | DCP id.: -

equipment type: >10t Excavator | excavation method: - | excavation dimensions: 3.7 m long 0.9 m wide | vane id.: -

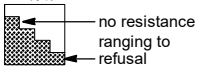
excavation information | **material substance**

method	support	penetration (1 2 3)	water	samples & field tests	RL (m)	depth (m)	graphic log	soil group symbol	material description (SOIL NAME: plasticity or particle characteristics, colour, secondary and minor components)	moisture condition	consistency / relative density	vane shear (kPa) ⊕ remoulded ⊙ peak (50 100 150 200)	DCP (blows/100 mm) (2 4 6 8 10)	soil origin, structure and additional observations
E	N		Not Observed			0.0		ML	**SILT**: low plasticity, dark brown, with trace of rootlets.	M				**TOPSOIL**
								SW	**SAND**: fine to medium grained, pale brown, with trace of silt.		L			**SPRINGSTON**
						1.0								
						2.0								
						3.0								
									Test pit TP-15 terminated at 3.7 m Machine limit					
						4.0								
						5.0								

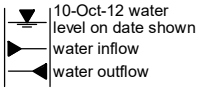
method
- N natural exposure
- X existing excavation
- BH backhoe bucket
- B bulldozer blade
- R ripper
- E excavator
- HT hand tools

support
- N none
- S shoring

penetration



water



samples & field tests
- D disturbed sample
- B bulk disturbed sample
- E environmental sample
- U## undisturbed sample ##mm diameter
- HP hand penetrometer (kPa)
- VS vane shear peak/remouded (kPa)

soil group symbol & material description
based on AS 1726:2017

moisture condition
- D dry
- M moist
- W wet
- S saturated
- Wp plastic limit
- Wl liquid limit

consistency / relative density
- VS very soft
- S soft
- F firm
- St stiff
- VSt very stiff
- H hard
- Fb friable
- VL very loose
- L loose
- MD medium dense
- D dense
- VD very dense

TETRA TECH COFFEY

Engineering Log - Excavation

		Excavation ID.	***TP-16***
		sheet:	1 of 1
		project no.	***773-CHCGE377712***
client:	***Rolleston Industrial Developments Ltd***	date excavated:	***11 Nov 2024***
principal:	***-***	date completed:	***12 Nov 2024***
project:	***Ryans Road Fast Track***	logged by:	***N.Cash***
location:	***Ryans Road, Yaldhurst, Christchurch***	checked by:	***A.Jordan***

position: Not Specified | surface elevation: Not Specified | pit orientation: NE-SW | DCP id.: -

equipment type: >10t Excavator | excavation method: - | excavation dimensions: 3.7 m long 0.9 m wide | vane id.: -

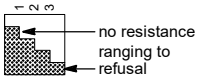
excavation information | **material substance**

method	support	penetration (1 2 3)	water	samples & field tests	RL (m)	depth (m)	graphic log	soil group symbol	material description (SOIL NAME: plasticity or particle characteristics, colour, secondary and minor components)	moisture condition	consistency / relative density	vane shear (remoulded ⊕ peak ⊙) (kPa) 50 100 150 200	DCP (blows/100 mm) 2 4 6 8 10	soil origin, structure and additional observations
E	N		Not Observed			0.0		ML	**SILT**: low plasticity, dark brown, with trace of fine grained sand and rootlets.	M				**TOPSOIL**
								SW	**SAND**: fine to medium grained, pale brown with orange mottling, and trace of silt.		MD			**SPRINGSTON**
						1.0								
						2.0								
						3.0								
									Test pit TP-16 terminated at 3.5 m Machine limit					
						4.0								
						5.0								

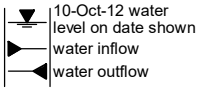
method
- N natural exposure
- X existing excavation
- BH backhoe bucket
- B bulldozer blade
- R ripper
- E excavator
- HT hand tools

support
- N none
- S shoring

penetration



water



samples & field tests
- D disturbed sample
- B bulk disturbed sample
- E environmental sample
- U## undisturbed sample ##mm diameter
- HP hand penetrometer (kPa)
- VS vane shear peak/remouded (kPa)

soil group symbol & material description
based on AS 1726:2017

moisture condition
- D dry
- M moist
- W wet
- S saturated
- Wp plastic limit
- Wl liquid limit

consistency / relative density
- VS very soft
- S soft
- F firm
- St stiff
- VSt very stiff
- H hard
- Fb friable
- VL very loose
- L loose
- MD medium dense
- D dense
- VD very dense

TETRA TECH COFFEY

Engineering Log - Excavation

		Excavation ID.	***TP-17***
		sheet:	1 of 1
		project no.	***773-CHCGE377712***
client:	***Rolleston Industrial Developments Ltd***	date excavated:	***12 Nov 2024***
principal:	***-***	date completed:	***12 Nov 2024***
project:	***Ryans Road Fast Track***	logged by:	***J.Monk***
location:	***Ryans Road, Yaldhurst, Christchurch***	checked by:	***A.Jordan***

position: Not Specified | surface elevation: Not Specified | pit orientation: N-S | DCP id.: -

equipment type: >10t Excavator | excavation method: - | excavation dimensions: 4.0 m long 1.0 m wide | vane id.: -

excavation information | **material substance**

method	support	penetration (1 2 3)	water	samples & field tests	RL (m)	depth (m)	graphic log	soil group symbol	material description (**SOIL NAME**: plasticity or particle characteristics, colour, secondary and minor components)	moisture condition	consistency / relative density	vane shear (kPa) ⊕ remoulded ⊙ peak (50 100 150 200)	DCP (blows/100 mm) (2 4 6 8 10)	soil origin, structure and additional observations
E	N		Not Observed			0.0		ML	**SILT**: low plasticity, dark brown, with trace of rootlets.	M				**TOPSOIL**
								SW	**SAND**: fine to medium grained, pale brown, with minor to some silt.		MD			**SPRINGSTON**
						1.0								
						2.0								
						3.0								
						4.0		GW	**GRAVEL**: medium to coarse grained, pale grey with orange staining, and some fine to medium grained sand.					
									Test pit TP-17 terminated at 4.4 m Target stratum					
						5.0								

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method
- N natural exposure
- X existing excavation
- BH backhoe bucket
- B bulldozer blade
- R ripper
- E excavator
- HT hand tools

support
- N none
- S shoring

penetration
1 2 3 — no resistance ranging to refusal

water
- 10-Oct-12 water level on date shown
- water inflow
- water outflow

samples & field tests
- D disturbed sample
- B bulk disturbed sample
- E environmental sample
- U## undisturbed sample ##mm diameter
- HP hand penetrometer (kPa)
- VS vane shear peak/remouded (kPa)

soil group symbol & material description
based on AS 1726:2017

moisture condition
- D dry
- M moist
- W wet
- S saturated
- Wp plastic limit
- Wl liquid limit

consistency / relative density
- VS very soft
- S soft
- F firm
- St stiff
- VSt very stiff
- H hard
- Fb friable
- VL very loose
- L loose
- MD medium dense
- D dense
- VD very dense

TETRA TECH COFFEY

Engineering Log - Excavation

		Excavation ID.	***TP-18***
		sheet:	1 of 1
		project no.	***773-CHCGE377712***
client:	***Rolleston Industrial Developments Ltd***	date excavated:	***12 Nov 2024***
principal:	***-***	date completed:	***12 Nov 2024***
project:	***Ryans Road Fast Track***	logged by:	***J.Monk***
location:	***Ryans Road, Yaldhurst, Christchurch***	checked by:	***A.Jordan***

position: Not Specified | surface elevation: Not Specified | pit orientation: N-S | DCP id.: -

equipment type: >10t Excavator | excavation method: - | excavation dimensions: 4.0 m long 1.0 m wide | vane id.: -

excavation information | **material substance**

method	support	penetration (1 2 3)	water	samples & field tests	RL (m)	depth (m)	graphic log	soil group symbol	material description (**SOIL NAME**: plasticity or particle characteristics, colour, secondary and minor components)	moisture condition	consistency / relative density	vane shear (kPa) ⊕ remoulded ⊙ peak (50 100 150 200)	DCP (blows/100 mm) (2 4 6 8 10)	soil origin, structure and additional observations
E	N		Not Observed			0.0		ML	**SILT**: low plasticity, dark brown, with trace of rootlets.	M				**TOPSOIL**
								SW	**SAND**: fine to medium grained, pale brown, with trace to minor silt.		MD			**SPRINGSTON**
						1.0								
						2.0								
						3.0								
						4.0		GW	**GRAVEL**: medium to coarse grained, pale orange-brown to grey-brown, with minor to some fine-grained sand.					
									Test pit TP-18 terminated at 4.2 m Target stratum					
						5.0								

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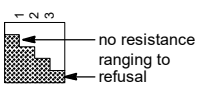
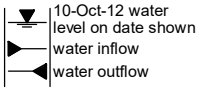
method
- N natural exposure
- X existing excavation
- BH backhoe bucket
- B bulldozer blade
- R ripper
- E excavator
- HT hand tools

support
- N none
- S shoring

penetration



water



samples & field tests
- D disturbed sample
- B bulk disturbed sample
- E environmental sample
- U## undisturbed sample ##mm diameter
- HP hand penetrometer (kPa)
- VS vane shear peak/remouded (kPa)

soil group symbol & material description
based on AS 1726:2017

moisture condition
- D dry
- M moist
- W wet
- S saturated
- Wp plastic limit
- Wl liquid limit

consistency / relative density
- VS very soft
- S soft
- F firm
- St stiff
- VSt very stiff
- H hard
- Fb friable
- VL very loose
- L loose
- MD medium dense
- D dense
- VD very dense

TETRA TECH COFFEY

Engineering Log - Excavation

Excavation ID.	***TP-19***
sheet:	1 of 1
project no.	***773-CHCGE377712***
client:	***Rolleston Industrial Developments Ltd***
date excavated:	***12 Nov 2024***
principal:	***-***
date completed:	***12 Nov 2024***
project:	***Ryans Road Fast Track***
logged by:	***J.Monk***
location:	***Ryans Road, Yaldhurst, Christchurch***
checked by:	***A.Jordan***

position: Not Specified | surface elevation: Not Specified | pit orientation: E-W | DCP id.: -

equipment type: >10t Excavator | excavation method: - | excavation dimensions: 4.0 m long 0.9 m wide | vane id.: -

excavation information | **material substance**

method	support	penetration (1 2 3)	water	samples & field tests	RL (m)	depth (m)	graphic log	soil group symbol	material description (SOIL NAME: plasticity or particle characteristics, colour, secondary and minor components)	moisture condition	consistency / relative density	vane shear (kPa) ⊕ remoulded ⊙ peak (50 100 150 200)	DCP (blows/100 mm) (2 4 6 8 10)	soil origin, structure and additional observations
E	N		Not Observed			0.0		ML	**SILT**: low plasticity, dark brown, with trace of rootlets.	M				**TOPSOIL**
								SW	**SAND**: fine to medium grained, pale brown, with some silt.		L - MD			**SPRINGSTON**
						1.0			1.0 to 1.3 m: becomes dark brown					
						2.0								
						3.0								
						4.0		GW	**GRAVEL**: medium to coarse grained, grey-brown, with some sand, some cobble and trace of silt.					
									Test pit TP-19 terminated at 4.6 m Target stratum					
						5.0								

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method
- N natural exposure
- X existing excavation
- BH backhoe bucket
- B bulldozer blade
- R ripper
- E excavator
- HT hand tools

support
- N none
- S shoring

penetration
1 2 3 — no resistance ranging to refusal

water
- 10-Oct-12 water level on date shown
- water inflow
- water outflow

samples & field tests
- D disturbed sample
- B bulk disturbed sample
- E environmental sample
- U## undisturbed sample ##mm diameter
- HP hand penetrometer (kPa)
- VS vane shear peak/remouded (kPa)

soil group symbol & material description
based on AS 1726:2017

moisture condition
- D dry
- M moist
- W wet
- S saturated
- Wp plastic limit
- Wl liquid limit

consistency / relative density
- VS very soft
- S soft
- F firm
- St stiff
- VSt very stiff
- H hard
- Fb friable
- VL very loose
- L loose
- MD medium dense
- D dense
- VD very dense

TETRA TECH COFFEY

Engineering Log - Excavation

		Excavation ID.	***TP-20***
		sheet:	1 of 1
		project no.	***773-CHCGE377712***
client:	***Rolleston Industrial Developments Ltd***	date excavated:	***11 Nov 2024***
principal:	***-***	date completed:	***12 Nov 2024***
project:	***Ryans Road Fast Track***	logged by:	***N.Cash***
location:	***Ryans Road, Yaldhurst, Christchurch***	checked by:	***A.Jordan***

position: Not Specified | surface elevation: Not Specified | pit orientation: E-W | DCP id.: -

equipment type: >10t Excavator | excavation method: - | excavation dimensions: 3.4 m long 0.9 m wide | vane id.: -

excavation information | **material substance**

method	support	penetration (1 2 3)	water	samples & field tests	RL (m)	depth (m)	graphic log	soil group symbol	material description (SOIL NAME: plasticity or particle characteristics, colour, secondary and minor components)	moisture condition	consistency / relative density	vane shear (kPa) ⊕ remolded ⊙ peak (50 100 150 200)	DCP (blows/100 mm) (2 4 6 8 10)	soil origin, structure and additional observations
E	N		Not Observed			0.0		ML	**SILT**: low plasticity, dark brown, with trace of rootlets.	M				**TOPSOIL**
								SW	**SAND**: fine to medium grained, pale brown, with trace of silt.		L			**SPRINGSTON**
						1.0		GW	**Sandy GRAVEL**: fine to coarse grained, pale brown, with trace of cobbles.					
						2.0								
						3.0								
									Test pit TP-20 terminated at 3.5 m Target stratum					
						4.0								
						5.0								

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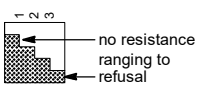
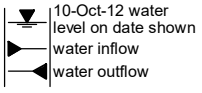
method
- N natural exposure
- X existing excavation
- BH backhoe bucket
- B bulldozer blade
- R ripper
- E excavator
- HT hand tools

support
- N none
- S shoring

penetration



water



samples & field tests
- D disturbed sample
- B bulk disturbed sample
- E environmental sample
- U## undisturbed sample ##mm diameter
- HP hand penetrometer (kPa)
- VS vane shear peak/remouded (kPa)

soil group symbol & material description
based on AS 1726:2017

moisture condition
- D dry
- M moist
- W wet
- S saturated
- Wp plastic limit
- Wl liquid limit

consistency / relative density
- VS very soft
- S soft
- F firm
- St stiff
- VSt very stiff
- H hard
- Fb friable
- VL very loose
- L loose
- MD medium dense
- D dense
- VD very dense

TETRA TECH COFFEY

Engineering Log - Excavation

		Excavation ID.	***TP-21***
		sheet:	1 of 1
		project no.	***773-CHCGE377712***
client:	***Rolleston Industrial Developments Ltd***	date excavated:	***11 Nov 2024***
principal:	***-***	date completed:	***12 Nov 2024***
project:	***Ryans Road Fast Track***	logged by:	***N.Cash***
location:	***Ryans Road, Yaldhurst, Christchurch***	checked by:	***A.Jordan***

position: Not Specified | surface elevation: Not Specified | pit orientation: N-S | DCP id.: -

equipment type: >10t Excavator | excavation method: - | excavation dimensions: 3.5 m long 0.9 m wide | vane id.: -

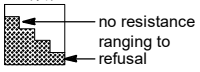
excavation information | **material substance**

method	support	penetration (1 2 3)	water	samples & field tests	RL (m)	depth (m)	graphic log	soil group symbol	material description (SOIL NAME: plasticity or particle characteristics, colour, secondary and minor components)	moisture condition	consistency / relative density	vane shear (kPa) ⊕ remoulded ⊙ peak (50 100 150 200)	DCP (blows/100 mm) (2 4 6 8 10)	soil origin, structure and additional observations
E	N		Not Observed			0.0		ML	**SILT**: low plasticity, dark brown, with trace of fine grained sand and rootlets.	M				**TOPSOIL**
								SW	**SAND**: fine to medium grained, grey-brown with orange staining, and trace to minor silt.		MD			**SPRINGSTON** DCP 0.7m: Refusal
						1.0								
						2.0		GW	**Sandy GRAVEL**: fine to coarse grained, grey-brown, with trace of cobbles.					
						3.0								
									Test pit TP-21 terminated at 3.5 m Target stratum					
						4.0								
						5.0								

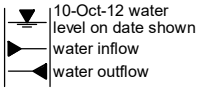
method
- N natural exposure
- X existing excavation
- BH backhoe bucket
- B bulldozer blade
- R ripper
- E excavator
- HT hand tools

support
- N none
- S shoring

penetration



water



samples & field tests
- D disturbed sample
- B bulk disturbed sample
- E environmental sample
- U## undisturbed sample ##mm diameter
- HP hand penetrometer (kPa)
- VS vane shear peak/remouded (kPa)

soil group symbol & material description
based on AS 1726:2017

moisture condition
- D dry
- M moist
- W wet
- S saturated
- Wp plastic limit
- Wl liquid limit

consistency / relative density
- VS very soft
- S soft
- F firm
- St stiff
- VSt very stiff
- H hard
- Fb friable
- VL very loose
- L loose
- MD medium dense
- D dense
- VD very dense

TETRA TECH COFFEY

Engineering Log - Excavation

		Excavation ID.	***TP-22***
		sheet:	1 of 1
		project no.	***773-CHCGE377712***
client:	***Rolleston Industrial Developments Ltd***	date excavated:	***12 Nov 2024***
principal:	***-***	date completed:	***12 Nov 2024***
project:	***Ryans Road Fast Track***	logged by:	***J.Monk***
location:	***Ryans Road, Yaldhurst, Christchurch***	checked by:	***A.Jordan***

position: Not Specified | surface elevation: Not Specified | pit orientation: E-W | DCP id.: -

equipment type: >10t Excavator | excavation method: - | excavation dimensions: 4.0 m long 0.9 m wide | vane id.: -

excavation information | **material substance**

method	support	penetration (1 2 3)	water	samples & field tests	RL (m)	depth (m)	graphic log	soil group symbol	material description (**SOIL NAME**: plasticity or particle characteristics, colour, secondary and minor components)	moisture condition	consistency / relative density	vane shear (kPa) ⊕ remolded ⊙ peak (50 100 150 200)	DCP (blows/100 mm) (2 4 6 8 10)	soil origin, structure and additional observations
E	N		Not Observed					ML	**SILT**: low plasticity, dark brown, with trace of rootlets.	M				**TOPSOIL**
								SW	**SAND**: fine grained, pale brown, with trace of silt.		MD			**SPRINGSTON**
						1.0		GW	**GRAVEL**: fine to coarse grained, pale grey, with some cobbles and fine-grained sand.					
									Test pit TP-22 terminated at 1.4 m Target stratum					
						2.0								
						3.0								
						4.0								
						5.0								

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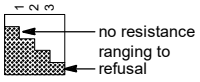
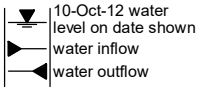
method
- N natural exposure
- X existing excavation
- BH backhoe bucket
- B bulldozer blade
- R ripper
- E excavator
- HT hand tools

support
- N none
- S shoring

penetration



water



samples & field tests
- D disturbed sample
- B bulk disturbed sample
- E environmental sample
- U## undisturbed sample ##mm diameter
- HP hand penetrometer (kPa)
- VS vane shear peak/remouded (kPa)

soil group symbol & material description
based on AS 1726:2017

moisture condition
- D dry
- M moist
- W wet
- S saturated
- Wp plastic limit
- Wl liquid limit

consistency / relative density
- VS very soft
- S soft
- F firm
- St stiff
- VSt very stiff
- H hard
- Fb friable
- VL very loose
- L loose
- MD medium dense
- D dense
- VD very dense

TETRA TECH COFFEY

Engineering Log - Excavation

		Excavation ID.	***TP-23***
		sheet:	1 of 1
		project no.	***773-CHCGE377712***
client:	***Rolleston Industrial Developments Ltd***	date excavated:	***12 Nov 2024***
principal:	***-***	date completed:	***12 Nov 2024***
project:	***Ryans Road Fast Track***	logged by:	***J.Monk***
location:	***Ryans Road, Yaldhurst, Christchurch***	checked by:	***A.Jordan***

position: Not Specified | surface elevation: Not Specified | pit orientation: N-S | DCP id.: -

equipment type: >10t Excavator | excavation method: - | excavation dimensions: 4.0 m long 1.0 m wide | vane id.: -

excavation information | **material substance**

method	support	penetration (1 2 3)	water	samples & field tests	RL (m)	depth (m)	graphic log	soil group symbol	material description (SOIL NAME: plasticity or particle characteristics, colour, secondary and minor components)	moisture condition	consistency / relative density	vane shear ⊕remoulded ⊙peak (kPa) 50 100 150 200	DCP (blows/100 mm) 2 4 6 8 10	soil origin, structure and additional observations
E	N		Not Observed			0.0		ML	**SILT**: low plasticity, dark brown, with trace of rootlets.	M				**TOPSOIL**
								SW	**SAND**: fine grained, pale brown with orange mottling, and some silt.		L			**SPRINGSTON**
						1.0								
						2.0								
						3.0								
						4.0			4.0 m: becomes orange-brown					
								GW	**GRAVEL**: medium to coarse grained, pale grey-brown with orange mottling, and some silt and fine-grained sand.					
									Test pit TP-23 terminated at 4.6 m Target stratum					
						5.0								

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method
- N natural exposure
- X existing excavation
- BH backhoe bucket
- B bulldozer blade
- R ripper
- E excavator
- HT hand tools

support
- N none
- S shoring

penetration
1 2 3 — no resistance ranging to refusal

water
- 10-Oct-12 water level on date shown
- water inflow
- water outflow

samples & field tests
- D disturbed sample
- B bulk disturbed sample
- E environmental sample
- U## undisturbed sample ##mm diameter
- HP hand penetrometer (kPa)
- VS vane shear peak/remouded (kPa)

soil group symbol & material description
based on AS 1726:2017

moisture condition
- D dry
- M moist
- W wet
- S saturated
- Wp plastic limit
- Wl liquid limit

consistency / relative density
- VS very soft
- S soft
- F firm
- St stiff
- VSt very stiff
- H hard
- Fb friable
- VL very loose
- L loose
- MD medium dense
- D dense
- VD very dense

TETRA TECH COFFEY

Engineering Log - Excavation

		Excavation ID.	***TP-24***
		sheet:	1 of 1
		project no.	***773-CHCGE377712***
client:	***Rolleston Industrial Developments Ltd***	date excavated:	***11 Nov 2024***
principal:	***-***	date completed:	***12 Nov 2024***
project:	***Ryans Road Fast Track***	logged by:	***N.Cash***
location:	***Ryans Road, Yaldhurst, Christchurch***	checked by:	***A.Jordan***

position: Not Specified | surface elevation: Not Specified | pit orientation: E-W | DCP id.: -

equipment type: >10t Excavator | excavation method: - | excavation dimensions: 3.0 m long 0.9 m wide | vane id.: -

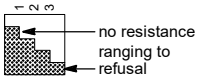
excavation information | **material substance**

method	support	penetration 1 2 3	water	samples & field tests	RL (m)	depth (m)	graphic log	soil group symbol	material description (SOIL NAME: plasticity or particle characteristics, colour, secondary and minor components)	moisture condition	consistency / relative density	vane shear ⊕remoulded ⊙peak (kPa) 50 100 150 200	DCP (blows/100 mm) 2 4 6 8 10	soil origin, structure and additional observations
E	N		Not Observed			0.0		ML	**SILT**: low plasticity, dark brown, with trace of fine grained sand and rootlets.	M				**TOPSOIL**
								SW	**SAND**: fine to medium grained, pale yellow-brown, with minor to some silt.		MD			**SPRINGSTON**
						1.0								
						2.0								
						3.0								
									Test pit TP-24 terminated at 3.6 m Machine limit					
						4.0								
						5.0								

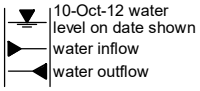
method
- N natural exposure
- X existing excavation
- BH backhoe bucket
- B bulldozer blade
- R ripper
- E excavator
- HT hand tools

support
- N none
- S shoring

penetration



water



samples & field tests
- D disturbed sample
- B bulk disturbed sample
- E environmental sample
- U## undisturbed sample ##mm diameter
- HP hand penetrometer (kPa)
- VS vane shear peak/remouded (kPa)

soil group symbol & material description based on AS 1726:2017

moisture condition
- D dry
- M moist
- W wet
- S saturated
- Wp plastic limit
- Wl liquid limit

consistency / relative density
- VS very soft
- S soft
- F firm
- St stiff
- VSt very stiff
- H hard
- Fb friable
- VL very loose
- L loose
- MD medium dense
- D dense
- VD very dense

TETRA TECH COFFEY

Engineering Log - Excavation

Excavation ID.	***TP-24B***
sheet:	1 of 1
project no.	***773-CHCGE377712***
client:	***Rolleston Industrial Developments Ltd***
date excavated:	***12 Nov 2024***
principal:	***-***
date completed:	***12 Nov 2024***
project:	***Ryans Road Fast Track***
logged by:	***J.Monk***
location:	***Ryans Road, Yaldhurst, Christchurch***
checked by:	***A.Jordan***

position: Not Specified | surface elevation: Not Specified | pit orientation: E-W | DCP id.: -

equipment type: >10t Excavator | excavation method: - | excavation dimensions: 4.2 m long 1.0 m wide | vane id.: -

excavation information | **material substance**

method	support	penetration (1 2 3)	water	samples & field tests	RL (m)	depth (m)	graphic log	soil group symbol	material description (SOIL NAME: plasticity or particle characteristics, colour, secondary and minor components)	moisture condition	consistency / relative density	vane shear (kPa) ⊕ remoulded ⊙ peak (50 100 150 200)	DCP (blows/100 mm) (2 4 6 8 10)	soil origin, structure and additional observations
E	N		Not Observed			0.0		ML	**SILT**: low plasticity, dark brown, with trace of rootlets.	M				**TOPSOIL**
								SW	**SAND**: fine to medium grained, pale brown, with some silt.		MD			**SPRINGSTON**
						1.0								
						2.0								
						3.0								
						4.0			4.6 m: becomes orange-brown					
						5.0		GW	**GRAVEL**: medium to coarse grained, orange-brown, with some cobbles and trace of silt.					
									Test pit TP-24B terminated at 5.4 m Target depth					

CDF_0_10_00.4_LIBRARY.GLB rev:CDF_0_10_00.4 2021-09-30 Log_COF EXCAVATION + PSP/DCP_773-CHCGE377712GINT.GPJ <<DrawingFile>> 03/12/2024 10:17

method
- N natural exposure
- X existing excavation
- BH backhoe bucket
- B bulldozer blade
- R ripper
- E excavator
- HT hand tools

support
- N none
- S shoring

penetration
1 2 3 — no resistance ranging to refusal

water
10-Oct-12 water level on date shown
water inflow
water outflow

samples & field tests
- D disturbed sample
- B bulk disturbed sample
- E environmental sample
- U## undisturbed sample ##mm diameter
- HP hand penetrometer (kPa)
- VS vane shear peak/remouded (kPa)

soil group symbol & material description
based on AS 1726:2017

moisture condition
- D dry
- M moist
- W wet
- S saturated
- Wp plastic limit
- Wl liquid limit

consistency / relative density
- VS very soft
- S soft
- F firm
- St stiff
- VSt very stiff
- H hard
- Fb friable
- VL very loose
- L loose
- MD medium dense
- D dense
- VD very dense

TETRA TECH COFFEY

Engineering Log - Excavation

		Excavation ID.	***TP-25***
		sheet:	1 of 1
		project no.	***773-CHCGE377712***
client:	***Rolleston Industrial Developments Ltd***	date excavated:	***12 Nov 2024***
principal:	***-***	date completed:	***12 Nov 2024***
project:	***Ryans Road Fast Track***	logged by:	***J.Monk***
location:	***Ryans Road, Yaldhurst, Christchurch***	checked by:	***A.Jordan***

position: Not Specified | surface elevation: Not Specified | pit orientation: N-S | DCP id.: -

equipment type: >10t Excavator | excavation method: - | excavation dimensions: 4.0 m long 0.9 m wide | vane id.: -

excavation information | **material substance**

method	support	penetration (1 2 3)	water	samples & field tests	RL (m)	depth (m)	graphic log	soil group symbol	material description (SOIL NAME: plasticity or particle characteristics, colour, secondary and minor components)	moisture condition	consistency / relative density	vane shear (kPa) ⊕ remoulded ⊙ peak (50 100 150 200)	DCP (blows/100 mm) (2 4 6 8 10)	soil origin, structure and additional observations
E	N		Not Observed			0.0		ML	**SILT**: low plasticity, dark brown, with trace of rootlets.	M				**TOPSOIL**
								SW	**SAND**: fine grained, pale brown, with trace to minor silt. 0.35 to 0.55 m: pale grey-brown 1.1 to 1.3 m: pale grey-brown		MD			**SPRINGSTON**
						1.0								
						2.0								
						3.0		GW	**GRAVEL**: medium to coarse grained, pale grey-brown, with some sand and trace of silt.					
						4.0			Test pit TP-25 terminated at 3.4 m Target stratum					
						5.0								

CDF_0_10_00.4_LIBRARY.GLB rev:CDF_0_10_00.4 2021-09-30 Log_COF EXCAVATION + PSP/DCP_773-CHCGE377712GINT.GPJ <<DrawingFile>> 03/12/2024 10:17

method
- N natural exposure
- X existing excavation
- BH backhoe bucket
- B bulldozer blade
- R ripper
- E excavator
- HT hand tools

support
- N none
- S shoring

penetration
1 2 3 — no resistance ranging to refusal

water
- 10-Oct-12 water level on date shown
- water inflow
- water outflow

samples & field tests
- D disturbed sample
- B bulk disturbed sample
- E environmental sample
- U## undisturbed sample ##mm diameter
- HP hand penetrometer (kPa)
- VS vane shear peak/remouded (kPa)

soil group symbol & material description
based on AS 1726:2017

moisture condition
- D dry
- M moist
- W wet
- S saturated
- Wp plastic limit
- Wl liquid limit

consistency / relative density
- VS very soft
- S soft
- F firm
- St stiff
- VSt very stiff
- H hard
- Fb friable
- VL very loose
- L loose
- MD medium dense
- D dense
- VD very dense

Tonkin+Taylor

BOREHOLE LOG

BOREHOLE No.: **S2-BH01**

Hole Location:

SHEET: 1 OF 2

PROJECT: CIAL - Kōwhai Solar Park Geotechnical		LOCATION: Kowhai Park Stage 2	JOB No.: 1019508.0020
CO-ORDINATES: (NZTM2000)	5183429.94 mN 1561844.81 mE	DRILL TYPE: Fraste CRS XL	HOLE STARTED: 04/09/2023 HOLE FINISHED: 04/09/2023
R.L.:	33.57m	METHOD: Sonic core drilling	DRILLED BY: ProDrill
DATUM:	NZVD2016	DRILL FLUID: WATER	LOGGED BY: EDFA CHECKED: CRB

GEOLOGICAL	METHOD OBSERVATIONS								ENGINEERING DESCRIPTION								
GEOLOGICAL UNIT/ ADDITIONAL OBSERVATIONS	FLUID LOSS (%)	WATER	CASING	CORE RECOVERY (%)	METHOD	TESTS	RL (m)	DEPTH (m)	GRAPHIC LOG	WEATHERING CLASSIFICATION	MOISTURE CLASSIFICATION	CONSISTENCY / DENSITY CLASSIFICATION	ESTIMATED SOIL SHEAR STRENGTH (Su, kPa)	ESTIMATED ROCK COMPRESSIVE STRENGTH (qu, MPa)	DEFECT SPACING (mm)	DESCRIPTION
Topsoil				100	SNC		33	0			M	VS-S				*0.00m:* SILT, trace rootlets; dark brown. Very soft to soft, moist, non-plastic. (TOPSOIL).
												VL				*0.20m:* Fine SAND, minor silt; light brown. Very loose, moist.
				100	SNC			1				VS-S				*0.80m:* SILT, trace sand; light brown mottled grey and orange. Very soft to soft, moist, non-plastic. Sand, fine to medium.
				100	SPT	1/1// 1/1/1/0 **N=3**	32	2								
				100	SNC		31	3				L				*2.20m:* Fine to medium SAND, trace silt; dark brown. Loose, moist, uniformly graded.
												VS-S				*2.60m:* SILT, trace clay; light brown. Very soft to soft, moist, non-plastic.
				91	SPT	1/1// 10/30/10 for 75 mm **N>=50**						VD				*3.15m:* Sandy fine to coarse GRAVEL; light greyish brown. Very dense, moist, well graded. Gravel, sub-rounded to sub-angular; sand, fine to coarse.
				100	SNC		30	4								*4.00m:* Silty fine to coarse GRAVEL, some sand; light greyish brown. Very dense, moist, gap graded. Gravel, sub-rounded to sub-angular.
				100	SPT	9/10// 10/9/10/10 **N=39**	29	5				D				*4.60m:* Sandy fine to coarse GRAVEL, trace silt; light greyish brown. Dense, moist, well graded. Gravel, sub-rounded to sub-angular; sand, fine to coarse.
Springston Formation				100	SNC		28	6								
				67	SPT	3/7// 7/10/9/10 **N=36**	27	7								
				100	SNC		26	8								*7.60 - 8.55m:* Greyish brown.
				100	SPT	18/21// 18/22/10 for 40 mm **N>=50**	25	9								
				100	SNC		24									
				56	SPT	8/10// 8/9/8/10 **N=35**										
				100	SNC											

COMMENTS: Groundwater measured at 11.94 m bgl at 1:35 p.m. 04/09/2023 upon completion. Groundwater measured at 12.05 m bgl at 7:39 a.m 05/09/2023 before casing was removed the next day.

Hole Depth 15.63m

Scale 1:50

Rev.: A

Tonkin+Taylor

BOREHOLE LOG

BOREHOLE No.: **S2-BH01**

Hole Location:

SHEET: 2 OF 2

PROJECT: CIAL - Kōwhai Solar Park Geotechnical		LOCATION: Kowhai Park Stage 2	JOB No.: 1019508.0020
CO-ORDINATES: (NZTM2000)	5183429.94 mN 1561844.81 mE	DRILL TYPE: Fraste CRS XL	HOLE STARTED: 04/09/2023
		METHOD: Sonic core drilling	HOLE FINISHED: 04/09/2023
R.L.:	33.57m		DRILLED BY: ProDrill
DATUM:	NZVD2016	DRILL FLUID: WATER	LOGGED BY: EDFA CHECKED: CRB

GEOLOGICAL	METHOD OBSERVATIONS								ENGINEERING DESCRIPTION								
GEOLOGICAL UNIT/ ADDITIONAL OBSERVATIONS	FLUID LOSS (%)	WATER	CASING	CORE RECOVERY (%)	METHOD	TESTS	RL (m)	DEPTH (m)	GRAPHIC LOG	WEATHERING CLASSIFICATION	MOISTURE CLASSIFICATION	CONSISTENCY / DENSITY CLASSIFICATION	ESTIMATED SOIL SHEAR STRENGTH (Su, kPa)	ESTIMATED ROCK COMPRESSIVE STRENGTH (qu, MPa)	DEFECT SPACING (mm)	DESCRIPTION
Springston Formation		05/09/2023		100	SNC		23	11			M	D				[CONT] *4.60m:* Sandy fine to coarse GRAVEL, trace silt; light greyish brown. Dense, moist, well graded. Gravel, sub-rounded to sub-angular; sand, fine to coarse. *10.60 - 11.30m:* Very dense.
				67	SPT	9/9// 12/11/17/2 for 10 mm **N>=50**						VD				
				100	SNC		22	12								*11.30m:* Sandy fine to coarse GRAVEL, minor cobbles, trace silt; light greyish brown. Very dense, moist, well graded. Gravel, sub-rounded to sub-angular; sand, fine to coarse.
				61	SPT	9/11// 12/15/16/7 for 35 mm **N>=50**	21	13			W					
				100	SNC		20	14								*12.85m:* Fine to coarse GRAVEL, minor sand, trace silt and trace cobbles; light brownish grey. Very dense, wet, well graded. Gravel, sub-rounded to sub-angular; sand, fine to coarse. *14.15 - 14.30m:* Orange brown.
				44	SPT	6/11// 13/11/11/11 **N=46**	19	15								
				100	SNC											*14.30m:* Sandy fine to coarse GRAVEL, minor silt; light greyish brown. Very dense, wet, well graded. Gravel, sub-rounded to sub-angular; sand, fine to coarse.
				58	SPT	13/13// 12/14/15/9 for 50 mm **N>=50**	18	16								
							17	17								15.63m: Target depth
							16	18								
							15	19								
							14									

COMMENTS: Groundwater measured at 11.94 m bgl at 1:35 p.m. 04/09/2023 upon completion. Groundwater measured at 12.05 m bgl at 7:39 a.m 05/09/2023 before casing was removed the next day.

Hole Depth 15.63m

Scale 1:50

Rev.: A

Tonkin+Taylor

CORE PHOTOS

BOREHOLE No.: **S2-BH01**

Hole Location:

PROJECT: CIAL - Kōwhai Solar Park Geotechnical	LOCATION: Kowhai Park Stage 2	JOB No.: 1019508.0020
CO-ORDINATES: 5183429.94 mN (NZTM2000) 1561844.81 mE R.L.: 33.57m DATUM: NZVD2016	DRILL TYPE: Fraste CRS XL METHOD: Sonic core drilling DRILL FLUID: WATER	HOLE STARTED: 04/09/2023 HOLE FINISHED: 04/09/2023 DRILLED BY: ProDrill LOGGED BY: EDFA CHECKED: CRB

0.00-2.65m

2.65-5.65m

Tonkin+Taylor

CORE PHOTOS

BOREHOLE No.: **S2-BH01**

Hole Location:

PROJECT: CIAL - Kōwhai Solar Park Geotechnical	LOCATION: Kowhai Park Stage 2	JOB No.: 1019508.0020
CO-ORDINATES: 5183429.94 mN (NZTM2000) 1561844.81 mE R.L.: 33.57m DATUM: NZVD2016	DRILL TYPE: Fraste CRS XL METHOD: Sonic core drilling DRILL FLUID: WATER	HOLE STARTED: 04/09/2023 HOLE FINISHED: 04/09/2023 DRILLED BY: ProDrill LOGGED BY: EDFA CHECKED: CRB

5.65-8.55m

8.55-11.40m

NZGD ID: BH_206406

Tonkin+Taylor

CORE PHOTOS

BOREHOLE No.: **S2-BH01**

Hole Location:

PROJECT: CIAL - Kōwhai Solar Park Geotechnical	LOCATION: Kowhai Park Stage 2	JOB No.: 1019508.0020
CO-ORDINATES: 5183429.94 mN (NZTM2000) 1561844.81 mE R.L.: 33.57m DATUM: NZVD2016	DRILL TYPE: Fraste CRS XL METHOD: Sonic core drilling DRILL FLUID: WATER	HOLE STARTED: 04/09/2023 HOLE FINISHED: 04/09/2023 DRILLED BY: ProDrill LOGGED BY: EDFA CHECKED: CRB

11.40-14.30m

14.30-15.60m

NZGD ID: BH_206406

Tonkin+Taylor

EXCAVATION LOG

Excavation Id.: **C2-TP12**

SHEET: 1 OF 1

PROJECT: CIAL - Kōwhai Solar Park Geotechnical	LOCATION: Kowhai Park Stage 2	JOB No.: 1019508.0020
CO-ORDINATES: 5183415.20 mN (NZTM2000) 1561168.80 mE	METHOD: Trial pit/trench	EXCAV. STARTED: 15/06/2023
	EQUIPMENT: Yanmar 5.5t excavator	EXCAV. FINISHED: 15/06/2023
R.L.: 37.06m	OPERATOR: Digging-Rite Ltd	LOGGED BY: HATI
DATUM: NZVD2016	DIMENSIONS: 3m by 1m	CHECKED BY: CRB

EXCAVATION TESTS | ENGINEERING DESCRIPTION | GEOLOGICAL

PENETRATION	SUPPORT	WATER	SAMPLES, TESTS	SAMPLES	RL (m)	DEPTH (m)	GRAPHIC LOG	SOIL NAME, PLASTICITY OR PARTICLE SIZE CHARACTERISTICS, COLOUR, SECONDARY AND MINOR COMPONENTS	WEATHERING CLASSIFICATION	MOISTURE CLASSIFICATION	CONSISTENCY / DENSITY CLASSIFICATION	ESTIMATED SOIL SHEAR STRENGTH (Su, kPa)	DEFECTS, STRUCTURE, COMMENTS	UNIT
1 2 3		DRY 15/06/2023	C2_TP12_0.3 @ 0.30m Civil		37	0	TS	*0.00m:* Silty fine to medium SAND; dark brown. Loosely packed, moist, uniformly graded. (TOPSOIL).		M	LP			TSoil
						0.5		*0.30m:* Fine to medium SAND, minor silt; greyish brown. Tightly packed, moist, uniformly graded.			TP			Springston Formation
					36	1.0								
						1.5		*1.50m:* Silty fine to medium SAND; greyish brown mottled reddish brown. Tightly packed, moist, uniformly graded.						
					35	2.0								
						2.5								
						3.0		3m: Target depth						
					34	3.5								

SKETCH / PHOTO:

0.0 - 3.0m:

COMMENTS: [Civil]: PSD; Standard Compaction; Natural Water Content; CBR. Thermal Resistivity (TR) testing: @0.5m In-situ TR test; @1.0m In-situ TR test + TR laboratory test.

Hole Depth 3m

Scale 1:33

Rev.: A

TTNZ_20230310 - Excavation DEV - 3/08/2023 9:25:08 PM - Produced with Core-GS by GeRoc

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EXCAVATION LOG

Excavation Id.: **C2-TP13**

SHEET: 1 OF 1

PROJECT: CIAL - Kōwhai Solar Park Geotechnical	LOCATION: Kowhai Park Stage 2	JOB No.: 1019508.0020
CO-ORDINATES: 5183547.10 mN (NZTM2000) 1561558.40 mE	METHOD: Trial pit/trench	EXCAV. STARTED: 15/06/2023
	EQUIPMENT: Yanmar 5.5t excavator	EXCAV. FINISHED: 15/06/2023
R.L.: 35.53m	OPERATOR: Digging-Rite Ltd	LOGGED BY: HATI
DATUM: NZVD2016	DIMENSIONS: 3m by 1m	CHECKED BY: CRB

EXCAVATION TESTS | ENGINEERING DESCRIPTION | GEOLOGICAL

PENETRATION	SUPPORT	WATER	SAMPLES, TESTS	SAMPLES	RL (m)	DEPTH (m)	GRAPHIC LOG	SOIL NAME, PLASTICITY OR PARTICLE SIZE CHARACTERISTICS, COLOUR, SECONDARY AND MINOR COMPONENTS	WEATHERING CLASSIFICATION	MOISTURE CLASSIFICATION	CONSISTENCY / DENSITY CLASSIFICATION	ESTIMATED SOIL SHEAR STRENGTH (Su, kPa)	DEFECTS, STRUCTURE, COMMENTS	UNIT
1 2 3		DRY 15/06/2023	C2_TP13_0.3 @ 0.30m Civil		35	0.5	TS	*0.00m:* Silty fine to medium SAND, trace rootlets; dark brown. Loosely packed, moist, uniformly graded. (TOPSOIL).		M	LP	VS S F St VSt H 12 25 50 100 200		TSoil
								0.30m: Fine to medium SAND, minor silt; greyish brown. Tightly packed, moist, uniformly graded.			TP			
					34	1.0		*1.00m:* Silty fine to medium SAND; greyish brown mottled reddish brown. Tightly packed, moist, uniformly graded.						Springston Formation
						1.5								
					33	2.0		*2.00m:* Fine to medium SAND, some silt; greyish brown mottled reddish brown. Tightly packed, moist, uniformly graded.						
						2.5								
					32	3.0		3m: Target depth						
						3.5								

SKETCH / PHOTO:

0.0 - 3.0m:

COMMENTS: [Civil]: PSD; Standard Compaction; Natural Water Content; CBR. Thermal Resistivity (TR) testing: @0.5m In-situ TR test; @1.0m In-situ TR test + TR laboratory test.

Hole Depth 3m

Scale 1:33

Rev.: A

Tonkin+Taylor

EXCAVATION LOG

Excavation Id.: **S2_TP01**

SHEET: 1 OF 1

PROJECT: CIAL - Kōwhai Solar Park Geotechnical	LOCATION: Kowhai Park Stage 2		JOB No.: 1019508.0020
CO-ORDINATES: (NZTM2000) 5183452.20 mN 1561800.00 mE	METHOD: Trial pit/trench	EQUIPMENT: Yanmar 5.5t excavator	EXCAV. STARTED: 28/08/2023
			EXCAV. FINISHED: 28/08/2023
R.L.: 33.82m	OPERATOR: Digging-Rite Ltd		LOGGED BY: HATI
DATUM: NZVD2016	DIMENSIONS: 3m by 1m		CHECKED BY: CRB

EXCAVATION TESTS | ENGINEERING DESCRIPTION | GEOLOGICAL

PENETRATION	SUPPORT	WATER	SAMPLES, TESTS	SAMPLES	RL (m)	DEPTH (m)	GRAPHIC LOG	SOIL NAME, PLASTICITY OR PARTICLE SIZE CHARACTERISTICS, COLOUR, SECONDARY AND MINOR COMPONENTS	WEATHERING CLASSIFICATION	MOISTURE CLASSIFICATION	CONSISTENCY / DENSITY CLASSIFICATION	ESTIMATED SOIL SHEAR STRENGTH (Su, kPa)	DEFECTS, STRUCTURE, COMMENTS	UNIT
1 2 3			S2_TP01_hills @ 0.00m Suite 2 S2_TP01_0.3 @ 0.30m Civil S2_TP01_hills @ 0.50m Suite 2 S2_TP01_hills @ 1.00m Suite 2		33 32 31 30	0.5 1.0 1.5 2.0 2.5 3.0 3.5	TS	*0.00m:* Silty fine to medium SAND, trace rootlets; dark brown. Very loose, moist, poorly graded. Organics, wood fragments (partially decomposed). (TOPSOIL). *0.30m:* Fine to medium SAND, trace silt; greyish brown. Very loose, moist, uniformly graded. *0.80m:* Silty fine to medium SAND; greyish brown. Very loose, moist, uniformly graded. *1.10m:* Fine to medium SAND, some silt; greyish brown. Very loose, moist, uniformly graded. 3m: Target depth		M	VL	VS 12 S 25 F 50 St 100 VSt 200 H		TSoil Springston Formation

DRY 28/08/2023

SKETCH / PHOTO:

COMMENTS: [Civil]: PSD; Standard Compaction; Natural Water Content; CBR. [Suite 2]: Acid Soluble Sulphate and Sulphate Content; Water Soluble Sulphate as SO4 and SO3; Water Soluble Chloride; Baumann-Gully Acidity; pH; Electrical Conductivity; Carbonate.Thermal Resistivity (TR) testing: @0.5m In-situ TR test; @1.0m In-situ TR test + TR laboratory test. Density correlated from S2_DPSH01.

Hole Depth 3m

Scale 1:33

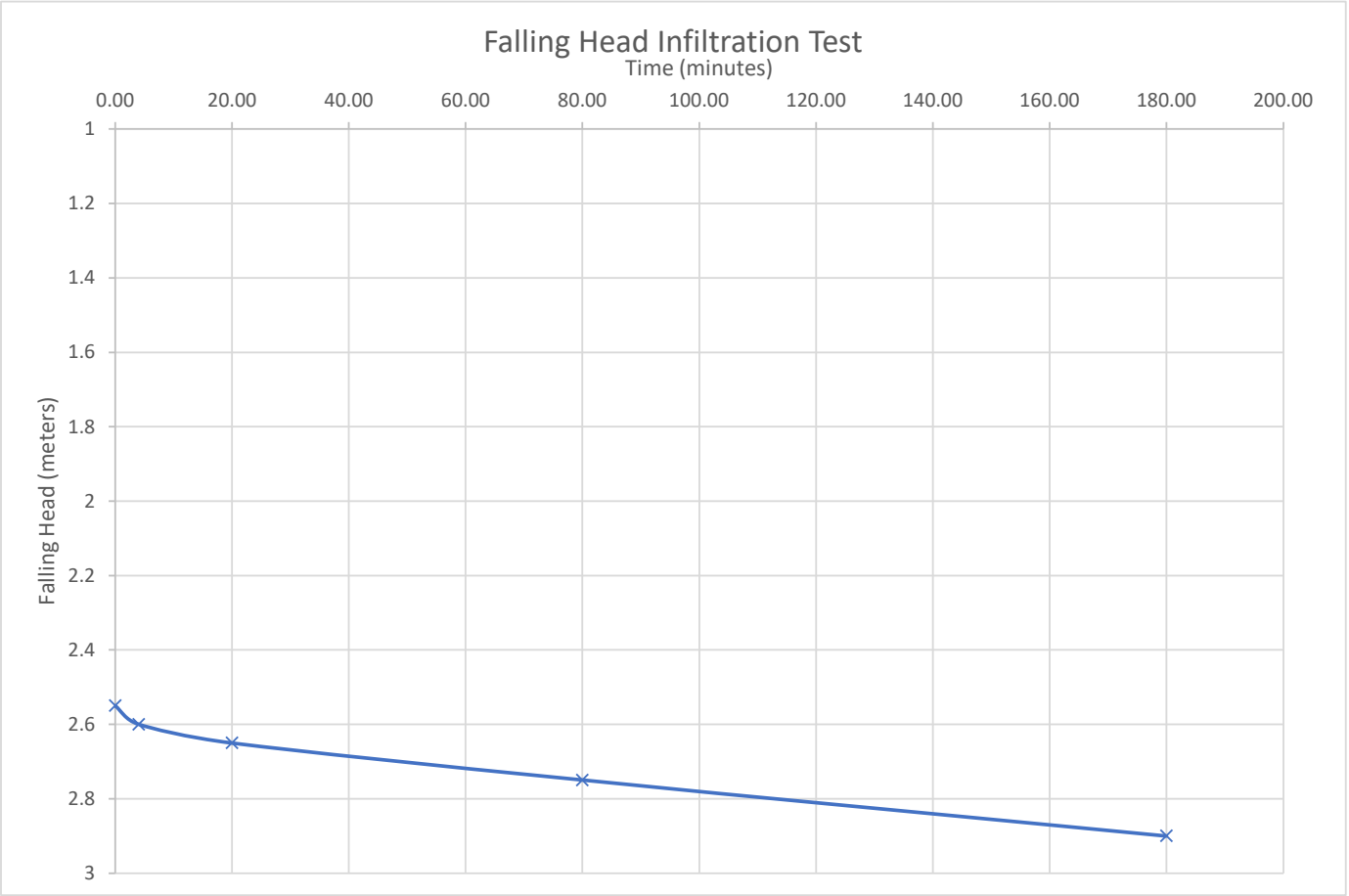
Rev.: A

NZGD ID: TP_206404

APPENDIX C: SOAKAGE TESTING

TP-01B

Time (minutes)	Time (hours)	depth from top (m)
0.00	0.00	2.55
4.00	0.07	2.6
20.00	0.33	2.65
80.00	1.33	2.75
180.00	3.00	2.9



Average expected infiltration rate	
125	mm/hr
3.47E-05	m/s

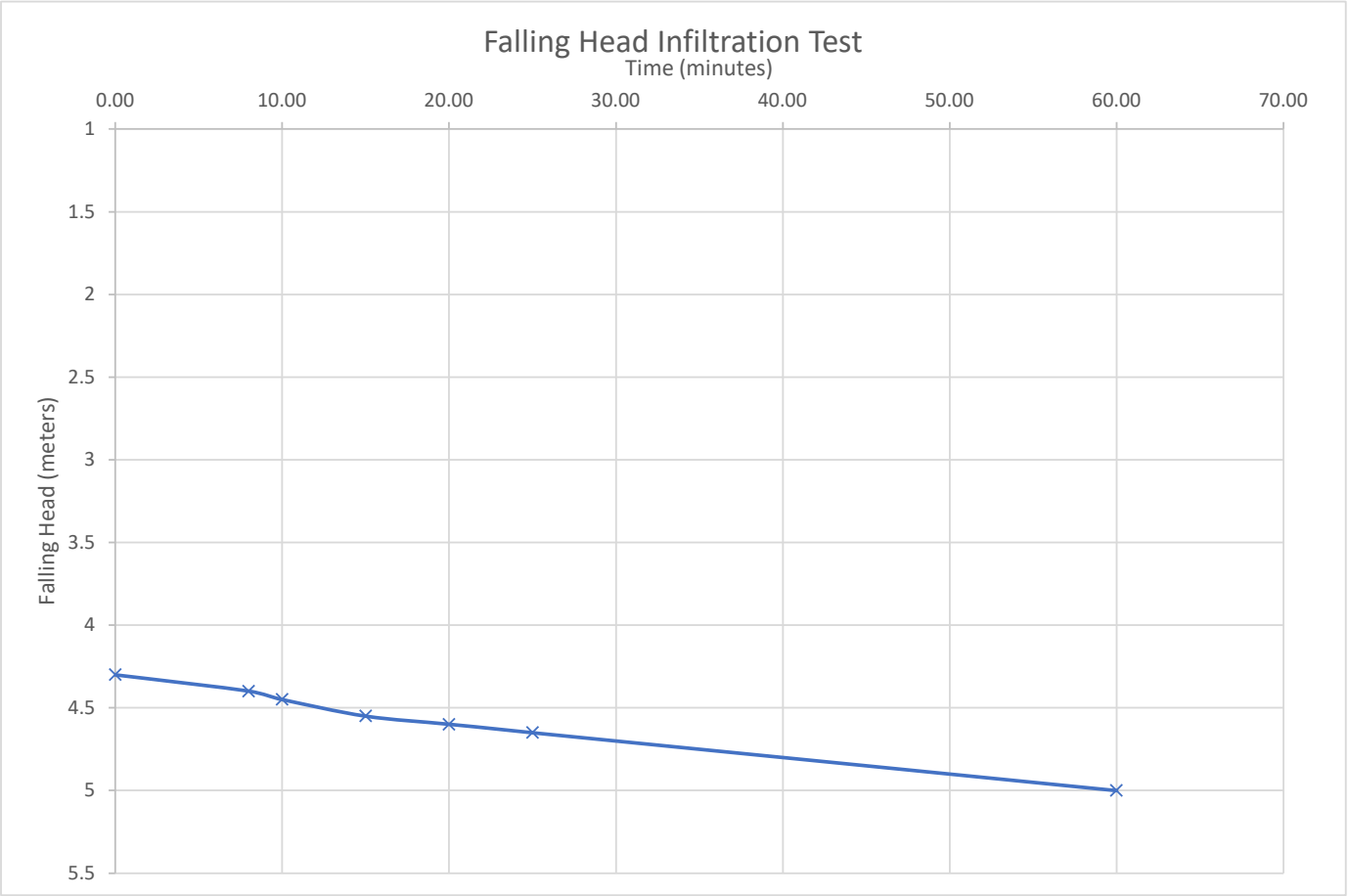
Completed: J. Monk
Ref: 773-CHCGE377712
Name: Ryans Rd, Yaldhurst
Date tested: 13/11/2024

gravel depth (mbgl): 2.8
depth of hole (mbgl): 3.2
depth into gravel (m) 0.4

TETRA TECH COFFEY

TP-04B

Time (minutes)	Time (hours)	depth from top (m)
0.00	0.00	4.3
8.00	0.13	4.4
10.00	0.17	4.45
15.00	0.25	4.55
20.00	0.33	4.6
25.00	0.42	4.65
60.00	1.00	5.0



Average expected infiltration rate	
600	mm/hr
1.67E-04	m/s

Completed: J. Monk
Ref: 773-CHCGE377712
Name: Ryans Rd, Yaldhurst
Date tested: 13/11/2024

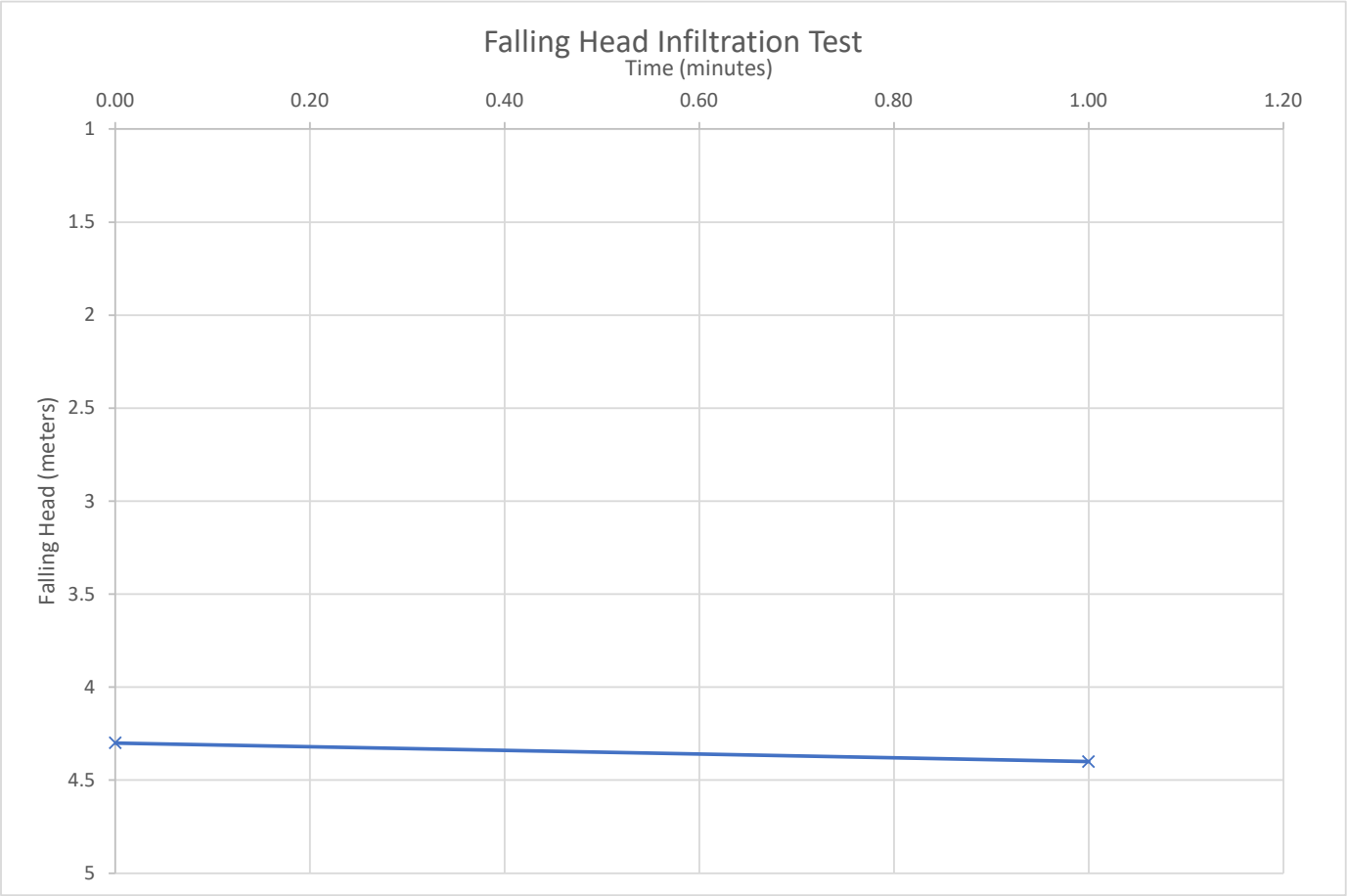
gravel depth (mbgl): 3.4
depth of hole (mbgl): 5.0
depth into gravel (m) 1.6

TETRA TECH COFFEY

TP-20

Time (minutes)	Time (hours)	depth from top (m)
0.00	0.00	4.3
1.00	0.02	4.4

Average expected infiltration rate	
6000	mm/hr
1.67E-03	m/s



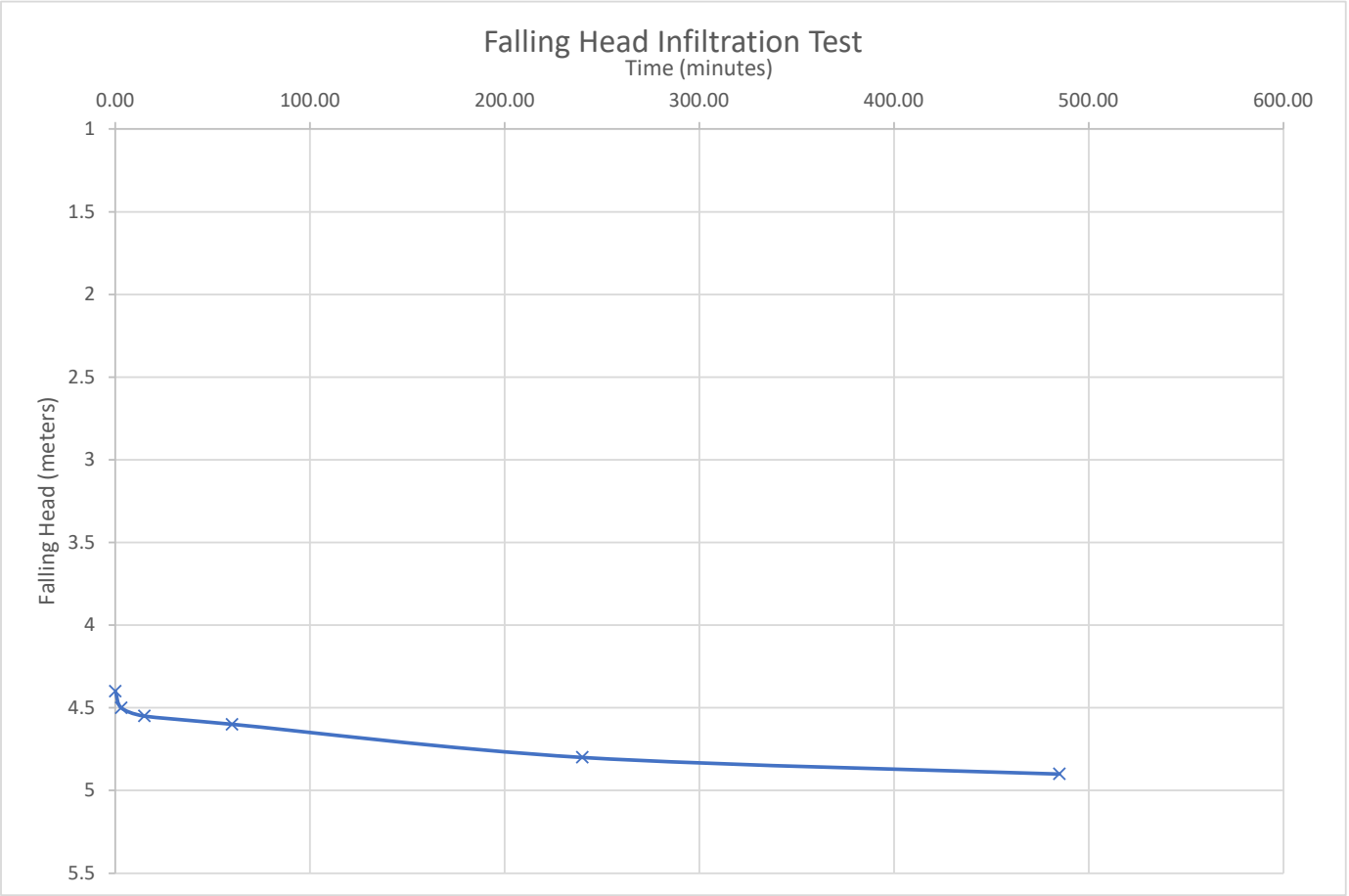
Completed: J. Monk
Ref: 773-CHCGE377712
Name: Ryans Rd, Yaldhurst
Date tested: 13/11/2024

gravel depth (mbgl): 2.2
depth of hole (mbgl): 3.5
depth into gravel (m) 1.3

TETRA TECH COFFEY

TP-24B

Time (minutes)	Time (hours)	depth from top (m)
0.00	0.00	4.4
3.00	0.05	4.5
15.00		4.55
60.00		4.6
240.00		4.8
485.00		4.9



Average expected infiltration rate	
50	mm/hr
1.39E-05	m/s

Completed: J. Monk
Ref: 773-CHCGE377712
Name: Ryans Rd, Yaldhurst
Date tested: 13/11/2024

gravel depth (mbgl): 4.8
depth of hole (mbgl): 5.4
depth into gravel (m) 0.6

TETRA TECH COFFEY

APPENDIX D: STATEMENT OF PROFESSIONAL OPINION

Statement of Professional Opinion on the Suitability of Land for Subdivision

(Appendix I to the Infrastructure Design Standard)

Issued by: *Tetra Tech Coffey (NZ) Limited*
(Geotechnical engineering firm or suitably qualified Geoprofessional)

To: *Christchurch City Council*
(Territorial authority)

To be supplied to: *Carter Group Limited*
(Owner/Developer)

In respect of: *Proposed industrial subdivision*
(Description of proposed infrastructure/land development)

At: *104 Ryans Road, Yaldhurst – Pt Lot 1 DP 2837 PT Lot 3 DP 22679, Lot 4 DP 22679*
(Address)

I *(Geoprofessional)* *Andrew Jordan* on behalf of *(Geotechnical engineering firm)* *Tetra Tech Coffey (NZ) Limited*

hereby confirm:

1. I am a suitably qualified and experienced Geoprofessional employed by *Tetra Tech Coffey (NZ) Limited* and the geotechnical firm named above was retained by the owner/developer as the Geoprofessional on the above proposed development.

2. The geotechnical assessment report, dated *7 February 2025* has been carried out in accordance with the Ministry of Building, Innovation and Employment *Part D - Guidelines for geotechnical investigation and assessment of subdivisions in the Canterbury region* and the Christchurch City Council *Infrastructure Design Standard – Part 4: Geotechnical requirements* and includes:
   (i) Details of and the results of the site investigations.
   (ii) A liquefaction and lateral spread assessment.
   (iii) An assessment of rockfall and slippage, including hazards resulting from seismic activity.
   (iv) An assessment of the slope stability and ground bearing capacity confirming the location and appropriateness of building sites.
   (v) Recommendations proposing measures to avoid, remedy or mitigate any potential hazards on the land subject to the application, in accordance with the provisions of Section 106 of the Resource Management Act 1991.

3. In my professional opinion, not to be construed as a guarantee, I consider that Council is justified in granting consent incorporating the following conditions:
   That Lot specific geotechnical reports are undertaken for each of the proposed new commercial lots. These reports should target the specific design requirements for the proposed structures at the site.

4. This professional opinion is furnished to the territorial authority and the owner/developer for their purposes alone, on the express condition that it will not be relied upon by any other person and does not remove the necessity for the normal inspection of foundation conditions at the time of erection of any building. It is limited to those items referred to in clause 2 only.

5. This certificate shall be read in conjunction with the geotechnical report referred to in clause 2 above, and shall not be copied or reproduced except in conjunction with the full geotechnical completion report.

6. Liability under this statement accrues to the geotechnical firm only and no liability shall accrue to the individual completing this statement.

7. The geotechnical engineering firm issuing this statement holds a current policy of professional indemnity insurance of no less than $ *500,000*

   (Minimum amount of insurance shall be commensurate with the current amounts recommended by IPENZ, ACENZ, NZTA, INGENIUM.)

.....

(Signature of Engineer, for and on behalf of *Tetra Tech Coffey)*

Date: *7 February 2025*

Qualifications and experience:

BSc, CMEngNZ, PEngGeol, 15 years of experience

This form is to accompany Form 9 – Resource Management Act 1991 (Application for a Resource Consent (Subdivision))