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Telegraph & Greendale Roads, Darfield

Prepared for Darfield Estates GP Ltd

Job No.: 2510105

Date: 29 April 2025

Revision: 02

Natural Hazard Assessment Report for Proposed Subdivision

Quality Control

Title	Natural Hazard Assessment Report for Proposed Subdivision – Telegraph & Greendale Roads, Darfield
Client	Darfield Estates GP Ltd
Filename	2510105 REP001 GEO S106 2025-04-24 Telegraph & Greendale Roads, Darfield Rev 01
Revision	02
Status	Final
Date	29 April 2025
Project Number	2510105

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1 Introduction

Kirk Roberts Consulting (Kirk Roberts) has been engaged by Darfield Estates GP Ltd (the client) to undertake site-specific investigations, assessments, and reporting for the Telegraph & Greendale Roads, Darfield (the site).

The purpose of this investigation is to assess the geotechnical suitability of the land for the proposed subdivision and prepare this report to support a Resource Consent application to subdivide the subject property into 445 new allotments.

This report presents the results of our desktop study and site-specific shallow geotechnical investigations that were undertaken by Kirk Roberts on the 31st of March 2025 and 04th of April 2025.

The following report covers the analysis of the soil properties and a discussion of the following issues:

- Review of topographical and geological information;
- Geotechnical conditions encountered across the site;
- Risk of material damage due to natural hazards; and
- Suitability to subdivide the site in accordance with Section 106 of the Resource Management Act (RMA) 1991.

Note:

- Risk mitigation measures are limited only to those that would be warranted at the time of subdivision.
- The layout and nature of the future residential dwellings within the proposed subdivision are not confirmed at this stage. This report should not be used to support any future application for foundation design or Building Consent unless supported by further site-specific geotechnical investigation, assessment and reporting.
- This report assesses the land only within the proposed development area, not the condition of any structures or retaining walls at the site.

2 Reporting Requirements

The scope of the report is governed by the need to address requirements set out in the following documents:

- Resource Management Act (1991): S106 Natural Hazards;
- Ministry for the Environment (MfE) Resource Legislation Amendments 2017 – Fact sheet 10 New matters to consider for resource consents of designations;
- Ministry of Business, Innovation and Employment (MBIE) Guidelines[1]: "*Repairing and Rebuilding Houses Affected by the Canterbury Earthquakes; Part D – Subdivisions*";
- Selwyn District Plan / B3.1 Natural Hazards[2].

3 Site Description

The site comprises one parcel of land, being summarised in Table 1 below.

Table 1: Site Identification[3]

Address	Legal Description	Area
Telegraph & Greendale Roads, Darfield	Part of Rural Section 25013, Rural Section 28136, Part Rural Section 22945 and Part Rural Section 25014	~ 40 ha

[1] Ministry of Business Innovation and Employment (MBIE) Guidance: Repairing and rebuilding houses affected by the Canterbury earthquakes, Version 3, December 2012

[2] Selwyn District Plan, Natural Hazards –https://eplan.selwyn.govt.nz/eplan/#Rules/0/13/1/2541/0

[3] Environment Canterbury – Canterbury Maps Viewer, data retrieved on in April 2025 from https://mapviewer.canterburymaps.govt.nz/

A site walkover was undertaken by a Kirk Roberts' technician at the time of the geotechnical investigation and the following observations were noted:

- The site is generally flat and accessible via Telegraph Road to the northeast and Greendale Road to the southwest.
- The site is enclosed by a rural timber post and steel fence, separating the paddocks with tree fence and farm gates. It is bordered by Telegraph Road to northeast, Greendale Road to west, residential lots to the northeast and neighbouring paddocks on all other boundaries.
- A small drain of approximately 1.3 m wide and 0.5 m deep runs along the western boundary of the site. Water flows north-south direction and is circa 300 mm deep.
- The Hawkins River is located approximately 2.8 km southwest of the site.
- Refer to Figure 1.



Figure 1: Approximate site location (source: Canterbury Maps[3], 2025)

4 Proposed Development

Kirk Roberts have been provided with a proposed subdivision plan prepared by Survus (ref. 16126, dwg. SC-03, rev. F, dated 21/02/2025). The proposed subdivision plan indicates the site is to be subdivided into 445 new allotments, roads and a recreation area. No plans have been provided for future dwellings on the proposed new lots.

Refer to Appendix A for the proposed subdivision plan.

Once the nature, layout and design requirements of any future developments within the proposed new lots are known, site-specific investigation and reporting will be required for each new development to advise on the geotechnical requirements in order to support the Building Consent applications.

5 Environmental Review

5.1 Environment Canterbury (ECan) Listed Land Use Register (LLUR)

The LLUR[4] indicates that the land area is too large to generate a statement.

Further assessment of site-specific environmental issues is beyond the scope of this report.

5.2 Flood Risk Assessment

We have accessed the Selwyn District Council Flood Map[5] which shows the 200-year and 500-year flood hazard models. The models indicate areas across the western part of the site is at low risk of inundation and the eastern part of the site is at very low risk of inundation from the 200-year and 500-year Annual Recurrence Interval (ARI) models. This risk is < 0.2 m and 0.2 – 0.5 m in depth. Refer to Figure 2 and Figure 3 below.

Further assessment of site-specific flood risk issues is beyond the scope of this report.

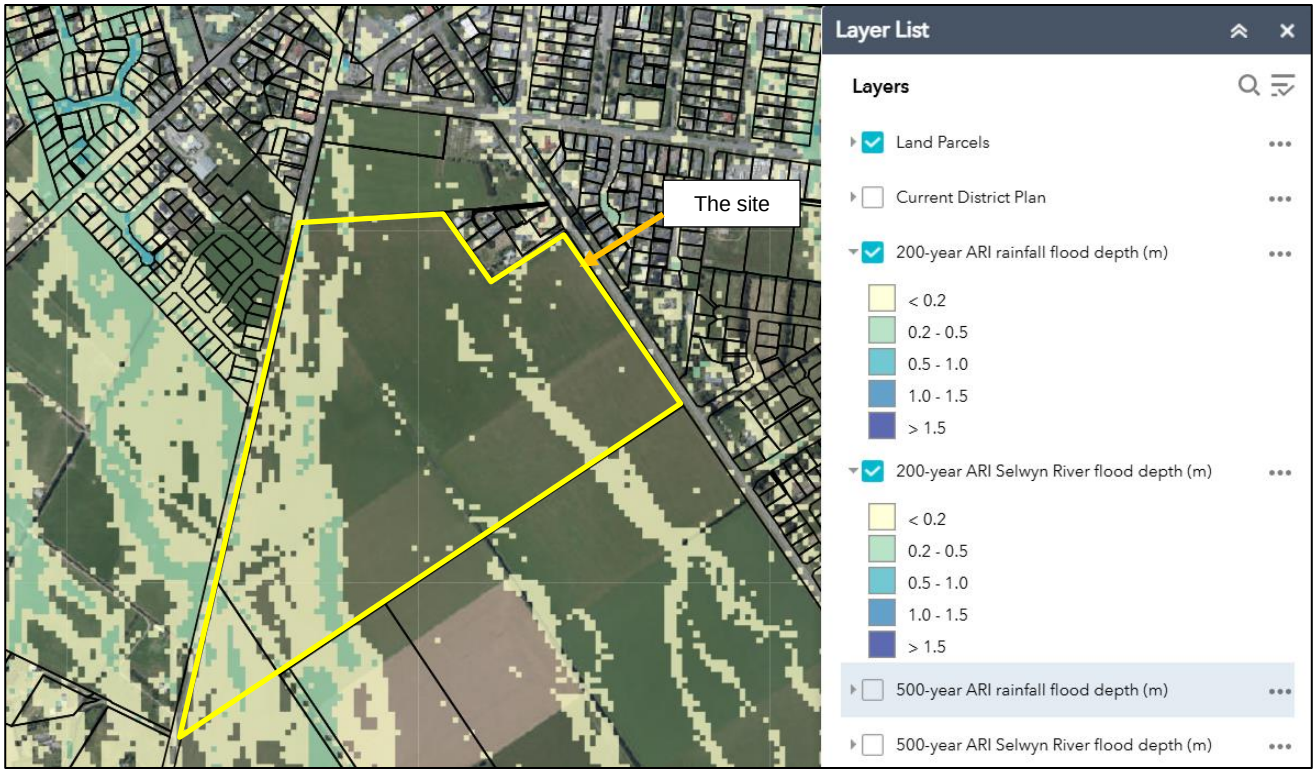


Figure 2: 200-year Annual Recurrence Interval (ARI) models (Source: Selwyn District Council Flood Map[5])

[4] Environmental Canterbury, Listed Land Use Register (LLUR), data retrieved in April 2025 from https://llur.ecan.govt.nz/home

[5] Selwyn District Council Flood Map – data retrieved in April 2025 from https://apps.canterburymaps.govt.nz/SelwynNaturalHazards/



Figure 3 : 500-year Annual Recurrence Interval (ARI) models (Source: Selwyn District Council Flood Map[5])

6 GNS Data

6.1 Published Geology

We have reviewed the data published by GNS Science on the New Zealand Geology Web Map[6] for the published subsurface geology beneath the site. This is summarised in Table 2.

Table 2: Published geology.

Geological group	Geological sub-group	Geological age	Description
Late Pleistocene sediments	Late Pleistocene river deposits	0.012 – 0.024 million years	Unweathered, brownish-grey, variable mix of gravels/sand/silt/clay in low river terraces; locally up to 2m silt (?loess) cap

These descriptions were generally confirmed by the lithology encountered during the geotechnical investigations.

6.2 Faults

We have searched GNS' Active Faults Database[7] and reviewed the Canterbury Maps Viewer[3] to identify if there are any known active faults in the locality.

The closest GNS mapped active fault trace is the Hororata Fault located approximately 6.5 km northwest of the site. Additionally, the Greendale Fault is located approximately 12 km south of the site.

[6] GNS Science – New Zealand Geology Web Map, date retrieved in April 2025 from http://data.gns.cri.nz/geology/

[7] Geological and Nuclear Sciences – Active Faults Database, data retrieved in April 2025 from https://data.gns.cri.nz/af/

Therefore, our advice defaults to the GNS' Active Faults Database and the Ministry for the Environment[8] (MfE) planning advice. The site is located outside the minimum 20 m fault avoidance zone recommended by the MfE.

7 Soil Investigation

7.1 Geotechnical Database Review

To supplement Kirk Robert's geotechnical investigation, a review of the New Zealand Geotechnical Database[9] (NZGD) has been undertaken.

The review uncovered two hand-augur and Scala penetrometer tests (HA_145609 and HA _169761) within approximately 100 m near the northeast corner and 200 m west of the site, respectively. The tests generally encountered gravel from below the topsoil at 0.4 m below ground level (bgl).

The well (L35/0170) listed on Canterbury Maps Viewer[3] is located approximately 1.2 km north of the site, encountered gravel/sandy gravel from 0.3 m bgl to at least 100 m bgl where the well ends.

Refer to Appendix B.

7.2 Geotechnical Investigation - Kirk Roberts, March & April 2025

A geotechnical investigation was undertaken by Kirk Roberts on the 31th of March 2025 and 04th of April 2025, consisting of forty hand-auger boreholes (HA-01 to HA-40) with associated Scala penetrometer tests (SP-01 to SP-40) to a target depth of 3.0 m bgl or effective refusal. Testing was completed to assess the near-surface soil profile, and the depth to groundwater table.

7.3 Investigation Summary

Geotechnical investigation plans of the assessed exploratory holes are presented in Appendix C. A summary of geotechnical investigations is presented in Table 3 below.

Table 3: Summary of investigations

Investigation	Test type/code	Depth of test (m bgl)	Comments
Kirk Roberts, April 2025	Hand-auger boreholes (HA-01 to HA-40)	0.5 – 0.8	Refusal on Gravels
	Scala Penetrometers (SP-01 to SP-40)	0.6 – 0.9	Refusal on Gravels

7.4 Soil profile – Site-Specific Shallow Investigation

Subsurface ground conditions encountered in the exploratory holes are summarised below. For the shallow test locations and a full detailed description of the subsoil encountered on site, reference should be made to the appended borehole logs in Appendix C. For this report, subsoil conditions on the site have been interpolated between the hand-auger boreholes and it must be accepted that soil conditions can and do vary between borehole positions.

The hand-auger test holes indicate a soil profile consisting of topsoil to 0.3 – 0.4 m bgl (below ground level), over silt/gravely silt down to at least 0.4 – 0.8 m bgl where the tests terminated due to refusal on gravels.

The Scala penetrometer tests (SP-01 – SP-40) generally indicate an index geotechnical ultimate bearing [10] (GUBC) of 300 kPa at 0.4 – 0.5 m bgl, but up to 0.8 m bgl at some locations.

Refer to Appendix C to the attached shallow soil test locations and test results.

[8] Ministry for the Environment. Planning for Development of Land on or Close to Active Faults: A Guideline to Assist Resource Management Planners in New Zealand (Published July 2003).

[9] New Zealand Geotechnical Database (NZGD), data retrieved in April 2025 from https://www.nzgd.org.nz/Default.aspx

[10] The inferred bearing capacity is based on Scala penetrometer tests and have been estimated using the procedure presented by M.J. Stockwell in the paper '*Determination of allowable bearing pressure under small structures (June 1977)*'.

7.5 Groundwater Table

Groundwater was not encountered during the Kirk Roberts shallow investigation in April 2025.

Other groundwater records from nearby wells shown on the Canterbury Maps Viewer[3] indicates the depth to groundwater is at least 50 m bgl.

7.6 Soil Profile Summary

Table 4 below provides a summary of the inferred subsurface soil profile based and site-specific exploratory investigations.

Table 4: Simplified Soil Profile

Top of layer (m bgl)	Description	Density
0.0	Topsoil	-
0.3 – 0.4	SILT/Gravelly SILT	Firm to Stiff
0.4 – 0.8	Refusal/ Inferred Gravel	Very Dense

8 Seismic Assessment

8.1 Importance Level

The future residential developments (following the subdivision) are considered as an Importance Level 2 (IL2) as defined by the NZS 1170.0:2002.

8.2 Ultimate and Serviceability Limit States – NZS 1170.0

The New Zealand design loads code NZS 1170.0:2002 defines two design conditions which need to be assessed for the purpose of liquefaction assessment.

- ULS - Ultimate Limit State is concerned with ground damage associated with a 500-year earthquake event, and all buildings shall be designed to avoid collapse and potential loss of life.
- SLS - Serviceability Limit State is concerned with ground damage associated with smaller earthquakes with a return period of 25 years. Buildings and their non-structural components are designed to withstand permanent damage for a 25-year event.

8.3 Area-Wide Liquefaction Hazard Assessment

Geotech Consulting Ltd undertook a liquefaction susceptibility study[11] to define areas of liquefaction susceptibility across the Selwyn District. The study mapped Selwyn District into four zones describing different levels of liquefaction potential (being Zone 1a with moderate liquefaction potential and Zone 3 with nil to extremely low liquefaction potential).

The site has been classified as ''*Zone 2*', which indicates a '*Zone of very low potential – areas of alluvium older than Holocene age. Very small risk of liquefaction of local, isolated areas*'.

8.4 Liquefaction Triggering Criteria

Not all soils are susceptible to liquefaction. Generally, for liquefaction to occur, three preconditions need to be met[12]:

- Geologically young (less than 10,000 years old), loose sediments, that are;
- Fine-grained and non-cohesive (coarse silts and fine sands), and;
- Saturated (below the water table).

If all three of these preconditions are met, then an assessment of the liquefaction hazard is required. Given the following:

[11] Yetton & McCahon (2006): *Earthquake Hazard Assessment for Selwyn District*, Environment Canterbury, Report No. U06/7

[12] Saunders, W. S. A., Berryman, K. R. 2012. "*Just add water: when should liquefaction be considerede in land use planning?*", GNS Science Miscellaneous Series 47. 15p.

- The soils at the site are expected to be "Late Pleistocene Sediments" (>12,000 years old); however
- The site is underlain by gravel from around 0.4 – 0.8 m bgl and is expected to extend to at least 100 m bgl and;
- The water table is expected to be at least 50 m bgl.

Based on the above, it is our professional opinion that the risk of liquefaction at the site is considered to be low.

8.5 Site-Specific Liquefaction Hazard Assessment

Section 16.2 of MBIE's guidelines[1] require appropriate geotechnical investigations be carried out to enable the ground forming materials to at least 15 m depth to be characterised, unless the ground is known to be of acceptable quality from lesser depths, for example in areas known to be underlain by competent natural gravels and/or deep groundwater profiles, or in hillside areas.

The results of the on-site shallow test holes, along with the nearby wells sourced from ECan[3] database, and nearby tests sourced from NZGD[9], provide satisfactory evidence that the nature of the ground forming materials comprises competent soils to at least 15 m bgl. Gravels are of very low vulnerability to liquefaction.

We therefore consider that the site is underlain by a stable, thick crust layer that is not likely to be at risk of liquefaction in a future large earthquake event. This crust layer is of sufficient thickness to mitigate potential effects of deep-seated liquefaction from impacting the ground surface and proposed developments.

Based on the above, a deep geotechnical investigation is not required to assess the site's susceptibility to liquefaction and accordingly not warranted to support this subdivision proposal. It is considered that the site will perform in accordance with the requirements for a **Technical Category 1 (TC1)**[13] land performance. This implies that the site is likely to be susceptible to less than 15 mm settlement in a Serviceability Limit State (SLS) event and 25 mm settlement in an Ultimate Limit State (ULS) event.

8.6 Lateral Spread

Lateral spread risk has been assessed according to site and ground conditions, as well as proximity to significant waterways or steep changes in ground level. The subject property is currently flat and level and not located in close proximity to any major waterways, which was confirmed through our desktop review and site walkover on 31/03/2025 and 04/04/2025.

Considering the above, it is our professional opinion that the site is not susceptible to lateral spreading in terms of both global lateral movement and lateral stretch.

[13] Technical Category 1 (TC1, grey) means that future land damage from liquefaction is unlikely, and ground settlements are expected to be within normally accepted tolerances. Standard foundations (NZS 3604) are acceptable subject to shallow geotechnical investigation.

9 NATURAL HAZARD ASSESSMENT

9.1 RMA 1991, S106 Assessment

A suitability assessment of the site for subdivision has been carried out in accordance with Section 106 of the Resource Management Act (RMA) 1991 and the Resource Legislation Amendments 2017 – Fact Sheet 10.

Our assessment is presented in Table 5 and is based on observations and desktop review of the subject property and experience of ground conditions within this area of Canterbury.

Table 5: Assessment of hazards and their risk to new subdivision development

Hazard	Potential Susceptibility	
	Risk - Current	Risk - Post Development
Falling Debris	The site has a flat topography and is not near any hills or rock outcrops. As such, the site is not at risk of material damage due to falling debris.	
Volcanic and Geothermal Activity	The GNS database does not identify any active volcanoes within the South Island. Therefore, material damage arising from volcanic and geothermal activities is unlikely.	
Landslip	The site is generally flat. There are no steep cliffs onsite or abrupt changes in elevation. Therefore, the site is not at risk of landslip resulting from slope instability.	
Inundation	The risk of inundation from liquefaction not likely. The site is at low risk of inundation.	The current risk of inundation is expected to be mitigated through the appropriate subdivision stormwater design and achieving appropriate finished floor levels. Stormwater concentrations from the roads, roofs, roads, driveways and hardstands should be discharged to an appropriately designed stormwater discharge system.
Subsidence	Given the encountered ground conditions and assessed TC1 categorisation, the site is considered susceptible to nil/low liquefaction settlement. The ground conditions may be susceptible to minor static settlement. We did not identify any areas of deep uncontrolled fill, organic soils, or peat in the subsoil tests, although it is conceivable that there could still be areas of shallow unidentified fill from historical activities that were not discovered.	Any future development will likely comprise the construction of residential dwellings and the likely degree of static settlement will not adversely affect this type of structure. The extent of any unidentified fill (if ever occurred) would typically be relatively small and would be addressed at the time of subdivision earthworks construction. Any filling exceeding 400mm above existing ground levels should only be undertaken with input from a suitably qualified Geotechnical Engineer.
Erosion & sedimentation	Due to the location, geology and topography of the site and surrounding land, it is not likely to be subject to material damage due to erosion and sedimentation. The site is at low risk of inundation from the 200 and 500-year ARI mapping. These areas are likely to be subject to some degree of erosion and sedimentation risk during the respective flood events. Some erosion could occur along the alignment of the small drain along the western boundary.	The likely current risk of erosion and sedimentation will not be exacerbated as a result of the proposed subdivision. It is expected that the small drain along the western boundary will be re-aligned/removed as part of the design and construction works. Fine grained silt soils have the potential to erode if exposed for long periods of inundation. However, vegetative cover should prevent this from occurring. All reasonable attempts should be made to protect exposed soils from rainfall and run-off by implementing an erosion and sediment control plan in accordance with the Council's requirements. The risk of erosion and sedimentation (if any) should be mitigation following the subdivision design and construction.

Hazard	Potential Susceptibility	
	Risk - Current	Risk - Post Development
Earthquake	The results of our qualitative liquefaction assessment indicate that TC1 equivalent land classification is appropriate. Therefore, the site is considered to have nil to minor land damage from liquefaction in future significant earthquake events.	The proposed subdivision is unlikely to worsen the current earthquake hazard at the site. The risk of earthquake damage is nil to low and can be mitigated by following the foundation requirements set by MBIE guidelines[1] for TC1 land.
Fire	The site is serviced by the Darfield Fire Brigade.	Detailed fire risk assessment is beyond the scope of this report.
Wind	The site is not located near cliffs or a sudden change in elevation. The subdivision will not exacerbate the risk of material damage due to wind.	Detailed wind risk assessment is beyond the scope of this report.
Tsunami	The site is located outside the Canterbury Tsunami Evacuation Zones[14]. Therefore, the risk of material damage from a Tsunami is unlikely.	Detailed tsunami risk assessment is beyond the scope of this report.
Drought	Detailed drought risk assessment is beyond the scope of this report.	

9.2 Natural Hazards Assessment Summary

Based on the above observed or predicted geotechnical hazards, as shown in Table 5, we conclude there is no reason to refuse subdivision consent in clause 106 (a) of the RMA 1991, based on natural hazards.

Any proposed development will have to comply with relevant legislation, codes and standards. The potential location for a future dwelling on the proposed lots is unlikely to require significant fill or cut earthworks. However, where earthworks are required, they are likely to expose fine grained soil that will be susceptible to erosion if left exposed to weathering for prolonged periods of time.

Erosion by wind, precipitation or inadequately discharged stormwater run-off should be controlled through best construction practices. Provided these best practice methodologies are implemented during construction, it is our opinion that the development of the site will not result in the acceleration or worsening of these hazards.

Section 106 1(c) is not relevant to a geotechnical appraisal and therefore has not been considered in this report.

Providing the recommendations of this report are followed, then it is our opinion that the site will be geotechnically suitable for the proposed residential subdivision. A '*Statement of Professional Opinion on the Suitability of Land for Subdivision*' is provided in Appendix D.

10 RECOMMENDATIONS

10.1 Subdivision Consent Conditions

- Appropriate accessways and roads will need to be formed to provide access to the proposed new lots.
- Stormwater concentrations from the sealed driveways and roads should be appropriately managed and discharged to an approved disposal system and should not be discharged to the ground near the future dwellings.
- The existing small drain along the western boundary (within the site) should be re-aligned/removed and its alignment should be remediated. Otherwise, a no-build zone should be established.

[14] Environment Canterbury. Canterbury Tsunami Evacuation Zones, data retrieved in April 2025 from https://ecan.maps.arcgis.com/apps/Minimalist/index.html?appid=591062afb6b542abb247cc8d15a64855

10.2 Consent Notice on Computer Freehold Register

- A TC1 land classification for the site is considered appropriate.
- Site-specific geotechnical investigations and reporting will be required to inform foundation design parameters once the nature, location, and layout of future buildings have been confirmed.
- Building platforms for any future construction should be designed to achieve the required Finished Floor Level (FFL), taking the risk of inundation into consideration as presented in this report and any subsequent update by the Council.
- Stormwater concentrations from roofs, driveways and areas of hardstanding should be channelled or piped to an approved disposal system.

11 POSSIBLE FOUNDATION OPTIONS

11.1 Discussion

The nature, layout and design requirements for any new buildings are not known at this stage. Therefore, providing specific foundation design parameters is beyond the scope of this report. Further, the site-specific investigations undertaken to inform this report were scattered across the site and did not target any specific building platform for future construction within the new lots.

Site-specific geotechnical investigation, assessment and engineering design of an appropriate foundation system will be required once the nature, layout and construction materials are known for any future development.

12 Conclusions

Kirk Roberts Consulting (Kirk Roberts) has been engaged by Darfield Estates GP Ltd (the client) to undertake site-specific investigations, assessment and reporting at Telegraph & Greendale Roads, Darfield.

The purpose of this investigation is to assess the site with a view to supporting a Resource Consent application to subdivide the subject property into 445 new residential lots.

Based on the findings of this investigation and assessment, the following can be concluded:

- The hand-auger test holes indicate a soil profile consisting of topsoil to 0.3 – 0.4 m bgl (below ground level), over silt/gravely silt down to at least 0.4 – 0.8 m bgl where the tests terminated due to refusal on gravels.
- Groundwater was not encountered during the Kirk Roberts site-specific investigation in April 2025. However, ECan data indicates the depth to groundwater is at least 50 m bgl.
- The site is at low risk of inundation from the 200-year and 500-year Annual Recurrence Interval (ARI) models.
- A Technical Category 1 (TC1) classification is appropriate for the site.
- The site-specific investigations undertaken to inform this report were scattered across the site and did not target any specific building platform for future construction within the new lots. Therefore, site-specific geotechnical investigation, assessment and engineering design of an appropriate foundation system will be required once the nature, layout and construction materials are known for any future development.

Following our investigation and assessment, it is our professional opinion that the site will be geotechnically suitable for the proposed subdivision, providing the recommendations outlined in this report are followed. There is no reason to refuse subdivision consent to clause 106 (a), based on natural hazards.

13 Disclaimer

Whilst every care was taken during our desktop review, site-specific investigations and interpretation of subsurface conditions, there may well be subsoil strata and features that were not detected.

It must be appreciated that the actual characteristics of the subsurface materials may vary significantly between adjacent test locations and sample intervals other than where observations, explorations and investigations have been made.

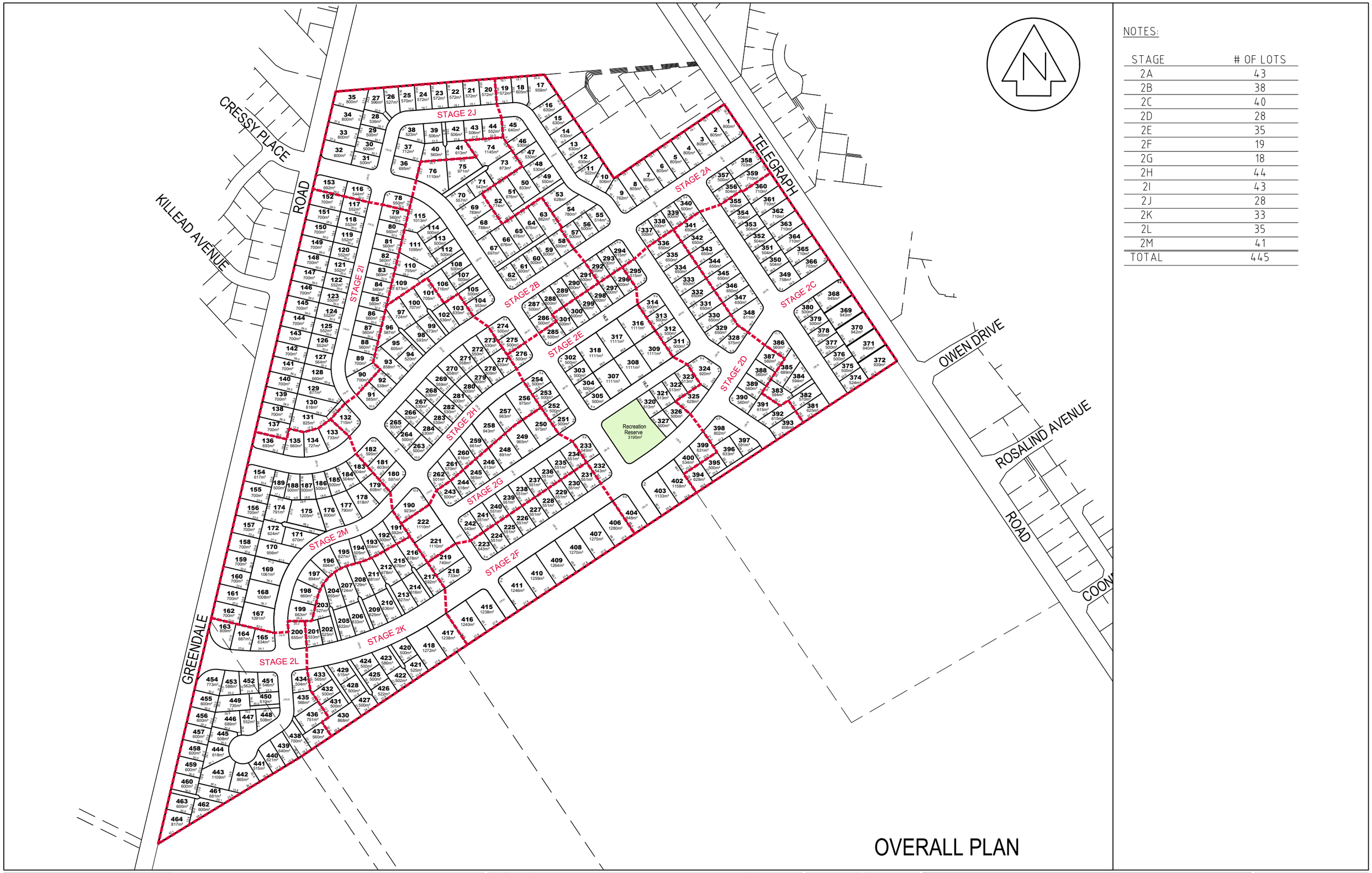
It should be noted that because of the inherent uncertainties in subsurface evaluations, changed or unanticipated subsurface conditions may occur that could affect total project cost and/or execution. Kirk Roberts Consulting does not accept responsibility for the consequences of significant variances in the conditions and the requirements for the execution of the works.

This report is intended to support the Resource Consent application to subdivide the site into 445 new residential allotments. However, this report is not suitable to support a Building Consent application for any future construction without further assessment. Further investigation, assessment, and reporting will be required once the nature, location, and layout of future buildings constructed within the respective lots have been confirmed.

This report has been prepared at the specific instructions of our client in connection with the above project and the geotechnical investigations and foundation recommendations are limited to the possible building area as discussed above. No liability is accepted by Kirk Roberts or any of their employees with respect to the use of this report by any other party.

Only our client and the Council are entitled to rely upon this report, and then only for the purpose stated above. Kirk Roberts Consulting Engineers Ltd accepts no liability to anyone other than these parties in any way in relation to this report and the content of it and any direct or indirect effect this report may have. Kirk Roberts Consulting Engineers Ltd does not contemplate anyone else relying on this report or that it will be used for any other purpose.

Appendix A Proposed Subdivision Plan



OVERALL PLAN

NOTES:

STAGE	# OF LOTS
2A	43
2B	38
2C	40
2D	28
2E	35
2F	19
2G	18
2H	44
2I	43
2J	28
2K	33
2L	35
2M	41
TOTAL	445

SURVUS CONSULTANTS
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REV	DATE	REVISION DETAILS	
F	21/02/25	PROPOSED SUBDIVISION LAYOUT	A CAIN
E	18/02/25	PROPOSED SUBDIVISION LAYOUT	A CAIN
C	18/02/25	PROPOSED SUBDIVISION LAYOUT	A CAIN
B	23/01/25	PROPOSED SUBDIVISION LAYOUT	A CAIN
A	30/12/24	PROPOSED SUBDIVISION LAYOUT	A CAIN

DRAFTED: SRS
VERIFIED:
APPROVED:
DATE:

PROJECT: TUATARA DEVELOPMENTS - TELEGRAPH & GREENDALE ROADS, DARFIELD

TITLE: CONCEPT SUBDIVISION LAYOUT

SHEET 1 OF 8

INFORMATION ONLY

PROJECT NO: 16126

SCALE: 1 : 4000 (A3)

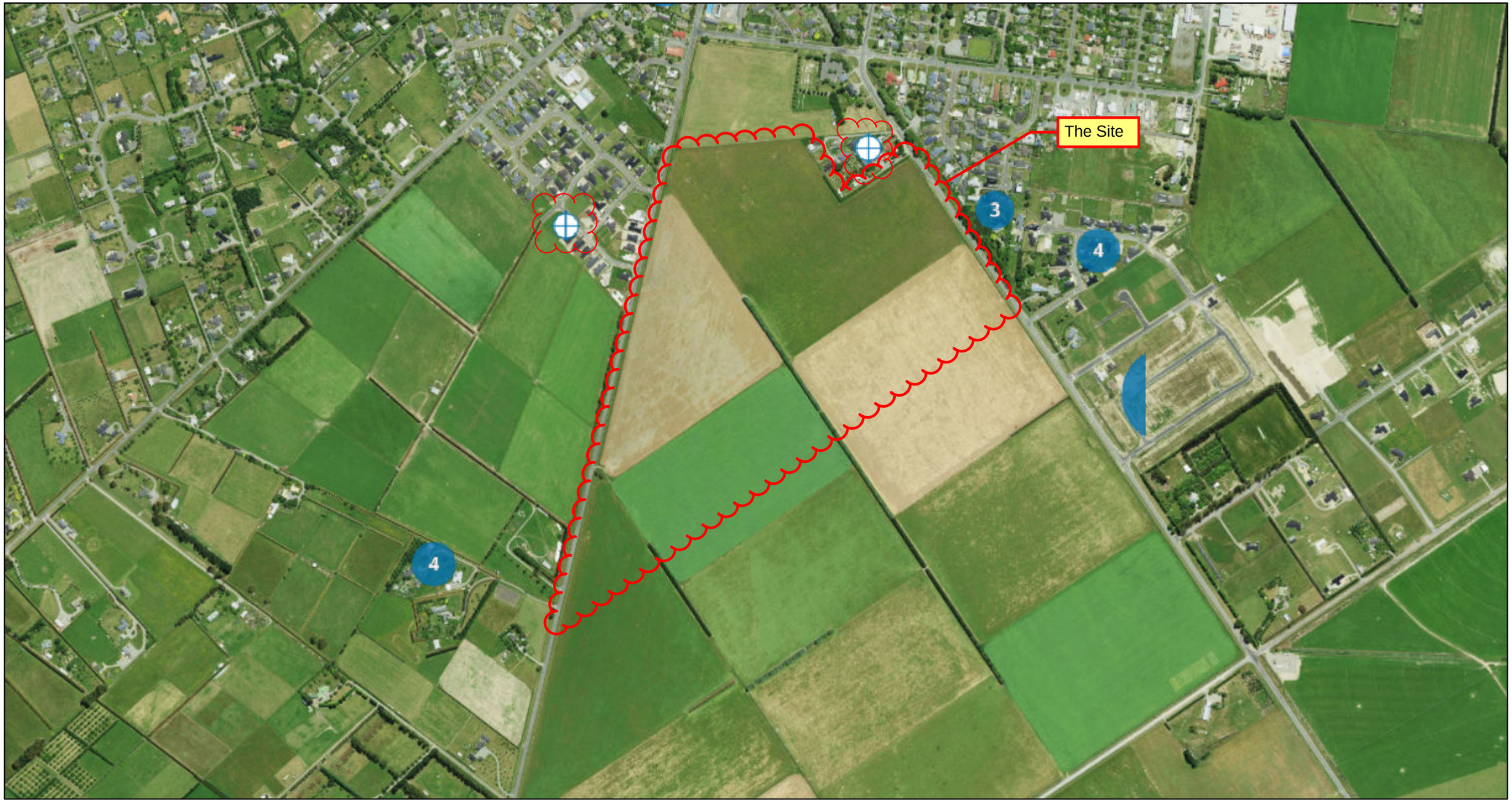
SIZE: A3

DRAWING NO: SC-03

REV: F

Appendix B Nearby Investigations (NZGD and ECan)

NZGD Map



5/04/2025

New Zealand Imagery

1:7,301

0 0.07 0.15 0.3 mi

0 0.13 0.25 0.5 km

Eagle Technology, Land Information New Zealand, GEBCO, Community maps contributors

NZGD ID: 145609

ENGCO Consulting Engineers

DCP-1

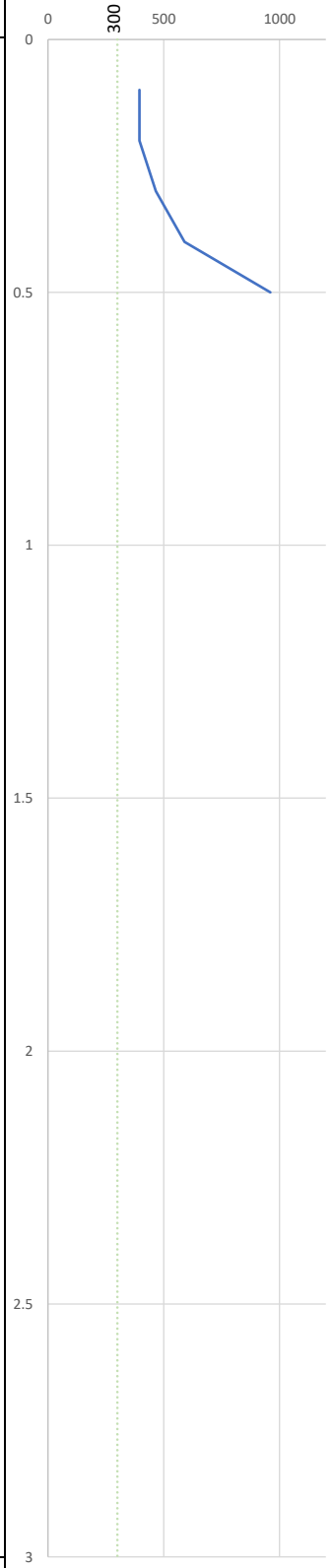
Job Number: 20056.16
Address: Lot 1 - 1967 Telegraph Road, Darfield
Date of Testing: 21/08/2020

Datum: Existing Ground
Operator: AJM

Soil Description	Depth [m]	Scala Penetrometer NZS 4402.6.5.2 (Blows / 100mm)	Water
No Hand Auger	0 – 0.1: 4; 0.1 – 0.2: 4; 0.2 – 0.3: 5; 0.3 – 0.4: 7; 0.4 – 0.5: 15		Not encountered
DCP refusal on gravel @ 500 mm b.g.l.			

End of hole: 0.5

Estimated Ultimate Bearing Capacity [kPa]



596 Ferry Road, Woolston, Christchurch

NZGD ID: 145609

NZGD ID: 145609

ENGCO Consulting Engineers

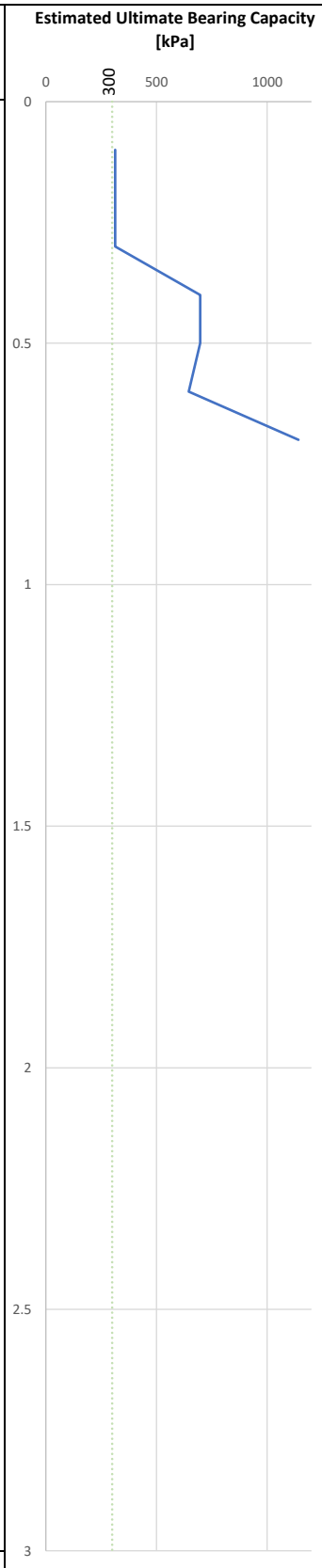
DCP-2

Job Number: 20056.16
Address: Lot 1 - 1967 Telegraph Road, Darfield
Date of Testing: 21/08/2020

Datum: Existing Ground
Operator: AJM

Soil Description	Depth [m]	Scala Penetrometer NZS 4402.6.5.2 (Blows / 100mm)	Water
No Hand Auger	0 – 0.1: 3		Not encountered
	0.1 – 0.2: 3		
	0.2 – 0.3: 3		
	0.3 – 0.4: 9		
	0.4 – 0.5: 9		
	0.5 – 0.6: 8		
	0.6 – 0.7: 20		
DCP refusal on gravel @ 700 mm b.g.l.	0.7 – 3		

End of hole: 0.7



596 Ferry Road, Woolston, Christchurch

NZGD ID: 145609

NZGD ID: 145609

ENGCO Consulting Engineers

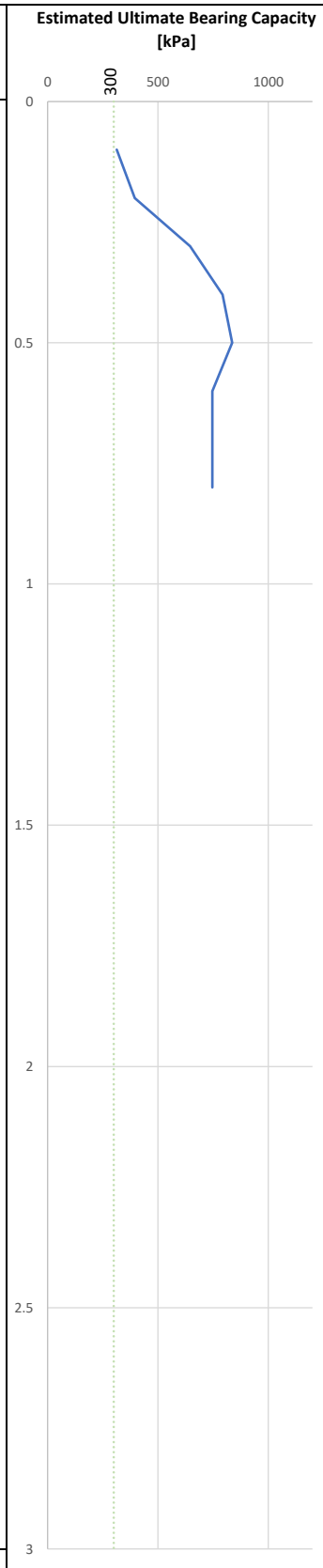
DCP-3/HA-2

Job Number: 20056.16
Address: Lot 1 - 1967 Telegraph Road, Darfield
Date of Testing: 21/08/2020

Datum: Existing Ground
Operator: AJM

Soil Description	Depth [m]	Scala Penetrometer NZS 4402.6.5.2 (Blows / 100mm)	Water
TOPSOIL: SILT with minor gravel. Brown, dry Minor organics/grass to 100mm b.g.l.	0 – 0.1	3	Not encountered
	0.1 – 0.2	4	
	0.2 – 0.3	8	
Auger terminated - refusal on gravel	0.3 – 0.4	11	
	0.4 – 0.5	12	
	0.5 – 0.6	10	
	0.6 – 0.7	10	
	0.7 – 0.8	10	
	0.8 – 3		

End of hole: 0.3



596 Ferry Road, Woolston, Christchurch

NZGD ID: 145609

NZGD ID: 145609

ENGCO Consulting Engineers

DCP-4

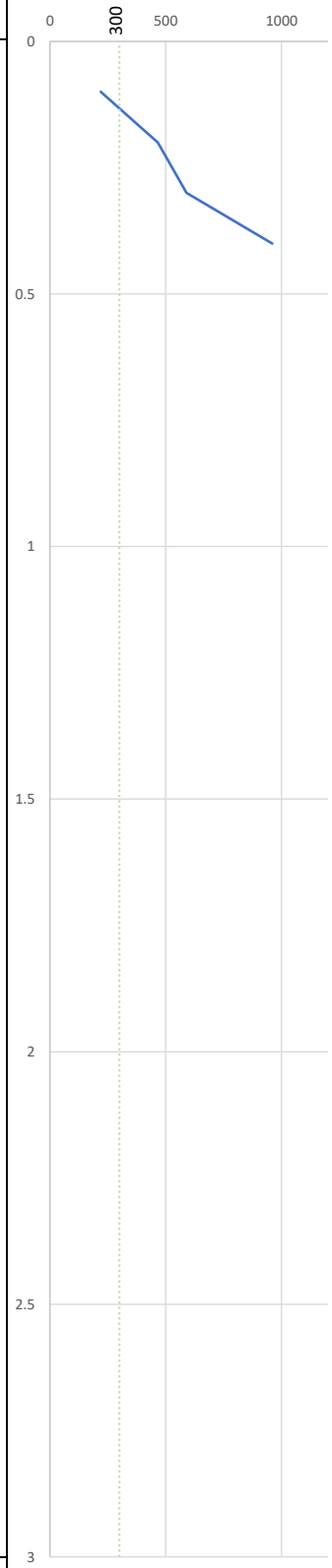
Job Number: 20056.16
Address: Lot 1 - 1967 Telegraph Road, Darfield
Date of Testing: 21/08/2020

Datum: Existing Ground
Operator: AJM

Soil Description	Depth [m]	Scala Penetrometer NZS 4402.6.5.2 (Blows / 100mm)	Water
No Hand Auger	0 – 0.1: 2 blows 0.1 – 0.2: 5 blows 0.2 – 0.3: 7 blows 0.3 – 0.4: 15 blows		Not encountered
DCP refusal on gravel @ 450 mm b.g.l.			

End of hole: 0.45

Estimated Ultimate Bearing Capacity [kPa]



596 Ferry Road, Woolston, Christchurch

NZGD ID: 145609

NZGD ID: 169761

LEWIS & BARROW LTD
Consulting Civil and Structural Engineers:

File: 25161
Date: 13/12/2021

HAND AUGER RESULTS

HA/DCP 1

Sheet 1 of 1

Soil Description

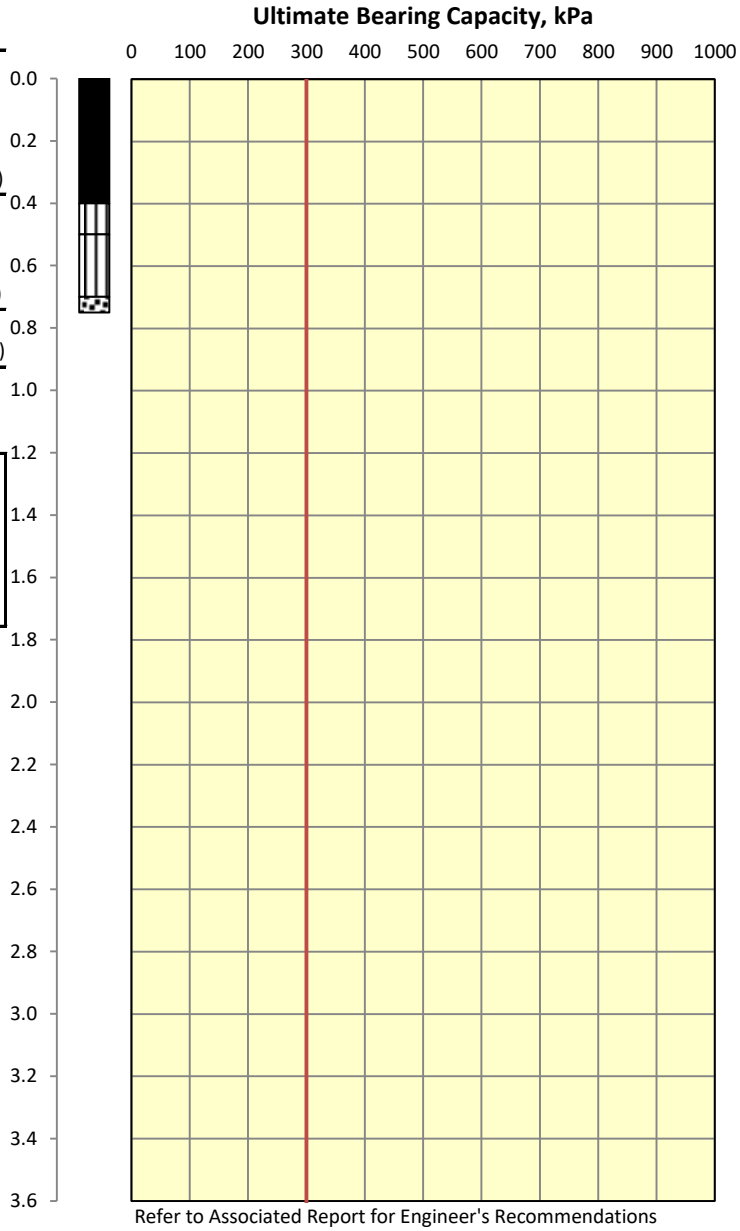
SILT, some sand, trace organics, gravel; dark brown. Firm; moist; sand, fine; gravel, fine to coarse. [TOPSOIL] (0.0 - 0.4m)

Gravelly SILT, some sand; brown grey. Stiff to very stiff; moist; sand, fine to medium; gravel, fine to cobbly, rounded to subrounded, well graded. [ALLUVIUM] (0.4 - 0.5m)

SILT, some sand; brown grey. Firm to stiff; moist; sand, fine; non-plastic. (0.5 - 0.7m)

End of Borehole at 0.7m bgl
[PRACTICAL REFUSAL]

* Scala/DCP Test met refusal at 0.46m bgl due to gravel content. Restarted at 0.51m bgl and met refusal at 0.76m bgl due to gravel content.
* Hand dug to 0.50m bgl and continued with a hand auger to practical refusal at 0.70m bgl on inferred natural gravel.



WT not struck

Refer to Associated Report for Engineer's Recommendations

The information on this page should only be interpreted by a Chartered Professional Engineer experienced in Geotechnical Engineering

Site Address: **15 Killead Avenue (Lot 73), Cressy Oaks Subdivision, Darfield**

Client: **N/A**

Technical Category: **N/A - Rural & Unmapped**
Reason for Test: **Council Requirement**

Plotted by: **NL**
Field Worker: **NL/NM**

This report (letter, soil test results sheets and site plan) must be read with the P.I.M. If there is anything adverse regarding ground bearing capacity on the P.I.M. this report shall be referred back to the Engineer for review. If any fill or soils other than those noted in the above report are found at the bottom of the excavations, the Engineer shall be notifed to inspect and issue further details. This report has been prepared solely for the benefit of our client. No liability is accepted by this firm or by any Principal, or Director, or any servant or agent of this firm, in respect of its use by any other person, and any other person who relies upon any matter contained in this report does so entirely at their own risk. This disclaimer shall apply notwithstanding that the report may be made available to any person in connection with any application for permission or approval, or pursuant to any requirement of law

NZGD ID: 169761

NZGD ID: 169761

LEWIS & BARROW LTD
Consulting Civil and Structural Engineers:

File: 25161
Date: 13/12/2021

HAND AUGER RESULTS

HA/DCP 2

Sheet 1 of 1

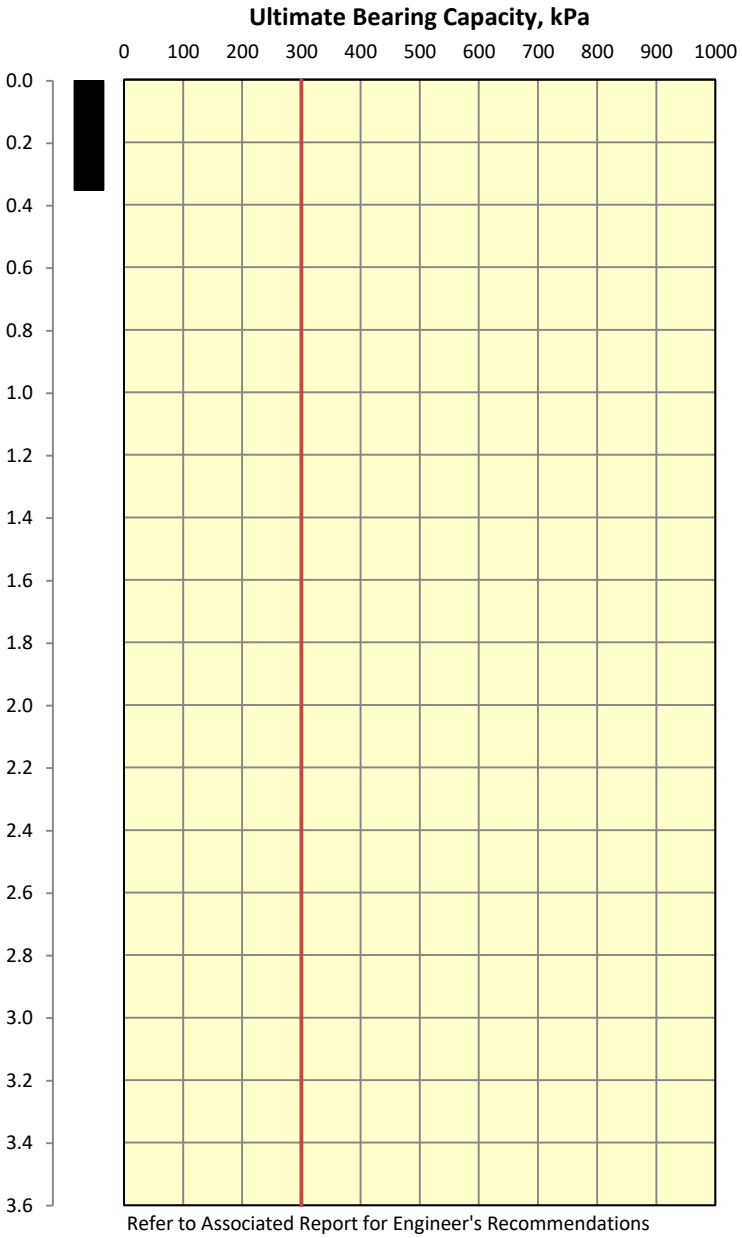
Soil Description

SILT, some sand, gravel, trace organics; dark brown. Firm; moist; sand, fine; gravel, fine to coarse. [TOPSOIL]

(0.0 - 0.35m)

End of Borehole at 0.35m bgl
[PRACTICAL REFUSAL]

* Scala/DCP Test met refusal at 0.81m bgl due to gravel content.
* Hand auger met practical refusal at 0.35m bgl due to increasing gravel content.



Refer to Associated Report for Engineer's Recommendations

The information on this page should only be interpreted by a Chartered Professional Engineer experienced in Geotechnical Engineering

Site Address: **15 Killead Avenue (Lot 73), Cressy Oaks Subdivision, Darfield**

Client: **N/A**

Technical Category: **N/A - Rural & Unmapped**
Reason for Test: **Council Requirement**

Plotted by: **NL**
Field Worker: **NL/NM**

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NZGD ID: 169761

NZGD ID: 169761

LEWIS & BARROW LTD
Consulting Civil and Structural Engineers:

File: 25161
Date: 13/12/2021

HAND DUG TEST PIT RESULTS

HA/DCP 3

Sheet 1 of 1

Soil Description

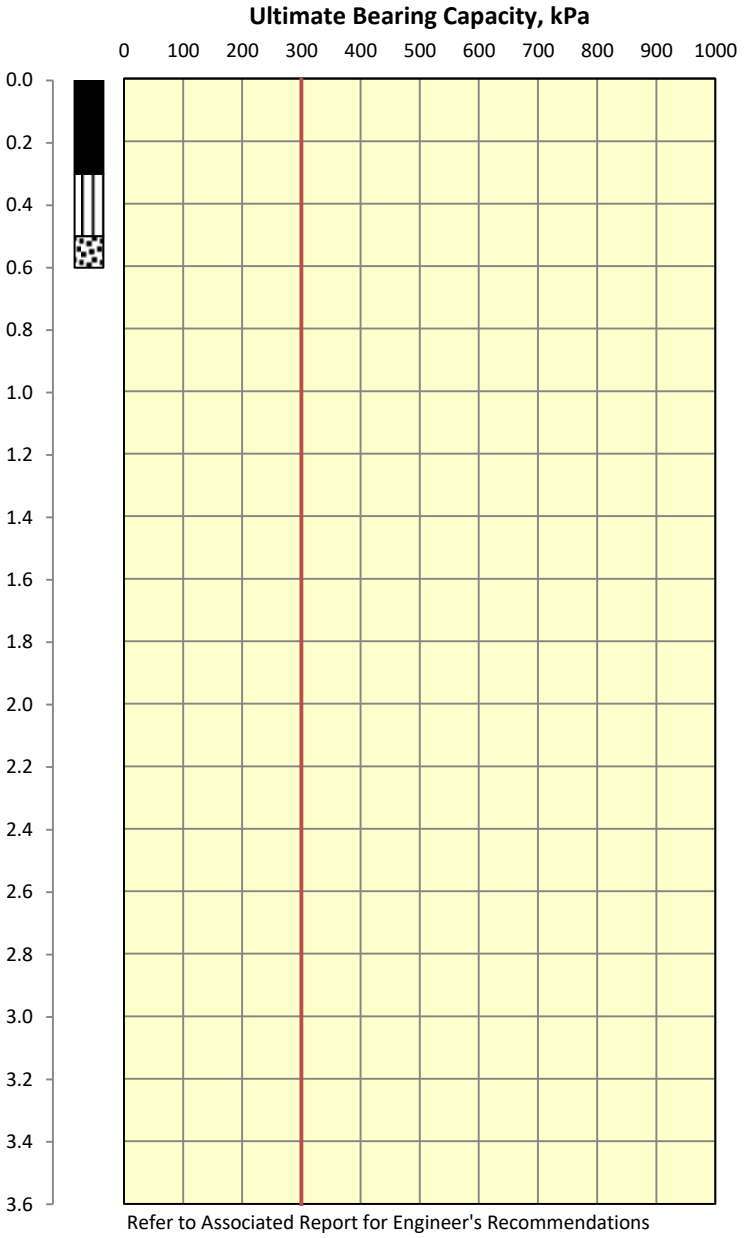
SILT, some sand, gravel, trace organics; dark brown. Firm; moist; sand, fine; gravel, fine to coarse. [TOPSOIL] (0.0 - 0.3m)

Gravelly SILT, some sand; brown grey. Stiff to very stiff; moist; sand, fine to medium; gravel, fine to cobbly, rounded to subrounded, well graded. [ALLUVIUM] (0.3 - 0.5m)

Sandy silty fine to cobbly GRAVEL; brown grey. Tightly packed; moist; sand, fine to coarse; gravel, rounded to subrounded, well graded. (0.5 - 0.6m)

End of Test Pit at 0.60m bgl
[TARGET DEPTH]

* Scala/DCP Test met refusal at 0.45m bgl due to gravel content.
* Hand dug test pit completed at 0.60m bgl within inferred natural gravel.



Refer to Associated Report for Engineer's Recommendations

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Site Address: **15 Killead Avenue (Lot 73), Cressy Oaks Subdivision, Darfield**

Client: **N/A**

Technical Category: **N/A - Rural & Unmapped**
Reason for Test: **Council Requirement**

Plotted by: **NL**
Field Worker: **NL/NM**

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NZGD ID: 169761

NZGD ID: 169761

LEWIS & BARROW LTD
Consulting Civil and Structural Engineers:

File: 25161
Date: 13/12/2021

HAND AUGER RESULTS

HA/DCP 4

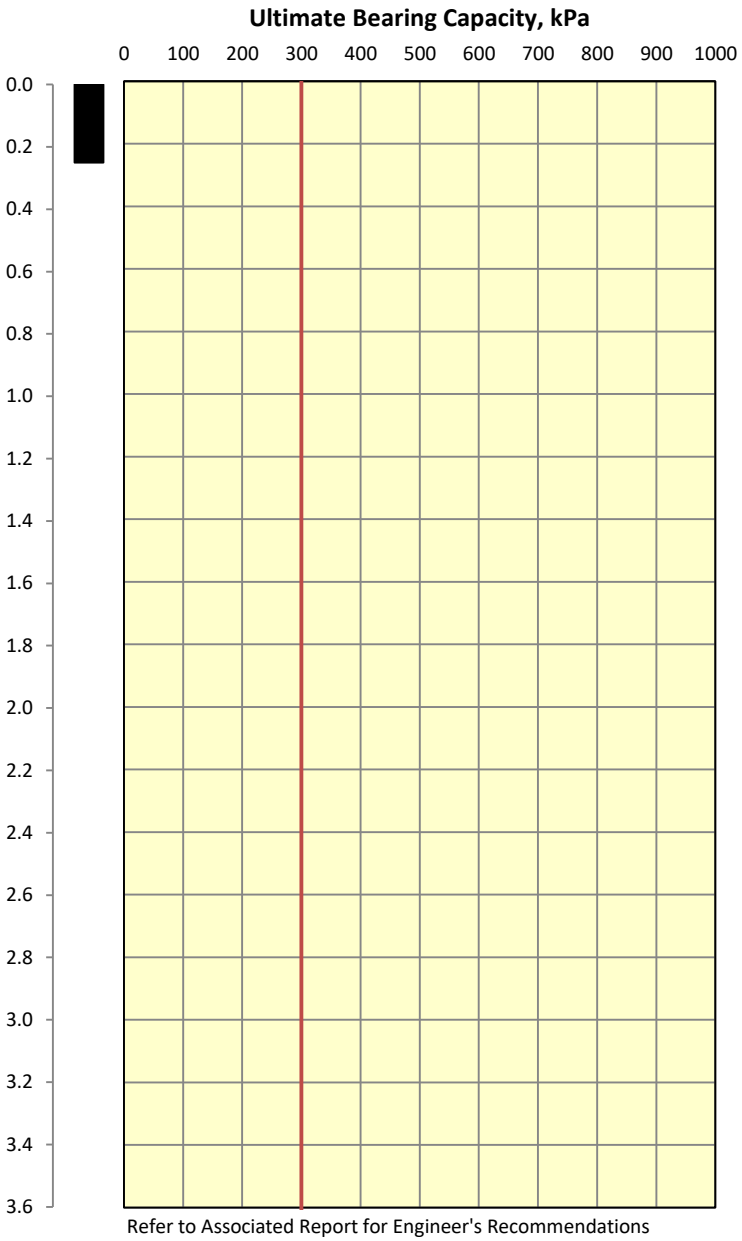
Sheet 1 of 1

Soil Description

SILT, some sand, minor gravel, trace organics; dark brown. Firm; moist; sand, fine; gravel, fine to coarse. [TOPSOIL]

End of Borehole at 0.25m bgl
[PRACTICAL REFUSAL]

* Scala/DCP Test met refusal at 0.55m bgl due to gravel content.
* Hand auger met practical refusal at 0.25m bgl due to increasing gravel content.



Refer to Associated Report for Engineer's Recommendations

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Site Address: **15 Killead Avenue (Lot 73), Cressy Oaks Subdivision, Darfield**

Client: **N/A**

Technical Category: **N/A - Rural & Unmapped**
Reason for Test: **Council Requirement**

Plotted by: **NL**
Field Worker: **NL/NM**

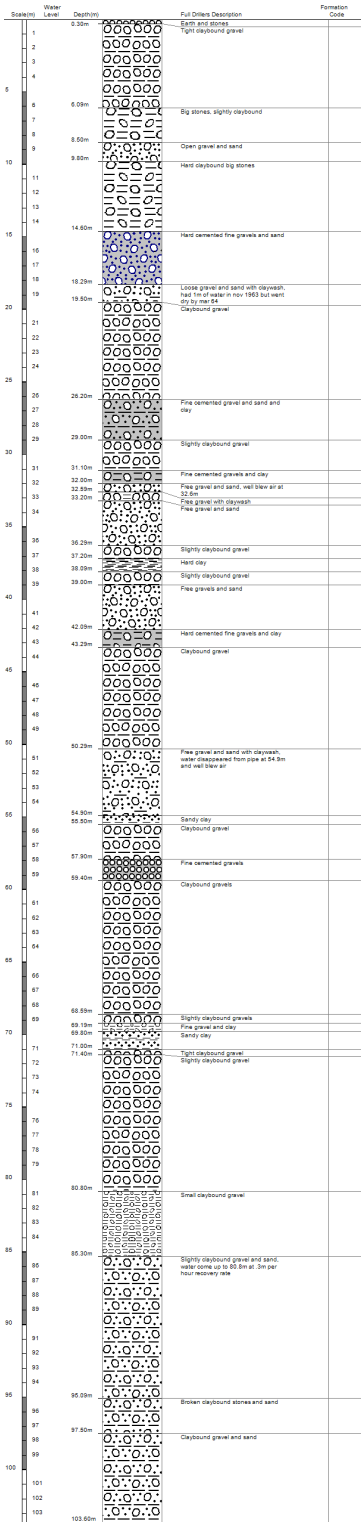
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NZGD ID: 169761

Borelog for well L35/0170

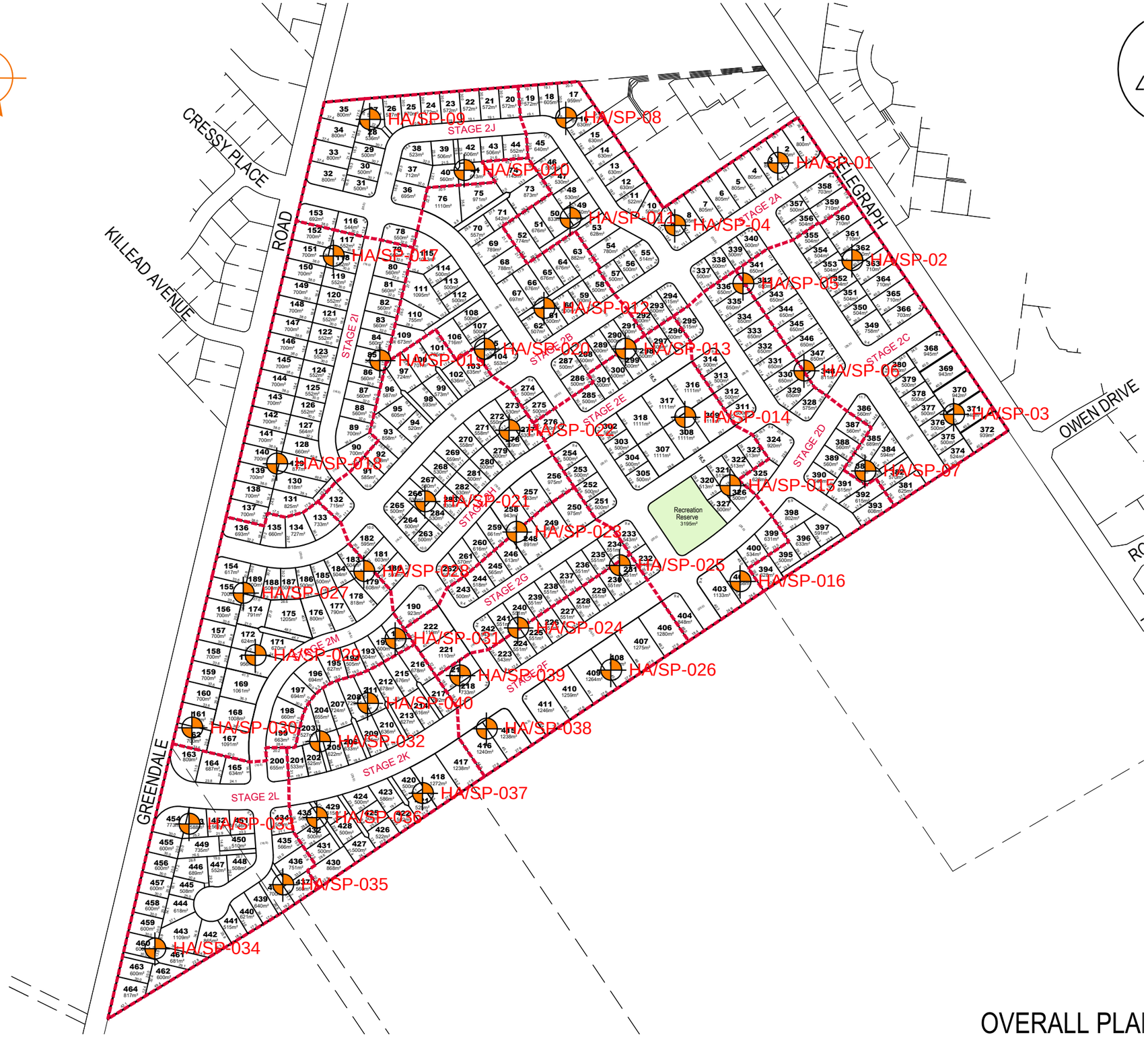
Grid Reference (NZTM): 1527614 mE, 5185085 mN
Location Accuracy: 50 - 300m
Ground Level Altitude: 205.8 m +MSD Accuracy: < 2.5 m
Driller: McMillan T T
Drill Method: Cable Tool
Borelog Depth: 103.6 m Drill Date: 01-May-1964

Environment Canterbury Regional Council
Kaunihera Taiao ki Waitaha



Environment Canterbury © 2025
Retrieved: 2:00pm, Sat 05 Apr 2025

Appendix C Site Plan & Site-Specific Investigations Logs



LEGENDS

Hand Auger and Scala Penetrometer locations, April 2025

NOTES

1. LOCATIONS OF FEATURES AND GROUND INVESTIGATION POINTS ARE APPROXIMATE ONLY.
2. SITE BOUNDARY AND LAYOUT SOURCED FROM SUBDIVISON PLAN PROVIDED BY CLIENT Ref; (PROJECT NO;16126, DRAWING NO: SC-03)

PROJECT: 2510105 CREATED BY: AA APPROVED BY: FS DATE: April 2025	DWG NO: 001 REVISION: A Scale: Not to Scale	TELEGRAPH & GREENDALE ROAD, DARFIELD	GEOTECHNICAL INVESTIGATION LOCATION PLAN

KIRK ROBERTS CONSULTING

SCALA PENETROMETER & HAND AUGER RESULTS

KIRK ROBERTS CONSULTING

Client:	Darfield Estates GP Ltd	**Scala Penetrometer:**	SP-01
Site Address:	Telegraph & Greendale Road, Darfield	**Hand Auger No.**	HA-01
Town/City:	Canterbury	**Job No.:**	2510105
Logged By:	AA	**Checked By:**	FS
Logged Date:	07/04/25	**Checked Date:**	08/04/25
		Date:	31/03/25
		Weather:	Fine
		Operator:	AA

Geological Formation	Depth (m)	Sample Description	Graphic	USCS	D_r	Water Table	Undrained Shear Strength Su (kPa)	Blows per 100 mm of Penetration
	0.0	Silty TOPSOIL (OL), with minor gravel; dark brown. Stiff, moist, non-plastic; gravel, fine to medium, subround to subangular.		OL		Groundwater Not Encountered		1, 2, 1
	0.5	SILT (M), with trace sand; yellow brown. Stiff, moist, non-plastic; sand, fine.		M				4, 15, 20
		EOH: 0.50m						
		0.5m: EOH, Refusal on Gravels.						

Remarks:

Scala Penetrometer and Test Bore log tests give an indication of the ground condition at the location of the tests only. While they are representative of typical conditions across the site, they do not identify variations in the ground away from the test locations.

Generated with CORE-GS

SCALA PENETROMETER & HAND AUGER RESULTS

KIRK ROBERTS CONSULTING

Client:	Darfield Estates GP Ltd	**Scala Penetrometer:**	SP-02
Site Address:	Telegraph & Greendale Road, Darfield	**Hand Auger No.**	HA-02
Town/City:	Canterbury	**Job No.:**	2510105
Logged By:	AA	**Checked By:**	FS
Logged Date:	07/04/25	**Checked Date:**	08/04/25
		Date:	31/03/25
		Weather:	Fine
		Operator:	AA

Geological Formation	Depth (m)	Sample Description	Graphic	USCS	D_r	Water Table	Undrained Shear Strength Su (kPa)	Blows per 100 mm of Penetration
		Silty TOPSOIL (OL), with some gravel; dark brown. Stiff, moist, non-plastic; gravel, fine to coarse, subround to subangular.		OL		Groundwater Not Encountered		3, 2, 2
		SILT (M), with some gravel, with trace sand; yellow brown. Stiff, moist, non-plastic; gravel, fine to medium, subround to subangular; sand, fine. EOH: 0.40m		M				5
	0.5	0.4m: EOH, Refusal on Gravels.						8, 20

Remarks:

Scala Penetrometer and Test Bore log tests give an indication of the ground condition at the location of the tests only. While they are representative of typical conditions across the site, they do not identify variations in the ground away from the test locations.

Generated with CORE-GS

SCALA PENETROMETER & HAND AUGER RESULTS

KIRK ROBERTS CONSULTING

Client:	Darfield Estates GP Ltd	**Scala Penetrometer:**	SP-03
Site Address:	Telegraph & Greendale Road, Darfield	**Hand Auger No.**	HA-03
Town/City:	Canterbury	**Job No.:**	2510105
Logged By:	AA	**Checked By:**	FS
Logged Date:	07/04/25	**Checked Date:**	08/04/25
		Date:	04/04/25
		Weather:	Fine
		Operator:	AA

Geological Formation	Depth (m)	Sample Description	Graphic	USCS	D_r	Water Table	Undrained Shear Strength Su (kPa)	Blows per 100 mm of Penetration
		Silty TOPSOIL (OL), with some gravel, with minor cobbles; dark brown. Stiff, moist, non-plastic; gravel, fine to coarse, subround to subangular.		OL		Groundwater Not Encountered		1, 4, 2
		Gravelly SILT (M), with trace sand; yellow brown. Firm to stiff, moist, non-plastic; gravel, fine to medium, subround to subangular; sand, fine.		M				3, 10
	0.5	EOH: 0.50m 0.5m: EOH, Refusal on Gravels.						20

Remarks:

Scala Penetrometer and Test Bore log tests give an indication of the ground condition at the location of the tests only. While they are representative of typical conditions across the site, they do not identify variations in the ground away from the test locations.

Generated with CORE-GS

SCALA PENETROMETER & HAND AUGER RESULTS

KIRK ROBERTS CONSULTING

Client:	Darfield Estates GP Ltd	**Scala Penetrometer:**	SP-04
Site Address:	Telegraph & Greendale Road, Darfield	**Hand Auger No.**	HA-04
Town/City:	Canterbury	**Job No.:**	2510105
Logged By:	AA	**Checked By:**	FS
Logged Date:	07/04/25	**Checked Date:**	08/04/25
		Date:	31/03/25
		Weather:	Fine
		Operator:	AA

Geological Formation	Depth (m)	Sample Description	Graphic	USCS	D_r	Water Table	Undrained Shear Strength Su (kPa)	Blows per 100 mm of Penetration
	0.0	Silty TOPSOIL (OL), with minor gravel; dark brown. Stiff, moist, non-plastic; gravel, fine to medium, subround to subangular.		OL		Groundwater Not Encountered		1, 2, 1
	0.5	SILT (M), with minor gravel, with trace sand; yellow brown. Stiff, moist, non-plastic; gravel, fine to medium, subround to subangular; sand, fine.		M				4, 15, 20
		EOH: 0.50m						
		0.5m: EOH, Refusal on Gravels.						

0.5

Remarks:

Scala Penetrometer and Test Bore log tests give an indication of the ground condition at the location of the tests only. While they are representative of typical conditions across the site, they do not identify variations in the ground away from the test locations.

Generated with CORE-GS

SCALA PENETROMETER & HAND AUGER RESULTS

KIRK ROBERTS CONSULTING

Client:	Darfield Estates GP Ltd	**Scala Penetrometer:**	SP-05
Site Address:	Telegraph & Greendale Road, Darfield	**Hand Auger No.**	HA-05
Town/City:	Canterbury	**Job No.:**	2510105
Logged By:	AA	**Checked By:**	FS
Logged Date:	07/04/25	**Checked Date:**	08/04/25
		Date:	31/03/25
		Weather:	Fine
		Operator:	AA

Geological Formation	Depth (m)	Sample Description	Graphic	USCS	D_r	Water Table	Undrained Shear Strength Su (kPa)	Blows per 100 mm of Penetration
	0.5	Silty TOPSOIL (OL), with some gravel; dark brown. Stiff, moist, non-plastic; gravel, fine to coarse, subround to subangular.		OL		Groundwater Not Encountered		1, 1, 1
		SILT (M), with some gravel, with minor sand; yellow brown. Firm to stiff, moist, non-plastic; gravel, fine to medium, subround to subangular; sand, fine. EOH: 0.40m		M				4
		0.4m: EOH, Refusal on Gravels.						11, 20
	0.5							

Remarks:

Scala Penetrometer and Test Bore log tests give an indication of the ground condition at the location of the tests only. While they are representative of typical conditions across the site, they do not identify variations in the ground away from the test locations.

Generated with CORE-GS

SCALA PENETROMETER & HAND AUGER RESULTS

KIRK ROBERTS CONSULTING

Client:	Darfield Estates GP Ltd	**Scala Penetrometer:**	SP-06
Site Address:	Telegraph & Greendale Road, Darfield	**Hand Auger No.**	HA-06
Town/City:	Canterbury	**Job No.:**	2510105
Logged By:	AA	**Checked By:**	FS
Logged Date:	07/04/25	**Checked Date:**	08/04/25
		Date:	04/04/25
		Weather:	Fine
		Operator:	AA

Geological Formation	Depth (m)	Sample Description	Graphic	USCS	D_r	Water Table	Undrained Shear Strength Su (kPa)	Blows per 100 mm of Penetration
	0.0	Silty TOPSOIL (OL), with some gravel; dark brown. Stiff, moist, non-plastic; gravel, fine to coarse, subround to subangular.		OL		Groundwater Not Encountered		1, 2, 2
	0.5	Gravelly SILT (M), with trace sand; yellow brown. Firm to stiff, moist, non-plastic; gravel, fine to medium, subround to subangular; sand, fine.		M				1, 3, 4
		EOH: 0.60m						
		0.6m: EOH, Refusal on Gravels.						20

Remarks:

Scala Penetrometer and Test Bore log tests give an indication of the ground condition at the location of the tests only. While they are representative of typical conditions across the site, they do not identify variations in the ground away from the test locations.

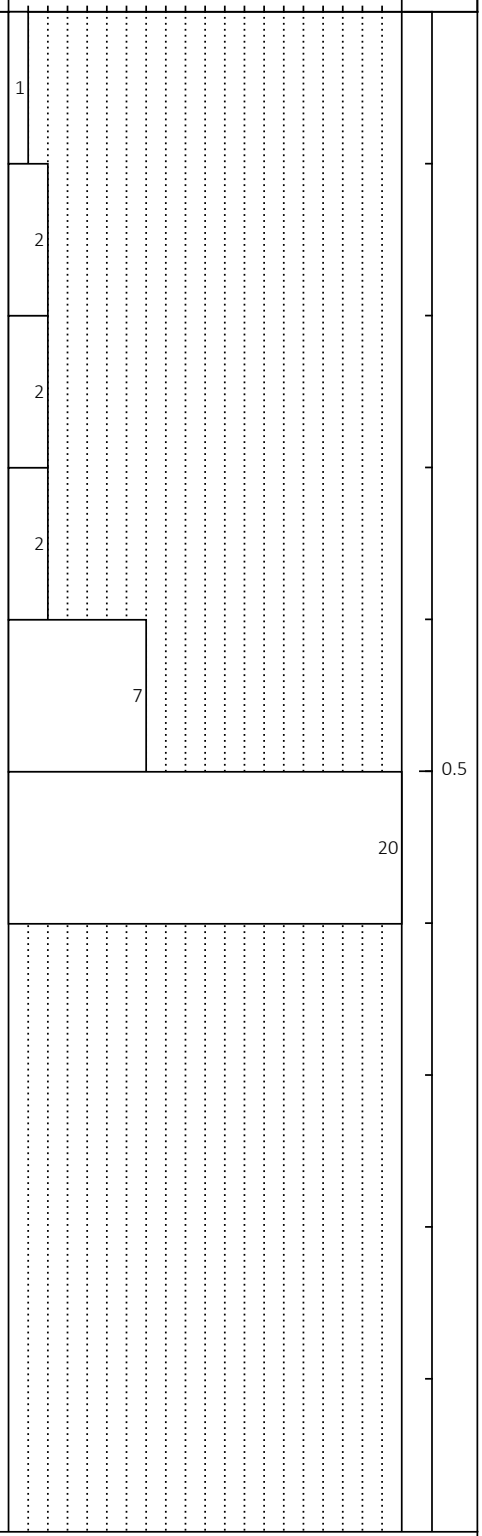
Generated with CORE-GS

SCALA PENETROMETER & HAND AUGER RESULTS

KIRK ROBERTS CONSULTING

Client:	Darfield Estates GP Ltd	**Scala Penetrometer:**	SP-07
Site Address:	Telegraph & Greendale Road, Darfield	**Hand Auger No.**	HA-07
Town/City:	Canterbury	**Job No.:**	2510105
Logged By:	AA	**Checked By:**	FS
Logged Date:	07/04/25	**Checked Date:**	08/04/25
		Date:	04/04/25
		Weather:	Fine
		Operator:	AA

Geological Formation	Depth (m)	Sample Description	Graphic	USCS	D_r	Water Table	Undrained Shear Strength Su (kPa)
	0.5	Silty TOPSOIL (OL), with some gravel; dark brown. Stiff, moist, non-plastic; gravel, fine to coarse, subround to subangular.		OL		Groundwater Not Encountered	
		Gravelly SILT (M), with trace sand; yellow brown. Firm to stiff, moist, non-plastic; gravel, fine to medium, subround to subangular; sand, fine.		M			
		EOH: 0.60m					
		0.6m: EOH, Refusal on Gravels.					



Remarks:

Scala Penetrometer and Test Bore log tests give an indication of the ground condition at the location of the tests only. While they are representative of typical conditions across the site, they do not identify variations in the ground away from the test locations.

SCALA PENETROMETER & HAND AUGER RESULTS

KIRK ROBERTS CONSULTING

Client:	Darfield Estates GP Ltd	**Scala Penetrometer:**	SP-08
Site Address:	Telegraph & Greendale Road, Darfield	**Hand Auger No.**	HA-08
Town/City:	Canterbury	**Job No.:**	2510105
Logged By:	AA	**Checked By:**	FS
Logged Date:	07/04/25	**Checked Date:**	08/04/25
		Date:	04/04/25
		Weather:	Fine
		Operator:	AA

Geological Formation	Depth (m)	Sample Description	Graphic	USCS	D_r	Water Table	Undrained Shear Strength Su (kPa)	Blows per 100 mm of Penetration
		Silty TOPSOIL (OL), with minor gravel; dark brown. Stiff, moist, non-plastic; gravel, fine to coarse, subround to subangular.		OL		Groundwater Not Encountered		1, 1, 1, 4
		SILT (M), with some gravel; yellow brown. Stiff, moist, non-plastic; gravel, fine to medium, subround to subangular.		M				9
	0.5	EOH: 0.50m 0.5m: EOH, Refusal on Gravels.						20

Remarks:

Scala Penetrometer and Test Bore log tests give an indication of the ground condition at the location of the tests only. While they are representative of typical conditions across the site, they do not identify variations in the ground away from the test locations.

Generated with CORE-GS

SCALA PENETROMETER & HAND AUGER RESULTS

KIRK ROBERTS CONSULTING

Client:	Darfield Estates GP Ltd	**Scala Penetrometer:**	SP-09
Site Address:	Telegraph & Greendale Road, Darfield	**Hand Auger No.**	HA-09
Town/City:	Canterbury	**Job No.:**	2510105
Logged By:	AA	**Checked By:**	FS
Logged Date:	07/04/25	**Checked Date:**	08/04/25
		Date:	04/04/25
		Weather:	Fine
		Operator:	AA

Geological Formation	Depth (m)	Sample Description	Graphic	USCS	D_r	Water Table	Undrained Shear Strength Su (kPa)
	0.0	Silty TOPSOIL (OL), with minor gravel; dark brown. Stiff, moist, non-plastic; gravel, fine to coarse, subround to subangular.		OL		Groundwater Not Encountered	
	0.5	Gravelly SILT (M); yellow brown. Stiff, moist, non-plastic; gravel, fine to medium, subround to subangular. EOH: 0.50m 0.5m: EOH, Refusal on Gravels.		M			

Blows per 100 mm of Penetration

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
1	1	2	3	7	9	20												

0.5

Remarks:

Scala Penetrometer and Test Bore log tests give an indication of the ground condition at the location of the tests only. While they are representative of typical conditions across the site, they do not identify variations in the ground away from the test locations.

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SCALA PENETROMETER & HAND AUGER RESULTS

KIRK ROBERTS CONSULTING

Client:	Darfield Estates GP Ltd	**Scala Penetrometer:**	SP-10
Site Address:	Telegraph & Greendale Road, Darfield	**Hand Auger No.**	HA-10
Town/City:	Canterbury	**Job No.:**	2510105
Logged By:	AA	**Checked By:**	FS
Logged Date:	07/04/25	**Checked Date:**	08/04/25
		Date:	04/04/25
		Weather:	Fine
		Operator:	AA

Geological Formation	Depth (m)	Sample Description	Graphic	USCS	D_r	Water Table	Undrained Shear Strength Su (kPa)	Blows per 100 mm of Penetration
	0.5	Silty TOPSOIL (OL), with minor gravel; dark brown. Stiff, moist, non-plastic; gravel, fine to coarse, subround to subangular.		OL		Groundwater Not Encountered		1, 1, 1, 4
		Gravelly SILT (M); yellow brown. Stiff, moist, non-plastic; gravel, fine to medium, subround to subangular. EOH: 0.50m		M				10, 20
		0.5m: EOH, Refusal on Gravels.						

0.5

Remarks:

Scala Penetrometer and Test Bore log tests give an indication of the ground condition at the location of the tests only. While they are representative of typical conditions across the site, they do not identify variations in the ground away from the test locations.

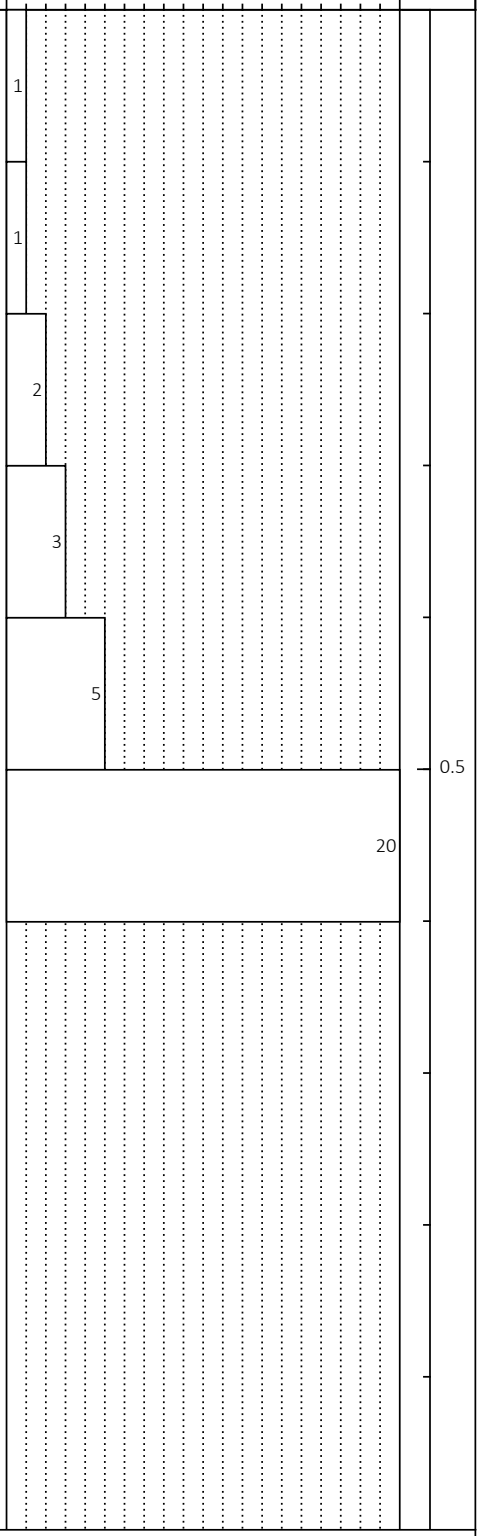
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SCALA PENETROMETER & HAND AUGER RESULTS

KIRK ROBERTS CONSULTING

Client:	Darfield Estates GP Ltd	**Scala Penetrometer:**	SP-11
Site Address:	Telegraph & Greendale Road, Darfield	**Hand Auger No.**	HA-11
Town/City:	Canterbury	**Job No.:**	2510105
Logged By:	AA	**Checked By:**	FS
Logged Date:	07/04/25	**Checked Date:**	08/04/25
		Date:	04/04/25
		Weather:	Fine
		Operator:	AA

Geological Formation	Depth (m)	Sample Description	Graphic	USCS	D_r	Water Table	Undrained Shear Strength Su (kPa)
		Silty TOPSOIL (OL), with minor gravel; dark brown. Stiff, moist, non-plastic; gravel, fine to coarse, subround to subangular.		OL		Groundwater Not Encountered	
	0.5	SILT (M), with trace gravel; yellow brown. Stiff, moist, non-plastic; gravel, fine to medium, subround to subangular. EOH: 0.50m 0.5m: EOH, Refusal on Gravels.		M			



Remarks:

Scala Penetrometer and Test Bore log tests give an indication of the ground condition at the location of the tests only. While they are representative of typical conditions across the site, they do not identify variations in the ground away from the test locations.

Generated with CORE-GS

SCALA PENETROMETER & HAND AUGER RESULTS

KIRK ROBERTS CONSULTING

Client:	Darfield Estates GP Ltd	**Scala Penetrometer:**	SP-12
Site Address:	Telegraph & Greendale Road, Darfield	**Hand Auger No.**	HA-12
Town/City:	Canterbury	**Job No.:**	2510105
Logged By:	AA	**Checked By:**	FS
Logged Date:	07/04/25	**Checked Date:**	08/04/25
		Date:	31/03/25
		Weather:	Fine
		Operator:	AA

Geological Formation	Depth (m)	Sample Description	Graphic	USCS	D_r	Water Table	Undrained Shear Strength Su (kPa)	Blows per 100 mm of Penetration
		Silty TOPSOIL (OL), with some gravel; dark brown. Stiff, moist, non-plastic; gravel, fine to coarse, subround to subangular.		OL		Groundwater Not Encountered		1, 1, 1
		SILT (M), with trace sand; yellow brown. Stiff, moist, non-plastic; sand, fine.						2, 2
	0.5	SILT (M), with minor sand, with trace gravel; yellow brown. Sand, fine; gravel, fine to medium, subround.		M				4, 6, 14, 20
		EOH: 0.70m						
		0.7m: EOH, Refusal on Gravels.						

0.5

Remarks:

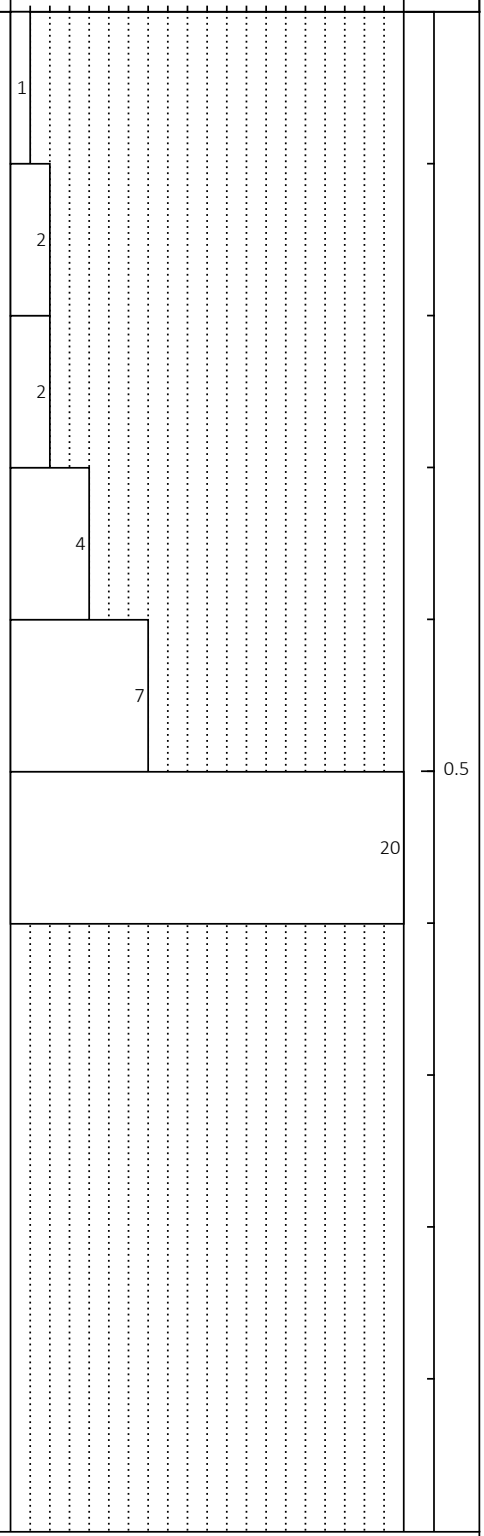
Scala Penetrometer and Test Bore log tests give an indication of the ground condition at the location of the tests only. While they are representative of typical conditions across the site, they do not identify variations in the ground away from the test locations.

SCALA PENETROMETER & HAND AUGER RESULTS

KIRK ROBERTS CONSULTING

Client:	Darfield Estates GP Ltd	**Scala Penetrometer:**	SP-13
Site Address:	Telegraph & Greendale Road, Darfield	**Hand Auger No.**	HA-13
Town/City:	Canterbury	**Job No.:**	2510105
Logged By:	AA	**Checked By:**	FS
Logged Date:	07/04/25	**Checked Date:**	08/04/25
		Date:	31/03/25
		Weather:	Fine
		Operator:	AA

Geological Formation	Depth (m)	Sample Description	Graphic	USCS	D_r	Water Table	Undrained Shear Strength Su (kPa)	Blows per 100 mm of Penetration
	0.5	Silty TOPSOIL (OL), with some gravel; dark brown. Stiff, moist, non-plastic; gravel, fine to coarse, subround to subangular.	TS	OL		Groundwater Not Encountered		1, 2, 2, 4
		SILT (M), with some gravel, with minor sand; yellow brown. Stiff, moist, non-plastic; gravel, fine to medium, subround to subangular; sand, fine. EOH: 0.50m	×	M				7
		0.5m: EOH, Refusal on Gravels.						20



Remarks:

Scala Penetrometer and Test Bore log tests give an indication of the ground condition at the location of the tests only. While they are representative of typical conditions across the site, they do not identify variations in the ground away from the test locations.

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SCALA PENETROMETER & HAND AUGER RESULTS

KIRK ROBERTS CONSULTING

Client:	Darfield Estates GP Ltd	**Scala Penetrometer:**	SP-14
Site Address:	Telegraph & Greendale Road, Darfield	**Hand Auger No.**	HA-14
Town/City:	Canterbury	**Job No.:**	2510105
Logged By:	AA	**Checked By:**	FS
Logged Date:	07/04/25	**Checked Date:**	08/04/25
		Date:	04/04/25
		Weather:	Fine
		Operator:	AA

Geological Formation	Depth (m)	Sample Description	Graphic	USCS	D_r	Water Table	Undrained Shear Strength Su (kPa)	Blows per 100 mm of Penetration
	0.5	Silty TOPSOIL (OL), with some gravel; dark brown. Stiff, moist, non-plastic; gravel, fine to coarse, subround to subangular.		OL		Groundwater Not Encountered		2, 2, 2
		Gravelly SILT (M), with trace sand; yellow brown. Firm to stiff, moist, non-plastic; gravel, fine to medium, subround to subangular; sand, fine. EOH: 0.40m		M				6
		0.4m: EOH, Refusal on Gravels.						15, 20

Remarks:

Scala Penetrometer and Test Bore log tests give an indication of the ground condition at the location of the tests only. While they are representative of typical conditions across the site, they do not identify variations in the ground away from the test locations.

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SCALA PENETROMETER & HAND AUGER RESULTS

KIRK ROBERTS CONSULTING

Client:	Darfield Estates GP Ltd	**Scala Penetrometer:**	SP-15
Site Address:	Telegraph & Greendale Road, Darfield	**Hand Auger No.**	HA-15
Town/City:	Canterbury	**Job No.:**	2510105
Logged By:	AA	**Checked By:**	FS
Logged Date:	07/04/25	**Checked Date:**	08/04/25
		Date:	04/04/25
		Weather:	Fine
		Operator:	AA

Geological Formation	Depth (m)	Sample Description	Graphic	USCS	D_r	Water Table	Undrained Shear Strength Su (kPa)	Blows per 100 mm of Penetration
		Silty TOPSOIL (OL), with some gravel; dark brown. Stiff, moist, non-plastic; gravel, fine to coarse, subround to subangular.		OL		Groundwater Not Encountered		2, 4, 5
		SILT (M), with some gravel, with trace sand; yellow brown. Stiff, moist, non-plastic; gravel, fine to medium, subround to subangular; sand, fine.		M				3, 8
	0.5	EOH: 0.50m 0.5m: EOH, Refusal on Gravels.						20

Remarks:

Scala Penetrometer and Test Bore log tests give an indication of the ground condition at the location of the tests only. While they are representative of typical conditions across the site, they do not identify variations in the ground away from the test locations.

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SCALA PENETROMETER & HAND AUGER RESULTS

KIRK ROBERTS CONSULTING

Client:	Darfield Estates GP Ltd	**Scala Penetrometer:**	SP-16
Site Address:	Telegraph & Greendale Road, Darfield	**Hand Auger No.**	HA-16
Town/City:	Canterbury	**Job No.:**	2510105
Logged By:	AA	**Checked By:**	FS
Logged Date:	07/04/25	**Checked Date:**	08/04/25
		Date:	04/04/25
		Weather:	Fine
		Operator:	AA

Geological Formation	Depth (m)	Sample Description	Graphic	USCS	D_r	Water Table	Undrained Shear Strength Su (kPa)	Blows per 100 mm of Penetration
		Silty TOPSOIL (OL), with some gravel; dark brown. Stiff, moist, non-plastic; gravel, fine to coarse, subround to subangular.		OL		Groundwater Not Encountered		2, 2, 2
		SILT (M), with minor gravel; yellow brown. Stiff, moist, non-plastic; gravel, fine to medium, subround to subangular.		M				3, 7
	0.5	EOH: 0.50m 0.5m: EOH, Refusal on Gravels.						20

0.5

Remarks:

Scala Penetrometer and Test Bore log tests give an indication of the ground condition at the location of the tests only. While they are representative of typical conditions across the site, they do not identify variations in the ground away from the test locations.

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SCALA PENETROMETER & HAND AUGER RESULTS

KIRK ROBERTS CONSULTING

Client:	Darfield Estates GP Ltd	**Scala Penetrometer:**	SP-17
Site Address:	Telegraph & Greendale Road, Darfield	**Hand Auger No.**	HA-17
Town/City:	Canterbury	**Job No.:**	2510105
Logged By:	AA	**Checked By:**	FS
Logged Date:	07/04/25	**Checked Date:**	08/04/25
		Date:	31/03/25
		Weather:	Fine
		Operator:	AA

Geological Formation	Depth (m)	Sample Description	Graphic	USCS	D_r	Water Table	Undrained Shear Strength Su (kPa)	Blows per 100 mm of Penetration
	0.5	Silty TOPSOIL (OL), with some gravel, with trace cobbles; dark brown. Stiff, moist, non-plastic; gravel, fine to coarse, subround to subangular.		OL		Groundwater Not Encountered		1, 2, 2
		Gravelly SILT (M); yellow brown. Stiff, moist, non-plastic; gravel, fine to medium, subround to subangular.		M				4, 20
		EOH: 0.50m						
		0.5m: EOH, Refusal on Gravels.						0.5

Remarks:

Scala Penetrometer and Test Bore log tests give an indication of the ground condition at the location of the tests only. While they are representative of typical conditions across the site, they do not identify variations in the ground away from the test locations.

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SCALA PENETROMETER & HAND AUGER RESULTS

KIRK ROBERTS CONSULTING

Client:	Darfield Estates GP Ltd	**Scala Penetrometer:**	SP-18
Site Address:	Telegraph & Greendale Road, Darfield	**Hand Auger No.**	HA-18
Town/City:	Canterbury	**Job No.:**	2510105
Logged By:	AA	**Checked By:**	FS
Logged Date:	07/04/25	**Checked Date:**	08/04/25
		Date:	31/03/25
		Weather:	Fine
		Operator:	AA

Geological Formation	Depth (m)	Sample Description	Graphic	USCS	D_r	Water Table	Undrained Shear Strength Su (kPa)	Blows per 100 mm of Penetration
	0.5	Silty TOPSOIL (OL), with some gravel, with trace cobbles; dark brown. Stiff, moist, non-plastic; gravel, fine to coarse, subround to subangular.		OL		Groundwater Not Encountered		1, 2, 2, 2, 4, 4, 5, 5, 20
		SILT (M), with trace gravel; yellow brown. Firm, moist, non-plastic; gravel, fine to medium, subround to subangular.		M				
		EOH: 0.70m						
		0.7m: EOH, Refusal on Gravels.						

Remarks:

Scala Penetrometer and Test Bore log tests give an indication of the ground condition at the location of the tests only. While they are representative of typical conditions across the site, they do not identify variations in the ground away from the test locations.

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SCALA PENETROMETER & HAND AUGER RESULTS

KIRK ROBERTS CONSULTING

Client:	Darfield Estates GP Ltd	**Scala Penetrometer:**	SP-19
Site Address:	Telegraph & Greendale Road, Darfield	**Hand Auger No.**	HA-19
Town/City:	Canterbury	**Job No.:**	2510105
Logged By:	AA	**Checked By:**	FS
Logged Date:	07/04/25	**Checked Date:**	08/04/25
		Date:	04/04/25
		Weather:	Fine
		Operator:	AA

Geological Formation	Depth (m)	Sample Description	Graphic	USCS	D_r	Water Table	Undrained Shear Strength Su (kPa)	Blows per 100 mm of Penetration
	0.5	Silty TOPSOIL (OL), with minor gravel; dark brown. Stiff, moist, non-plastic; gravel, fine to coarse, subround to subangular.		OL		Groundwater Not Encountered		1, 2, 2
		SILT (M), with some gravel, with trace sand; yellow brown. Stiff, moist, non-plastic; gravel, fine to medium, subround to subangular; sand, fine. EOH: 0.40m		M				4, 6, 20
		0.4m: EOH, Refusal on Gravels.						

Remarks:

Scala Penetrometer and Test Bore log tests give an indication of the ground condition at the location of the tests only. While they are representative of typical conditions across the site, they do not identify variations in the ground away from the test locations.

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SCALA PENETROMETER & HAND AUGER RESULTS

KIRK ROBERTS CONSULTING

Client:	Darfield Estates GP Ltd	**Scala Penetrometer:**	SP-20
Site Address:	Telegraph & Greendale Road, Darfield	**Hand Auger No.**	HA-20
Town/City:	Canterbury	**Job No.:**	2510105
Logged By:	AA	**Checked By:**	FS
Logged Date:	07/04/25	**Checked Date:**	08/04/25
		Date:	31/03/25
		Weather:	Fine
		Operator:	AA

Geological Formation	Depth (m)	Sample Description	Graphic	USCS	D_r	Water Table	Undrained Shear Strength Su (kPa)	Blows per 100 mm of Penetration
		Silty TOPSOIL (OL), with minor gravel; dark brown. Stiff, moist, non-plastic; gravel, fine to medium, subround to subangular.		OL		Groundwater Not Encountered		1, 2, 1
		SILT (M), with minor gravel, with trace sand; yellow brown. Stiff, moist, non-plastic; gravel, fine to medium, subround to subangular; sand, fine.		M				3, 3, 14, 20
	0.5	EOH: 0.50m 0.5m: EOH, Refusal on Gravels.						0.5

Remarks:

Scala Penetrometer and Test Bore log tests give an indication of the ground condition at the location of the tests only. While they are representative of typical conditions across the site, they do not identify variations in the ground away from the test locations.

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SCALA PENETROMETER & HAND AUGER RESULTS

KIRK ROBERTS CONSULTING

Client:	Darfield Estates GP Ltd	**Scala Penetrometer:**	SP-21
Site Address:	Telegraph & Greendale Road, Darfield	**Hand Auger No.**	HA-21
Town/City:	Canterbury	**Job No.:**	2510105
Logged By:	AA	**Checked By:**	FS
Logged Date:	07/04/25	**Checked Date:**	08/04/25
		Date:	04/04/25
		Weather:	Fine
		Operator:	AA

Geological Formation	Depth (m)	Sample Description	Graphic	USCS	D_r	Water Table	Undrained Shear Strength Su (kPa)	Blows per 100 mm of Penetration
	0.5	Silty TOPSOIL (OL), with minor gravel; dark brown. Stiff, moist, non-plastic; gravel, fine to coarse, subround to subangular.		OL		Groundwater Not Encountered		1, 2, 2
		SILT (M), with some gravel, with trace sand; yellow brown. Stiff, moist, non-plastic; gravel, fine to medium, subround to subangular; sand, fine. EOH: 0.40m		M				4, 8, 20
		0.4m: EOH, Refusal on Gravels.						

0.5

Remarks:

Scala Penetrometer and Test Bore log tests give an indication of the ground condition at the location of the tests only. While they are representative of typical conditions across the site, they do not identify variations in the ground away from the test locations.

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SCALA PENETROMETER & HAND AUGER RESULTS

KIRK ROBERTS CONSULTING

Client:	Darfield Estates GP Ltd	**Scala Penetrometer:**	SP-22
Site Address:	Telegraph & Greendale Road, Darfield	**Hand Auger No.**	HA-22
Town/City:	Canterbury	**Job No.:**	2510105
Logged By:	AA	**Checked By:**	FS
Logged Date:	07/04/25	**Checked Date:**	08/04/25
		Date:	04/04/25
		Weather:	Fine
		Operator:	AA

Geological Formation	Depth (m)	Sample Description	Graphic	USCS	D_r	Water Table	Undrained Shear Strength Su (kPa)	Blows per 100 mm of Penetration
		Silty TOPSOIL (OL), with minor gravel; dark brown. Stiff, moist, non-plastic; gravel, fine to coarse, subround to subangular.		OL		Groundwater Not Encountered		1, 2, 2
		SILT (M), with some gravel, with trace sand; yellow brown. Stiff, moist, non-plastic; gravel, fine to medium, subround to subangular; sand, fine. EOH: 0.40m		M				5
		0.4m: EOH, Refusal on Gravels.						20
	0.5							0.5

Remarks:

Scala Penetrometer and Test Bore log tests give an indication of the ground condition at the location of the tests only. While they are representative of typical conditions across the site, they do not identify variations in the ground away from the test locations.

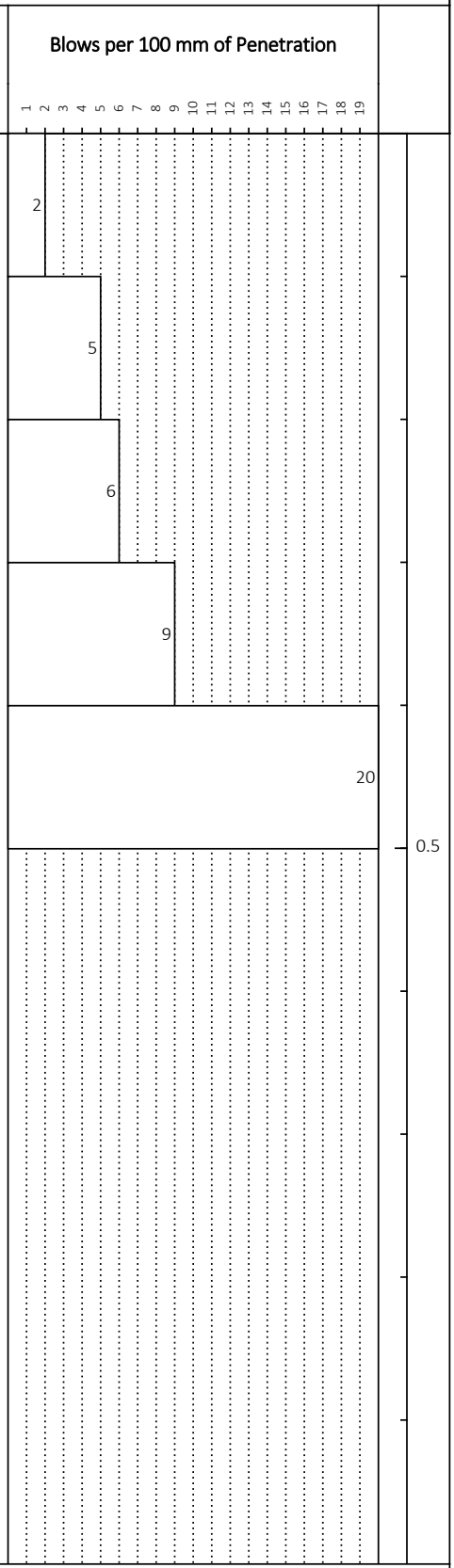
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SCALA PENETROMETER & HAND AUGER RESULTS

KIRK ROBERTS CONSULTING

Client:	Darfield Estates GP Ltd	**Scala Penetrometer:**	SP-23
Site Address:	Telegraph & Greendale Road, Darfield	**Hand Auger No.**	HA-23
Town/City:	Canterbury	**Job No.:**	2510105
Logged By:	AA	**Checked By:**	FS
Logged Date:	07/04/25	**Checked Date:**	08/04/25
		Date:	04/04/25
		Weather:	Fine
		Operator:	AA

Geological Formation	Depth (m)	Sample Description	Graphic	USCS	D_r	Water Table	Undrained Shear Strength Su (kPa)
	0.0	Silty TOPSOIL (OL), with some gravel; dark brown. Stiff, moist, non-plastic; gravel, fine to coarse, subround to subangular.		OL		Groundwater Not Encountered	
	0.5	SILT (M), with trace sand and gravel; yellow brown. Firm to stiff, moist, non-plastic; sand, fine, gravel, fine to medium, subround to subangular.		M			
		EOH: 0.50m					
		0.5m: EOH, Refusal on Gravels.					



Remarks:

Scala Penetrometer and Test Bore log tests give an indication of the ground condition at the location of the tests only. While they are representative of typical conditions across the site, they do not identify variations in the ground away from the test locations.

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SCALA PENETROMETER & HAND AUGER RESULTS

KIRK ROBERTS CONSULTING

Client:	Darfield Estates GP Ltd	**Scala Penetrometer:**	SP-24
Site Address:	Telegraph & Greendale Road, Darfield	**Hand Auger No.**	HA-24
Town/City:	Canterbury	**Job No.:**	2510105
Logged By:	AA	**Checked By:**	FS
Logged Date:	07/04/25	**Checked Date:**	08/04/25
		Date:	04/04/25
		Weather:	Fine
		Operator:	AA

Geological Formation	Depth (m)	Sample Description	Graphic	USCS	D_r	Water Table	Undrained Shear Strength Su (kPa)	Blows per 100 mm of Penetration
		Silty TOPSOIL (OL), with some gravel; dark brown. Stiff, moist, non-plastic; gravel, fine to coarse, subround to subangular.		OL		Groundwater Not Encountered		2, 2, 2
		SILT (M), with trace sand and gravel; yellow brown. Firm to stiff, moist, non-plastic; sand, fine, gravel, fine to medium, subround to subangular.		M				5, 4, 5, 13, 20
	0.5	EOH: 0.50m 0.5m: EOH, Refusal on Gravels.						0.5

Remarks:

Scala Penetrometer and Test Bore log tests give an indication of the ground condition at the location of the tests only. While they are representative of typical conditions across the site, they do not identify variations in the ground away from the test locations.

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SCALA PENETROMETER & HAND AUGER RESULTS

KIRK ROBERTS CONSULTING

Client:	Darfield Estates GP Ltd	**Scala Penetrometer:**	SP-25
Site Address:	Telegraph & Greendale Road, Darfield	**Hand Auger No.**	HA-25
Town/City:	Canterbury	**Job No.:**	2510105
Logged By:	AA	**Checked By:**	FS
Logged Date:	07/04/25	**Checked Date:**	08/04/25
		Date:	04/04/25
		Weather:	Fine
		Operator:	AA

Geological Formation	Depth (m)	Sample Description	Graphic	USCS	D_r	Water Table	Undrained Shear Strength Su (kPa)	Blows per 100 mm of Penetration
		Silty TOPSOIL (OL), with minor gravel; dark brown. Stiff, moist, non-plastic; gravel, fine to coarse, subround to subangular.		OL		Groundwater Not Encountered		1, 2, 2
		SILT (M), with some gravel, with trace sand; yellow brown. Stiff, moist, non-plastic; gravel, fine to medium, subround to subangular; sand, fine. EOH: 0.40m		M				10
		0.4m: EOH, Refusal on Gravels.						20
	0.5							0.5

Remarks:

Scala Penetrometer and Test Bore log tests give an indication of the ground condition at the location of the tests only. While they are representative of typical conditions across the site, they do not identify variations in the ground away from the test locations.

Generated with CORE-GS

SCALA PENETROMETER & HAND AUGER RESULTS

KIRK ROBERTS CONSULTING

Client:	Darfield Estates GP Ltd	**Scala Penetrometer:**	SP-26
Site Address:	Telegraph & Greendale Road, Darfield	**Hand Auger No.**	HA-26
Town/City:	Canterbury	**Job No.:**	2510105
Logged By:	AA	**Checked By:**	FS
Logged Date:	07/04/25	**Checked Date:**	08/04/25
		Date:	04/04/25
		Weather:	Fine
		Operator:	AA

Geological Formation	Depth (m)	Sample Description	Graphic	USCS	D_r	Water Table	Undrained Shear Strength Su (kPa)	Blows per 100 mm of Penetration
		Silty TOPSOIL (OL), with some gravel; dark brown. Stiff, moist, non-plastic; gravel, fine to coarse, subround to subangular.		OL		Groundwater Not Encountered		1, 2, 2
		SILT (M), with trace sand and gravel; yellow brown. Firm to stiff, moist, non-plastic; sand, fine, gravel, fine to medium, subround to subangular.		M				3, 10, 14, 20
	0.5	EOH: 0.50m 0.5m: EOH, Refusal on Gravels.						0.5

Remarks:

Scala Penetrometer and Test Bore log tests give an indication of the ground condition at the location of the tests only. While they are representative of typical conditions across the site, they do not identify variations in the ground away from the test locations.

Generated with CORE-GS

SCALA PENETROMETER & HAND AUGER RESULTS

KIRK ROBERTS CONSULTING

Client:	Darfield Estates GP Ltd	**Scala Penetrometer:**	SP-27
Site Address:	Telegraph & Greendale Road, Darfield	**Hand Auger No.**	HA-27
Town/City:	Canterbury	**Job No.:**	2510105
Logged By:	AA	**Checked By:**	FS
Logged Date:	07/04/25	**Checked Date:**	08/04/25
		Date:	04/04/25
		Weather:	Fine
		Operator:	AA

Geological Formation	Depth (m)	Sample Description	Graphic	USCS	D_r	Water Table	Undrained Shear Strength Su (kPa)	Blows per 100 mm of Penetration
		Silty TOPSOIL (OL), with minor gravel; dark brown. Stiff, moist, non-plastic; gravel, fine to coarse, subround to subangular.		OL		Groundwater Not Encountered		1, 2, 8
		SILT (M), with some gravel, with trace sand; yellow brown. Stiff, moist, non-plastic; gravel, fine to medium, subround to subangular; sand, fine. EOH: 0.40m		M				6
	0.5	0.4m: EOH, Refusal on Gravels.						20

Remarks:

Scala Penetrometer and Test Bore log tests give an indication of the ground condition at the location of the tests only. While they are representative of typical conditions across the site, they do not identify variations in the ground away from the test locations.

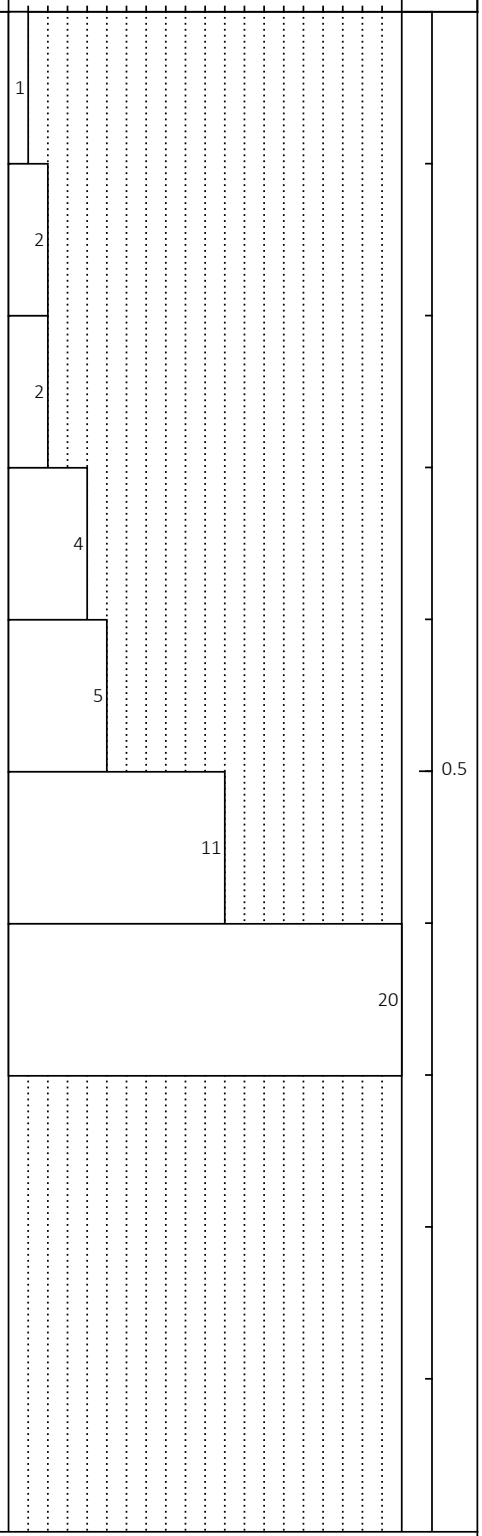
Generated with CORE-GS

SCALA PENETROMETER & HAND AUGER RESULTS

KIRK ROBERTS CONSULTING

Client:	Darfield Estates GP Ltd	**Scala Penetrometer:**	SP-28
Site Address:	Telegraph & Greendale Road, Darfield	**Hand Auger No.**	HA-28
Town/City:	Canterbury	**Job No.:**	2510105
Logged By:	AA	**Checked By:**	FS
Logged Date:	07/04/25	**Checked Date:**	08/04/25
		Date:	04/04/25
		Weather:	Fine
		Operator:	AA

Geological Formation	Depth (m)	Sample Description	Graphic	USCS	D_r	Water Table	Undrained Shear Strength Su (kPa)
	0.5	Silty TOPSOIL (OL), with minor gravel; dark brown. Stiff, moist, non-plastic; gravel, fine to coarse, subround to subangular.		OL		Groundwater Not Encountered	
		SILT (M), with some gravel, with trace sand; yellow brown. Stiff, moist, non-plastic; gravel, fine to medium, subround to subangular; sand, fine. EOH: 0.40m		M			
		0.4m: EOH, Refusal on Gravels.					



Remarks:

Scala Penetrometer and Test Bore log tests give an indication of the ground condition at the location of the tests only. While they are representative of typical conditions across the site, they do not identify variations in the ground away from the test locations.

Generated with CORE-GS

SCALA PENETROMETER & HAND AUGER RESULTS

KIRK ROBERTS CONSULTING

Client:	Darfield Estates GP Ltd	**Scala Penetrometer:**	SP-29
Site Address:	Telegraph & Greendale Road, Darfield	**Hand Auger No.**	HA-29
Town/City:	Canterbury	**Job No.:**	2510105
Logged By:	AA	**Checked By:**	FS
Logged Date:	07/04/25	**Checked Date:**	08/04/25
		Date:	04/04/25
		Weather:	Fine
		Operator:	AA

Geological Formation	Depth (m)	Sample Description	Graphic	USCS	D_r	Water Table	Undrained Shear Strength Su (kPa)	Blows per 100 mm of Penetration
	0.5	Silty TOPSOIL (OL), with minor gravel; dark brown. Stiff, moist, non-plastic; gravel, fine to coarse, subround to subangular.		OL		Groundwater Not Encountered		1, 2, 2
		SILT (M), with some gravel, with trace sand; yellow brown. Firm, moist, non-plastic; gravel, fine to medium, subround to subangular; sand, fine. EOH: 0.40m		M				3, 6, 20
		0.4m: EOH, Refusal on Gravels.						
	0.5							

Remarks:

Scala Penetrometer and Test Bore log tests give an indication of the ground condition at the location of the tests only. While they are representative of typical conditions across the site, they do not identify variations in the ground away from the test locations.

Generated with CORE-GS

SCALA PENETROMETER & HAND AUGER RESULTS

KIRK ROBERTS CONSULTING

Client:	Darfield Estates GP Ltd	**Scala Penetrometer:**	SP-30
Site Address:	Telegraph & Greendale Road, Darfield	**Hand Auger No.**	HA-30
Town/City:	Canterbury	**Job No.:**	2510105
Logged By:	AA	**Checked By:**	FS
Logged Date:	07/04/25	**Checked Date:**	08/04/25
		Date:	31/03/25
		Weather:	Fine
		Operator:	AA

Geological Formation	Depth (m)	Sample Description	Graphic	USCS	D_r	Water Table	Undrained Shear Strength Su (kPa)	Blows per 100 mm of Penetration
	0.0	Silty TOPSOIL (OL), with some gravel, with trace cobbles; dark brown. Stiff, moist, non-plastic; gravel, fine to coarse, subround to subangular.		OL		Groundwater Not Encountered		1, 2, 2, 2
		SILT (M), with minor gravel; yellow brown. Firm, moist, non-plastic; gravel, fine to medium, subround to subangular.		M				5
	0.5	EOH: 0.50m 0.5m: EOH, Refusal on Gravels.						20

Remarks:

Scala Penetrometer and Test Bore log tests give an indication of the ground condition at the location of the tests only. While they are representative of typical conditions across the site, they do not identify variations in the ground away from the test locations.

Generated with CORE-GS

SCALA PENETROMETER & HAND AUGER RESULTS

KIRK ROBERTS CONSULTING

Client:	Darfield Estates GP Ltd	**Scala Penetrometer:**	SP-31
Site Address:	Telegraph & Greendale Road, Darfield	**Hand Auger No.**	HA-31
Town/City:	Canterbury	**Job No.:**	2510105
Logged By:	AA	**Checked By:**	FS
Logged Date:	07/04/25	**Checked Date:**	08/04/25
		Date:	04/04/25
		Weather:	Fine
		Operator:	AA

Geological Formation	Depth (m)	Sample Description	Graphic	USCS	D_r	Water Table	Undrained Shear Strength Su (kPa)	Blows per 100 mm of Penetration
	0.0	Silty TOPSOIL (OL), with some gravel; dark brown. Stiff, moist, non-plastic; gravel, fine to coarse, subround to subangular.		OL		Groundwater Not Encountered		1, 2, 1
	0.5	SILT (M), with minor gravel, with trace sand; yellow brown. Firm, moist, non-plastic; gravel, fine, subround to subangular; sand, fine.		M				3, 3, 2
		Sandy SILT (MS), with trace gravel; yellow brown. Firm, moist, non-plastic; sand, fine; gravel, fine.		MS				2, 6
		EOH: 0.80m						
		0.8m: EOH, Refusal on Gravels.						20

Remarks:

Scala Penetrometer and Test Bore log tests give an indication of the ground condition at the location of the tests only. While they are representative of typical conditions across the site, they do not identify variations in the ground away from the test locations.

Generated with CORE-GS

SCALA PENETROMETER & HAND AUGER RESULTS

KIRK ROBERTS CONSULTING

Client:	Darfield Estates GP Ltd	**Scala Penetrometer:**	SP-32
Site Address:	Telegraph & Greendale Road, Darfield	**Hand Auger No.**	HA-32
Town/City:	Canterbury	**Job No.:**	2510105
Logged By:	AA	**Checked By:**	FS
Logged Date:	07/04/25	**Checked Date:**	08/04/25
		Date:	04/04/25
		Weather:	Fine
		Operator:	AA

Geological Formation	Depth (m)	Sample Description	Graphic	USCS	D_r	Water Table	Undrained Shear Strength Su (kPa)	Blows per 100 mm of Penetration
		Silty TOPSOIL (OL), with some gravel; dark brown. Stiff, moist, non-plastic; gravel, fine to coarse, subround to subangular.		OL		Groundwater Not Encountered		1, 2, 3
		SILT (M), with some gravel; yellow brown. Firm, moist, non-plastic; gravel, fine to medium, subround to subangular. EOH: 0.40m		M				20
	0.5	0.4m: EOH, Refusal on Gravels.						0.5

Remarks:

Scala Penetrometer and Test Bore log tests give an indication of the ground condition at the location of the tests only. While they are representative of typical conditions across the site, they do not identify variations in the ground away from the test locations.

Generated with CORE-GS

SCALA PENETROMETER & HAND AUGER RESULTS

KIRK ROBERTS CONSULTING

Client:	Darfield Estates GP Ltd	**Scala Penetrometer:**	SP-33
Site Address:	Telegraph & Greendale Road, Darfield	**Hand Auger No.**	HA-33
Town/City:	Canterbury	**Job No.:**	2510105
Logged By:	AA	**Checked By:**	FS
Logged Date:	07/04/25	**Checked Date:**	08/04/25
		Date:	04/04/25
		Weather:	Fine
		Operator:	AA

Geological Formation	Depth (m)	Sample Description	Graphic	USCS	D_r	Water Table	Undrained Shear Strength Su (kPa)	Blows per 100 mm of Penetration
	0.5	Silty TOPSOIL (OL), with some gravel; dark brown. Stiff, moist, non-plastic; gravel, fine to coarse, subround to subangular.		OL		Groundwater Not Encountered		1, 2, 3
		SILT (M), with some gravel; yellow brown. Firm to stiff, moist, non-plastic; gravel, fine to medium, subround to subangular. EOH: 0.40m		M				7
		0.4m: EOH, Refusal on Gravels.						20

Remarks:

Scala Penetrometer and Test Bore log tests give an indication of the ground condition at the location of the tests only. While they are representative of typical conditions across the site, they do not identify variations in the ground away from the test locations.

Generated with CORE-GS

SCALA PENETROMETER & HAND AUGER RESULTS

KIRK ROBERTS CONSULTING

Client:	Darfield Estates GP Ltd	**Scala Penetrometer:**	SP-34
Site Address:	Telegraph & Greendale Road, Darfield	**Hand Auger No.**	HA-34
Town/City:	Canterbury	**Job No.:**	2510105
Logged By:	AA	**Checked By:**	FS
Logged Date:	07/04/25	**Checked Date:**	08/04/25
		Date:	04/04/25
		Weather:	Fine
		Operator:	AA

Geological Formation	Depth (m)	Sample Description	Graphic	USCS	D_r	Water Table	Undrained Shear Strength Su (kPa)	Blows per 100 mm of Penetration
	0.5	Silty TOPSOIL (OL), with some gravel; dark brown. Stiff, moist, non-plastic; gravel, fine to coarse, subround to subangular.		OL		Groundwater Not Encountered		1, 1, 1
		SILT (M), with trace gravel; yellow brown. Firm to stiff, moist, non-plastic; gravel, fine to medium, subround to subangular.		M				2, 3, 2
		Sandy SILT (MS); yellow brown. Firm to stiff, moist; sand, fine.		MS				6, 20
		EOH: 0.80m						
		0.8m: EOH, Refusal on Gravels.						

0.5

Remarks:

Scala Penetrometer and Test Bore log tests give an indication of the ground condition at the location of the tests only. While they are representative of typical conditions across the site, they do not identify variations in the ground away from the test locations.

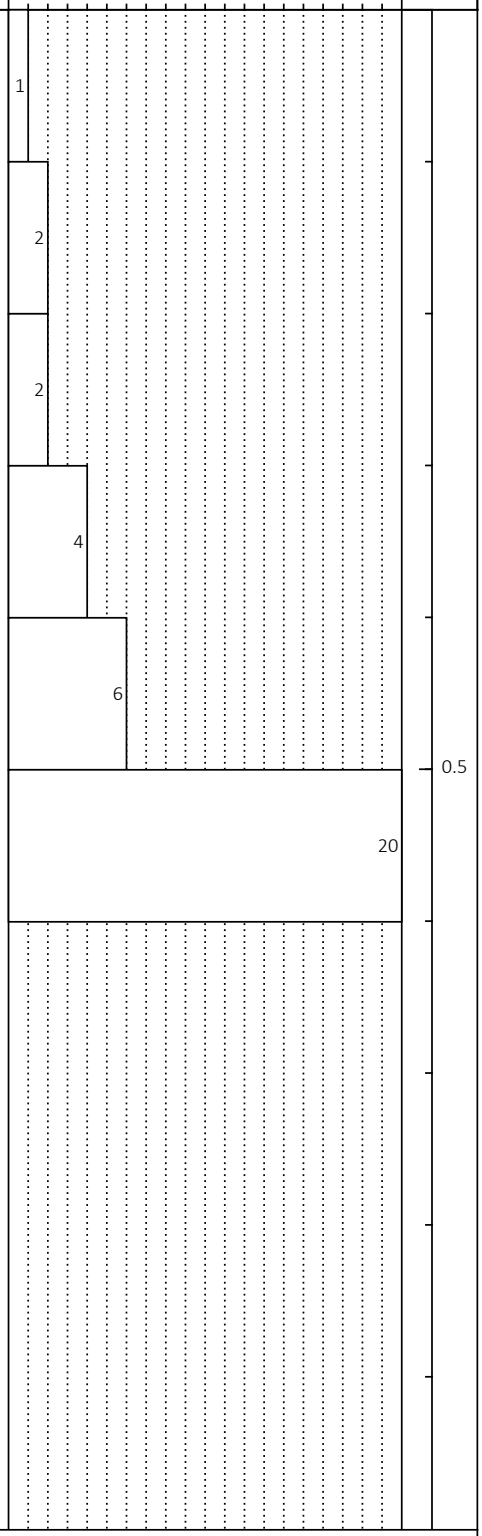
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SCALA PENETROMETER & HAND AUGER RESULTS

KIRK ROBERTS CONSULTING

Client:	Darfield Estates GP Ltd	**Scala Penetrometer:**	SP-35
Site Address:	Telegraph & Greendale Road, Darfield	**Hand Auger No.**	HA-35
Town/City:	Canterbury	**Job No.:**	2510105
Logged By:	AA	**Checked By:**	FS
Logged Date:	07/04/25	**Checked Date:**	08/04/25
		Date:	04/04/25
		Weather:	Fine
		Operator:	AA

Geological Formation	Depth (m)	Sample Description	Graphic	USCS	D_r	Water Table	Undrained Shear Strength Su (kPa)
	0.5	Silty TOPSOIL (OL), with trace gravel; dark brown. Stiff, moist, non-plastic; gravel, fine to medium, subround to subangular.		OL		Groundwater Not Encountered	
		SILT (M), with some gravel, with trace sand; yellow brown. Firm, moist, non-plastic; gravel, fine to medium, subround to subangular; sand, fine. EOH: 0.40m		M			
		0.4m: EOH, Refusal on Gravels.					



Remarks:

Scala Penetrometer and Test Bore log tests give an indication of the ground condition at the location of the tests only. While they are representative of typical conditions across the site, they do not identify variations in the ground away from the test locations.

Generated with CORE-GS

SCALA PENETROMETER & HAND AUGER RESULTS

KIRK ROBERTS CONSULTING

Client:	Darfield Estates GP Ltd	**Scala Penetrometer:**	SP-36
Site Address:	Telegraph & Greendale Road, Darfield	**Hand Auger No.**	HA-36
Town/City:	Canterbury	**Job No.:**	2510105
Logged By:	AA	**Checked By:**	FS
Logged Date:	07/04/25	**Checked Date:**	08/04/25
		Date:	04/04/25
		Weather:	Fine
		Operator:	AA

Geological Formation	Depth (m)	Sample Description	Graphic	USCS	D_r	Water Table	Undrained Shear Strength Su (kPa)	Blows per 100 mm of Penetration
		Silty TOPSOIL (OL), with some gravel; dark brown. Stiff, moist, non-plastic; gravel, fine to coarse, subround to subangular.		OL		Groundwater Not Encountered		1, 2, 2
		SILT (M), with some gravel; yellow brown. Firm, moist, non-plastic; gravel, fine to medium, subround to subangular.		M				3, 12
	0.5	EOH: 0.50m 0.5m: EOH, Refusal on Gravels.						20

0.5

Remarks:

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SCALA PENETROMETER & HAND AUGER RESULTS

KIRK ROBERTS CONSULTING

Client:	Darfield Estates GP Ltd	**Scala Penetrometer:**	SP-37
Site Address:	Telegraph & Greendale Road, Darfield	**Hand Auger No.**	HA-37
Town/City:	Canterbury	**Job No.:**	2510105
Logged By:	AA	**Checked By:**	FS
Logged Date:	07/04/25	**Checked Date:**	08/04/25
		Date:	04/04/25
		Weather:	Fine
		Operator:	AA

Geological Formation	Depth (m)	Sample Description	Graphic	USCS	D_r	Water Table	Undrained Shear Strength Su (kPa)	Blows per 100 mm of Penetration
		Silty TOPSOIL (OL), with some gravel; dark brown. Stiff, moist, non-plastic; gravel, fine to coarse, subround to subangular.		OL		Groundwater Not Encountered		1, 2, 3
		Gravelly SILT (M); yellow brown. Stiff, moist, non-plastic; gravel, fine to medium, subround to subangular. EOH: 0.40m		M				6
	0.5	0.4m: EOH, Refusal on Gravels.						20

Remarks:

Scala Penetrometer and Test Bore log tests give an indication of the ground condition at the location of the tests only. While they are representative of typical conditions across the site, they do not identify variations in the ground away from the test locations.

Generated with CORE-GS

SCALA PENETROMETER & HAND AUGER RESULTS

KIRK ROBERTS CONSULTING

Client:	Darfield Estates GP Ltd	**Scala Penetrometer:**	SP-38
Site Address:	Telegraph & Greendale Road, Darfield	**Hand Auger No.**	HA-38
Town/City:	Canterbury	**Job No.:**	2510105
Logged By:	AA	**Checked By:**	FS
Logged Date:	07/04/25	**Checked Date:**	08/04/25
		Date:	04/04/25
		Weather:	Fine
		Operator:	AA

Geological Formation	Depth (m)	Sample Description	Graphic	USCS	D_r	Water Table	Undrained Shear Strength Su (kPa)	Blows per 100 mm of Penetration (1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19)
		Silty TOPSOIL (OL), with some gravel; dark brown. Stiff, moist, non-plastic; gravel, fine to coarse, subround to subangular.		OL		Groundwater Not Encountered		1
								1
								1
		Gravelly SILT (M), with trace sand; yellow brown. Firm to stiff, moist, non-plastic; gravel, fine to medium, subround to subangular; sand, fine. EOH: 0.40m		M				7
		0.4m: EOH, Refusal on Gravels.						20
	0.5							0.5

Remarks:

Scala Penetrometer and Test Bore log tests give an indication of the ground condition at the location of the tests only. While they are representative of typical conditions across the site, they do not identify variations in the ground away from the test locations.

Generated with CORE-GS

SCALA PENETROMETER & HAND AUGER RESULTS

KIRK ROBERTS CONSULTING

Client:	Darfield Estates GP Ltd	**Scala Penetrometer:**	SP-39
Site Address:	Telegraph & Greendale Road, Darfield	**Hand Auger No.**	HA-39
Town/City:	Canterbury	**Job No.:**	2510105
Logged By:	AA	**Checked By:**	FS
Logged Date:	07/04/25	**Checked Date:**	08/04/25
		Date:	04/04/25
		Weather:	Fine
		Operator:	AA

Geological Formation	Depth (m)	Sample Description	Graphic	USCS	D_r	Water Table	Undrained Shear Strength Su (kPa)
	0.0	Silty TOPSOIL (OL), with some gravel; dark brown. Stiff, moist, non-plastic; gravel, fine to coarse, subround to subangular.		OL		Groundwater Not Encountered	
	0.5	SILT (M), with minor gravel, with trace sand; yellow brown. Firm to stiff, moist, non-plastic; gravel, fine to medium, subround to subangular; sand, fine.		M			
		Sandy SILT (MS); yellow brown. Firm, moist, non-plastic; sand, fine. EOH: 0.70m		MS			
		0.7m: EOH, Refusal on Gravels.					

Blows per 100 mm of Penetration

Depth (m)	Blows per 100 mm
0.0 – 0.1	1
0.1 – 0.2	2
0.2 – 0.3	3
0.3 – 0.4	3
0.4 – 0.5	8
0.5 – 0.6	2
0.6 – 0.7	3
0.7 – 0.8	20

0.5

Remarks:

Scala Penetrometer and Test Bore log tests give an indication of the ground condition at the location of the tests only. While they are representative of typical conditions across the site, they do not identify variations in the ground away from the test locations.

Generated with CORE-GS

SCALA PENETROMETER & HAND AUGER RESULTS

KIRK ROBERTS CONSULTING

Client:	Darfield Estates GP Ltd	**Scala Penetrometer:**	SP-40
Site Address:	Telegraph & Greendale Road, Darfield	**Hand Auger No.**	HA-40
Town/City:	Canterbury	**Job No.:**	2510105
Logged By:	AA	**Checked By:**	FS
Logged Date:	07/04/25	**Checked Date:**	08/04/25
		Date:	04/04/25
		Weather:	Fine
		Operator:	AA

Geological Formation	Depth (m)	Sample Description	Graphic	USCS	D_r	Water Table	Undrained Shear Strength Su (kPa)	Blows per 100 mm of Penetration
	0.5	Silty TOPSOIL (OL), with some gravel; dark brown. Stiff, moist, non-plastic; gravel, fine to coarse, subround to subangular.		OL		Groundwater Not Encountered		1, 2, 2
		SILT (M), with some gravel; yellow brown. Firm, moist, non-plastic; gravel, fine to medium, subround to subangular. EOH: 0.40m		M				4, 10, 20
		0.4m: EOH, Refusal on Gravels.						

0.5

Remarks:

Scala Penetrometer and Test Bore log tests give an indication of the ground condition at the location of the tests only. While they are representative of typical conditions across the site, they do not identify variations in the ground away from the test locations.

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Appendix D Statement of Professional Opinion

Statement of Professional Opinion

on the Suitability of Land for Subdivision

ISSUED BY:

Kirk Roberts Consulting Engineers Limited

(Geotechnical engineering firm or suitably qualified engineer)

TO:

Darfield Estates GP Ltd

(Owner/Developer)

TO BE SUPPLIED TO:

Selwyn District Council

(Territorial authority)

IN RESPECT OF:

Subdivision of Part of Rural Section 25013, Rural Section 28136, Part Rural Section 22945 and Part Rural Section 25014 into 445 lots

(Description of infrastructure/land development)

AT:

Telegraph & Greendale Roads, Darfield

(Address)

I Firas Salman (Geoprofessional) ON BEHALF OF: Kirk Roberts Consulting Engineers Ltd (Geotechnical engineering firm)

Hereby confirm:

1. I am a suitably qualified and experienced geoprofessional employed by 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 29/04/2025 has been carried out in accordance with the Requirements of the Territorial authority and includes:

   (i) Details of and the results of my/the site investigations

   (ii) An assessment of the slope stability and ground bearing capacity confirming the location and appropriateness of building sites.

   (iii) 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:

   (i) Refer to Section 10 of our Natural Hazard Assessment Report for Proposed Subdivision, reference 2510105, rev. 01, dated 29/04/2025.

   (ii) _____

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 statement 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.)

Firas Salman Date: 29/04/2025

Signature of engineer, for an on behalf of Kirk Roberts Consulting Engineers Ltd

Qualifications and experience:

PhD(Geo), CMEngNZ, CPEng (1023569), IntPE(NZ)

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

Kirk Roberts Consulting

Engineering (Environmental/Contaminated Land, Geotechnical, Civil, Structural, Fire), Architecture, Building Information Modelling

Auckland, Hamilton, Tauranga, ***Christchurch****, Dunedin, Queenstown*

337 Saint Asaph Street, Christchurch Central City, Christchurch 8011

03 379 8600

Please visit www.krikroberts.co.nz to learn about our vision, purpose and values.