



19 December 2025

- Courtney Dupont
Body Corporate 552171 (C/- Pitcaithly Body Corporate Services Limited)
10 Hurley Street,
Christchurch Central,
CHRISTCHURCH 8011

Dear Courtney

C054250005 - GEOTECHNICAL GROUND BEARING CAPACITY ASSESSMENT FOR 10 HURLEY STREET, CHRISTCHURCH CENTRAL, CHRISTCHURCH.

1.0 Introduction

Body Corporate 552171 (the client) have engaged Pattle Delamore Partners Limited (PDP) to undertake geotechnical investigations and bearing capacity assessment on a block of four connected townhouse units located at 10 Hurley Street, Christchurch Central (the site) that is currently being structurally assessed.

1.1 Purpose

The purpose of the geotechnical investigation is to provide an assessment of the site-specific ground conditions to assess the bearing capacity below the existing foundations of all four units.

1.2 Scope and Objectives

- Desktop review of the general site geology and ground conditions.
- Subsurface geotechnical investigations, including hand augers (HA), Dynamic Cone Penetration (scala) tests.
- Reporting and data processing of geotechnical site investigation findings.
- Provide an interpretative ground model and geotechnical parameters for preliminary ground bearing capacity assessment for the existing foundation.

1.3 Site Description

The site is located at 10 Hurley Street, Christchurch Central and is legally described by four unit titles, Units 1-4 DP 552171, on Lot 1 DP 527037. The site is a series of four residential properties down a private right-of-way accessed off Hurley Street. Topographically, the site is generally flat and situated on an inside loop of the Avon River. The Avon River is located approximately 50 m northwest of the boundary.

2.0 Background / Desktop Review

The published geological map of the Christchurch Urban Area (Brown & Weeber, 1992) indicates that the site is underlain by the alluvial deposits of the Yaldhurst Member (spy) described as “*dominantly alluvial sand and silt overbank deposits*”.



During the Canterbury Earthquake Sequence (CES) the site was observed to experience moderate to severe liquefaction ejecta and some cracking from lateral spreading was observed through the site, perpendicular to Hurley Street (Canterbury Geotechnical Database, 2013). The site is currently mapped as technical category 3 (TC3), which is defined by the Ministry of Business Innovation and Employment (2013) as “*moderate to significant land damage is possible in future large earthquakes. Foundation solutions should be based on site-specific geotechnical investigation and specific engineering design.*”

3.0 Geotechnical Site investigation

A site walkover was completed on 3 November 2025 and shallow geotechnical site investigations were completed by a PDP engineering geologist on 8 December 2025 (refer to site plan in Appendix A).

3.1 Site Observations

The following is a summary of site observations:

- ∴ Prior to an intrusive subsurface investigation, a service locate was completed and established that there were services located under the site through the garden areas of Units 1-3. Test locations were positioned as to avoid these services.
- ∴ The site was built up by approximately 1.0 m above the level of Hurley Street and was retained by a series of three concrete block walls on the northern boundary of Unit 1.
- ∴ No signs of differential settlement were observed on the exterior of the units.

3.2 Ground Investigations

Hand augering and scala tests were carried out from the surface to assess the ground conditions and the soil strength profile of the subsurface. The soil was logged in accordance with New Zealand Geotechnical Society logging guidelines (2005).

- ∴ Six Hand Augers were completed (HA02a to HA04b).
- ∴ Scala tests were carried out adjacent to each hand auger.
- ∴ In-situ shear vane tests were completed in hand auger holes where cohesive material was encountered.
- ∴ Hand auger holes were backfilled with arisings.

Hand augers terminated at depths between 0.3 - 2.1 m below ground level (bgl), where refusal or collapse was encountered. Scalias were completed until refusal of penetration was encountered between 0.2 and 2.2 m bgl. “Refusal” was accepted to be 20 blows per 100 mm of penetration.

Hand auger numbering corresponds with the unit numbers, with two hand augers completed within each unit boundary, denoted by “a” or “b”. No scalias or hand augers could be completed within the Unit 1 boundaries due to the proximity of power cable services and the shallow refusal of the hand auger. A suspected service trench was identified in HA04a, this has been excluded from the site ground model.

The hand auger and scala logs are attached in Appendix B.

3.3 Groundwater

Groundwater was encountered within the natural soils at between 1.6 and 1.7 m bgl. The groundwater table identified at the site corresponds with the approximate level of the Avon River located 50 m northwest of the site.

4.0 Geotechnical Assessment

4.1 Geotechnical Ground Model

- ∴ **Non-engineered Fill:** The site is generally underlain by a layer of non-engineered fill material. The non-engineered fill comprises dark silt material mixed with gravel, brick and concrete fragments extending to between 0.6 and 1.5 m bgl. The fill depth generally increased towards the north of the site. Fill underlying Unit 1 is expected to be between 1.0 m – 1.5 m depth based on the height of the retaining structures and no non-engineered fill was encountered in Unit 4 (HA04b). Scala testing within the fill resulted in between 1 to 7 blows per 100 mm penetration and shear vane testing indicated an undrained peak shear strength of between 132 to 169 kPa (corrected).
- ∴ **Alluvial Sands and Silts:** Underlying the fill is the Yaldhurst Member, consisting of alluvial fine sand and silt deposits. Scala testing within the alluvial deposits resulted in between 1 to 11 blows per 100 mm penetration, indicating loose to medium dense material as defined by NZGS (2005). Shear vane testing indicated an undrained peak shear strength of between 71 to 73 kPa (corrected) within the silt layers. Residual shear strength was measured to be 26 kPa (corrected) indicating the natural soils are considered sensitive and prone to shear strength reduction when exposed or reworked. The soil strength generally increased with depth, soils below 1.0 m bgl achieved scala results of >3 blows per 100 mm penetration.

Scala refusal was encountered at depths between 1.8 and 2.2 m bgl, where 20+ blows were encountered (per 100 mm penetrated), refusal is inferred from the scalas and hand augers to be within gravels.

Hand augers and scalas completed approximately 0.5 m from Unit 2 and Unit 3 indicated the presence of a compacted gravel raft underlying the dwelling foundations. The raft consisted of very dense, sandy, fine to medium gravel. Scala tests refused (>20 blows per 100 mm penetration) within the gravels.

4.2 Geotechnical Soil Parameters

The following preliminary soil parameters were based on the site-specific investigation results and PDP’s experience in Central Christchurch soils. Soil parameters are summarised in Table 1.

Table 1: Geotechnical Soil Parameters¹

Soil Type	Approximate Depth to Base (m bgl)	Unit Weight (γ) (kN/m ³)	Internal Friction Angle (ϕ') (degrees)	Effective Cohesion (c) (kPa)
Gravel Raft	1.0	22-24	32-35	0
Non-engineered Fill	0.6 – 1.5	18-19	28-32	0
Yaldhurst Member Silt	1.1 – 1.7	18-19	30-32	2
Yaldhurst Member Fine Sand	1.7 – 2.1	19-20	28-32	0
Yaldhurst Member Gravel	>2.5 m	19-21	32-38	0

Notes:

1. Soil parameters are derived based on limited site-specific soil investigation locations and PDP’s experience in similar soils and are correlated with the in-situ strength testing results.
- 2.

4.3 Foundation Assessment and Considerations

The Geotechnical Ultimate Bearing Capacity (GUBC) is based on soil parameters in Table 1 and an estimation from the scala penetrometer results. Due to the unknown geometry, depth and composition (material and compaction standard) of the foundations directly underlying the units, the GUBC has been estimated. The estimation was calculated applying the commonly used correlation of scala blows and the allowable bearing capacity (ABC) in Stockwell (1979). As outlined in Stockwell (1979) a safety factor of 3 was used to convert ABC to GUBC.

The results of the correlation indicate a highly variable GUBC of between 80 kPa and 500 kPa within the non-engineered fill material (i.e., <1.0 – 1.2 m bgl). Natural (i.e., alluvial) sand encountered below 1.2 m bgl indicate a consistent GUBC of >200 kPa.

5.0 Conclusions and Geotechnical Recommendations

The following conclusions and geotechnical recommendations are based on the above geotechnical investigation and assessment.

- ∴ The site is underlain by non-engineered fill and alluvial sand and silt deposits which was encountered beneath topsoil. A dense material inferred to be gravel was encountered at between 1.8 and 2.2 m bgl. Groundwater was encountered at 1.6 to 1.7 m bgl. It is unclear if the non-engineered fill has been removed from under the building footprint prior to the placement of the gravel raft.
- ∴ A gravel raft is present, underlying the dwellings. Based on limited testing due to accessibility, the gravel appears to be adequately compacted at the areas where PDP have completed scala penetrometer testing adjacent to Unit 2 and Unit 3.
- ∴ The Geotechnical Ultimate Bearing Capacity has been estimated based on the scala penetrometer results. Generally, blow counts of > 3 blows per 100 mm (of penetration) were encountered from 1.0-1.2 m bgl, corresponding with a GUBC of 200 kPa below this depth.
- ∴ The GUBC of 200 kPa generally required for a compacted gravel raft was not available within the upper 1.0 m of soil. It should be considered that testing was done on the outer periphery of the foundations and therefore the exact GUBC under the dwellings cannot be confirmed.

6.0 References

- Brown, L.J. & Weeber, J.H. (1992), Geology of the Christchurch urban area. Scale 1:25000. Institute of Geological and Nuclear Sciences geological map 1. One sheet. Institute of Geological and Nuclear Sciences Limited, Lower Hutt, New Zealand.
- Canterbury Geotechnical Database (2013). Liquefaction and Lateral Spreading Observations, Map Layer CGD0300 - 22 September 2016, retrieved 15/12/2025.
- Stockwell, M.J. (1979). Determination of allowable bearing pressure under small structures. New Zealand Engineering, 32, 6.
- Ministry of Business, Innovation and Employment (2013). Residential Foundation Technical Categories map. First published by the on 28 October 2011 and updated 5 December 2013.
- New Zealand Geotechnical Society (2005). Field description of soil and rock – guideline for the field classification and description of soil and rock for engineering purposes.

7.0 Limitations

This report has been prepared by Pattle Delamore Partners Limited (PDP) on the basis of information provided by Body Corporate 552171 (C/- Pitcaithly Body Corporate Services Limited) and Maynard Marks. PDP has not independently verified the provided information and has relied upon it being accurate and sufficient for use by PDP in preparing the report. PDP accepts no responsibility for errors or omissions in, or the currency or sufficiency of, the provided information.

This report has been prepared by PDP on the specific instructions of Body Corporate 552171 (C/- Pitcaithly Body Corporate Services Limited) for the limited purposes described in the report. PDP accepts no liability if the report is used for a different purpose or if it is used or relied on by any other person. Any such use or reliance will be solely at their own risk.

This document has been prepared based on a series of shallow hand augers, scala penetrometer tests and in situ shear vane testing. The site conditions as described in this document have been interpreted from, and are subject to, this information and its limitations and accordingly PDP does not represent that its interpretation accurately represents the full site conditions.

The advice and opinions expressed in this document are based on the observation and sampling of a series of hand augers at the site. The geological and associated environmental conditions interpolated between the hand augers are not guaranteed to be accurate.

© 2025 Pattle Delamore Partners Limited

Yours faithfully

PATTLE DELAMORE PARTNERS LIMITED


Prepared by



Ethan Walsh

Engineering Geologist

Reviewed by



Izak Breytenbach

Service Leader – Geotechnics

Approved by



Matt Engel

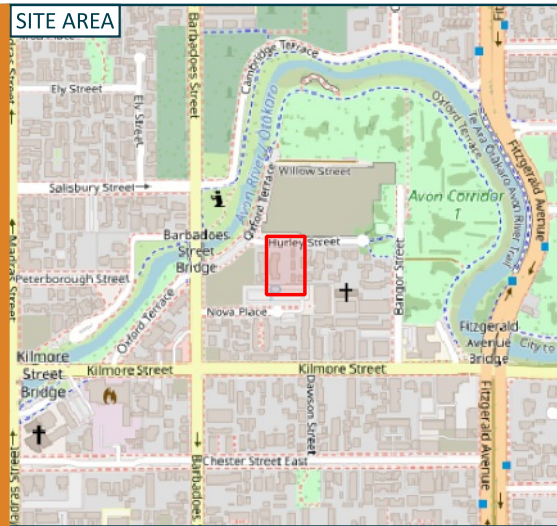
Technical Director – Geotechnics

Copy to: Daniel Kennett (Maynard Marks)



BODY CORPORATE 552171 (C/- PITCAITHLY BODY CORPORATE SERVICES LIMITED) - C054250005 - GEOTECHNICAL
GROUND BEARING CAPACITY ASSESSMENT FOR 10 HURLEY STREET, CHRISTCHURCH CENTRAL, CHRISTCHURCH.

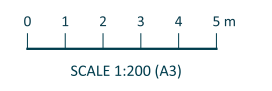
Appendix A: Site Map



KEY:

PDP INVESTIGATIONS

- LOGGED
- REFUSAL
- UNIT BOUNDARIES
- SITE BOUNDARY



THIS DRAWING REMAINS THE PROPERTY OF PATTLE DELAMORE PARTNERS LTD AND MAY NOT BE REPRODUCED OR ALTERED WITHOUT WRITTEN PERMISSION. NO LIABILITY SHALL BE ACCEPTED FOR UNAUTHORISED USE OF THE DRAWING.

A	FINAL	DEC 25	EW
NO.	REVISION	DATE	BY

SOURCE:
 1. BASEMAP AERIAL AND SITE BOUNDARY SOURCED FROM THE LINZ DATA SERVICE AND LICENSED FOR REUSE UNDER THE CC BY 4.0 LICENCE.
 2. SITE INVESTIGATION LOCATIONS ARE NOT SURVEYED AND ARE APPROXIMATE ONLY.

CLIENT
 Body Corporate
 552171

FIGURE 1: PDP WALKOVER OBSERVATIONS AND INVESTIGATION LOCATIONS

PROJECT
 C054250005L001 - GEOTECHNICAL BEARING CAPACITY ASSESSMENT, 10 HURLEY STREET, CHRISTCHURCH CENTRAL CITY



BODY CORPORATE 552171 (C/- PITCAITHLY BODY CORPORATE SERVICES LIMITED) - C054250005 - GEOTECHNICAL
GROUND BEARING CAPACITY ASSESSMENT FOR 10 HURLEY STREET, CHRISTCHURCH CENTRAL, CHRISTCHURCH.

Appendix B: PDP Investigation Logs

INVESTIGATION LOG

Job No.: C054250005

Test No.: HA04a

Sheet: 1 of 1

Date: 08/12/25

Client:
Body Corporate 552171

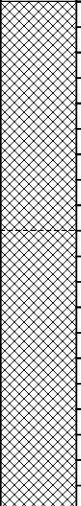
Site Address:
10 Hurley Street, Christchurch Central City

Project:
Geotechnical Bearing Capacity Assessment, Hurley Street

Coordinates:
1571477.7mE, 5180774.0mN (NZTM)

Ground Level mRL:

3.5m (NZVD2016)

Interpretation	Geological Description <small>Soil and Rock logged in accordance with New Zealand Geotechnical Society field description of soil and rock (2005).</small>	Graphic Log	Depth (m)	RL (m)	Squeeze Zone	Samples	Scala Penetrometer <small>(Blows / 100 mm)</small>										Vane Shear Strength (kPa) <small>Vane:</small>				Water					
							2	4	6	8	10	12	14	16	18	50	100	150	200	Values						
Non-Engineered Fill	Fine SAND, with minor silt, with trace rootlets; greyish brown. Loosely Packed; moist; poorly graded.																									Groundwater Not Encountered
	Fine to medium GRAVEL, with some silt and sand; greyish brown. Loosely Packed; moist; poorly graded; gravel, angular to subangular, unweathered to slightly weathered, greywacke; sand, fine to coarse; uncompacted gravels. [TRENCH FILL].		0.5	3.0																						
	EOH: 1.00m Services Encountered		1.0	2.5																						
			1.5	2.0																						
			2.0	1.5																						
			2.5	1.0																						

Remarks

- Scala penetrometer completed adjacent to hand auger hole.
- Hand auger backfilled with arisings.
- No groundwater encountered.

Investigation Type

- Hand Auger
 Test Pit

Water

- ▼ Standing Water Level
← In flow
▷ Out flow

Contractor:

PDP

Rig/Plant Used:

75 mm HAND AUGER

Logged By:

EW

Checked By:

SmcV

Hole Depth:

1.00 m

