P25145.V1

SITE SUITABILTY ASSESSMENT

THIS REPORT IS FOR RESOURCE CONSENT PURPOSES ONLY

102D Maungakawa Road, Cambridge

CLIENT: WARREN SWAIN

DATE: 2ND MAY.2025

EMAIL: JAMES@PROBASE.CO.NZ

Report Prepared for: Warren Swain

Note: The information contained in this document is solely for the use of the Client identified above for the purpose for which it has been prepared and the Author undertakes no duty to or accepts any responsibility to any third party who may rely upon this document.

Revision:	Date:	Details:	Prepared by:	Reviewed & Approved by:
0	02.05.2025	Final	Charlie Banks	James Harper

QUALITY ASSURANCE STATEMENT		
Task	**Responsibility**	**Signature**
Testing by:	Pritpal Singh Geotechnical Engineer Diploma (Civil), B.Tech. (Civil), MEngNZ	
Report by:	Charlie Banks NZDE (Civil), MEngNZ	
Civils by:	Ngaire Dampney BSc, GradErth, NZDE (Civil)	
Reviewed and Approval by:	John Warrington Principal Geotechnical Engineer BSc; MSc; CMEngNZ; CPEng (Geo/Civil)	

PROPOSED DEVELOPMENT SUMMARY

The following provides a summary of the requirements Probase Engineering recommends for the proposed subdivision at 102D Maungakawa Road, Cambridge.

Parameters	Preliminary Recommendations
Liquefaction	**Category 'TC2'.**
Slope Stability	**Slope stability satisfies the requirements of NZS3604: 2011.**
Foundations	**Foundation recommendations for Southern Section of Site (MA01 and MA02):** ○ The GI beneath the site identified organic soils, including PEAT, to a depth of up to 1.7m begl. Liquefiable soils have also been identified below a depth of from 2.6m begl. ○ It should be noted, however, that the ground investigation undertaken for the proposed development to the west of the site identified improving ground below the organic soils, with piled foundations recommended ○ Specific Engineer Designed Pile type foundations to support suspended timber floor or concrete raft. **Foundation recommendations for Northern Section of Site (MA03 and MA04):** ○ Option 1: Specific Engineer Designed 'TC2' raft type foundations. ○ Option 2: **'**TC2' 'Type A or B' pile foundations with suspended timber floors. *Results are based on limited information available at the time of preliminary investigations. To confirm the recommendations, it is recommended that further testing and considerations be made once detailed development plans becomes available at* ***the Building Consent stage.***

Parameters	Civil Site Recommendations
Stormwater	Probase Engineering recommends the use of above ground detention tanks to mitigate stormwater discharges (with a portion available for potable water use for a new dwelling). It is recommended that the overflow pipe is directed to a swale or soakage trench
Wastewater	Wastewater treatment and disposal via Primary or Secondary Treatment.

Contents

1 INTRODUCTION

1.1 ENGAGEMENT AND PROJECT DETAILS

Probase Engineering was engaged by Warren Swain to carry out a Site Suitability Assessment at 102D Maungakawa Road, Cambridge. The site is a rural property situated within the low alluvial hills typical of the Waikato Region and is legally described as 'Lot 2 DP 351938'.

The area of investigation covered the eastern section of the property. Within this area, the ground is generally near level to gently sloping towards the south-west into an existing shallow pond with a wetland situated within the middle of the overall lot (i.e., to the west of the area under investigation). Based on contour data from the Waikato Regional Council GIS, the ground level within the area of interest ranged from approximately 71m RL to 73m RL. (all RL's are relative to the Moturiki Datum).

The proposed site is currently an open area covered with mown grass, as shown on the latest aerial photograph below, refer Figure 1.

Figure 1: Indicative location of the investigated area at the subject site.

1.2 EXISTING GEOTECHNICAL INFORMATION

The following geotechnical report, undertaken for the proposed development within the same lot to the west of the site, was available to Probase Engineering at the time of testing:

- *"Geotechnical Assessment – 102D Maungakawa Road, Cambridge"; Ref:P24465.REVB; (GAR)*[1]

The report is to be read in conjunction with this report regarding:

- Geology and soil classification.
- Slope stability.
- Liquefaction.
- Foundation recommendations.

1.3 PROPOSED DEVELOPMENT

The project brief provided by Warren Swain advises that it is proposed to subdivide the subject site into 2 separate lots.

[1] "Geotechnical Assessment – 102D Maungakawa Road, Cambridge"; Ref:P24465.REVB; Probase Engineering; February 2025

2 GROUND INVESTIGATIONS

2.1 REGIONAL GEOLOGY

Published geological information[2] describes the geology within the area of the subject site as: "OIS3-OIS2 (Late Pleistocene) river deposits (Hinuera Formation) comprised of Cross-bedded pumice sand, silt and gravel with interbedded peat."

Absolute age (min)	0.012 million years
Absolute age (max)	0.027 million years

2.2 ON-SITE INVESTIGATIONS

Ground investigations of the site was undertaken within the subject site and comprised the following:

- 4 No. Machine Augers (HA) between 2000mm - 4500mm depth below existing ground level (begl).
- Shear Vane tests *(undrained shear strength of cohesive soils).*
- 2 No. Dynamic Cone Penetrometer tests *(bearing strength of granular soils).*
- A visual inspection and walk over of the site.

Locations of the boreholes are shown on the 'Test Location Plan' attached within Appendix A. All logging of the HA core has been undertaken in accordance with the 'NZ Geotechnical Society Guidelines for the description of soils and rocks'[3] presented in Appendix B 'Soil Logs'.

2.3 SOIL PROFILES

Based on the description of the soils identified by the HAs, the ground conditions present beneath the site can be split into two halves, the "Southern Half" (MA01 and MA02) displaying a more variable profile with some poorer strength soils than the "Northern Half" (MA03 and MA04). These are discussed in further detail below:

Southern Half (MA01/MA02)

Within MA01 uncontrolled FILL with a 200mm thick layer of Topsoil was present to a depth of 600mm begl. This was underlain by stiff clayey SILT with moderate organics to a depth of 1000mm begl which was then underlain by a firm amorphous PEAT layer to a depth of 1400mm begl. Underlying soils then comprised a stiff, becoming firm, CLAY with minor Silt to a depth of 2600mm begl overlying silty SAND to the end of the HA at a depth of 4500mm begl.

Within MA02 uncontrolled FILL with a 200mm thick layer of Topsoil was present to a depth of 700mm begl. This was underlain by stiff to firm CLAY with minor Silt to a depth of 1000mm begl overlying a clayey SILT with organics to a depth of 1400mm begl. This was underlain by firm amorphous PEAT to a depth of 1800mm begl overlying a thin 200mm layer of silty SAND/sandy SILT. Underlying soils comprised a silty CLAY to the end of the HA at a depth of 3000mm begl.

Northern Half (MA03/MA04)

Within MA03 Topsoil was present to a depth of 200mm begl overlying hard SILT to 500mm begl. Underlying soils then comprised medium-dense to dense silty SAND/sandy SILT to the end of the HA at a depth of 2000mm begl.

Within MA04 Topsoil was present to a depth of 300mm begl overlying a layer of uncontrolled FILL to a depth of 600m begl. This was then underlain by medium-dense becoming dense silty SAND/sandy SILT to the end of the HA at a depth of 3000mm begl.

Groundwater was identified at a depth of 1700mm begl in HA01/HA02 and at a depth of 2500mm begl in HA04.

[2] GNS (2023). New Zealand Geology Webmap. https://data.gns.cri.nz/geology/
[3] Field Description of Soil & Rock"; NZGS: 2005

3 GEOTECHNICAL ASSESSMENT

For Building Consent, the development will be required to satisfy the conditions specified within "NZS 3604:2011 – Timber Framed Buildings"[4] (NZS 3604:2011) for the determination of 'Good Ground' and the "New Zealand Building Code"[5] (NZBC), as detailed below:

- 5 DCP blows/100mm down to a depth of twice the width of the footing.
- 3 DCP blows/100mm at depths beyond twice the width of proposed footing.
- 2 DCP blows/100mm for proprietary raft foundations.
- An allowable bearing capacity of 100kPa from shear vane testing (Su >60kPa).
- Investigations confirm the absence of organic soils, very loose/loose cohesionless soils, peat, soft clays or expansive clays.
- Any fill materials present should be certified in accordance with "NZS 4431:2022 - Engineered fill construction for lightweight structures"[6] (NZS 4431:2022).
- Indication of slips or creep present on slopes.
- Buried services.

A review of the potential impact from liquefaction, in accordance with the guidance provided within "Earthquake Geotechnical Engineering Practice Guidance - Modules 1-6", MBIE & New Zealand Geotechnical Society; November 2021[7] (MBIE/NZGS:2021) will also be required. The guidance will be used to consider the potential for liquefaction of the soils beneath the site and influence these conditions will have on the foundation design.

3.1 SOIL MATERIAL TYPE

- **Southern Section of Site (MA01 and MA02):** Borehole investigations identified soils with material characteristics outside of the parameters set in NZS 3604:2011 - Section 3.1.3. Therefore, soil material type is not in accordance with NZS 3604:2011.
- **Northern Section of Site (MA03 and MA04):** Borehole investigations identified with material characteristics are within the parameters set in NZS 3604:2011 - Section 3.1.3. Therefore, soil material type is in accordance with NZS 3604:2011.
- See Appendix B 'Soil Logs' for further information on soil type encountered during investigations.

3.2 GEOTECHNICAL ULTIMATE BEARING CAPACITY

- **Southern Section of Site (MA01 and MA02):** Test results indicate the presence of soils having a geotechnical ultimate bearing capacity (GUBC) less than 300kPa. Therefore, soils do not meet the required GUBC in accordance with NZS 3604:2011.
- **Northern Section of Site (MA03 and MA04):** Test results indicate soils having a GUBC of above 300kPa. Therefore, soils below the topsoil and uncontrolled fill meet the required GUBC in accordance with NZS 3604:2011.
- See Appendix B 'Soil Logs' for further information.

3.3 GROUNDWATER

- **Southern Section of Site (MA01 and MA02):** Groundwater was encountered at a depth of **1700mm** begl.
- **Northern Section of Site (MA03 and MA04):** Groundwater was encountered at a depth of **2500mm** begl.

Based on the above, groundwater is not expected to impact on the construction of shallow foundations.

[4] NZS 3604:2011 – Timber Framed Buildings
[5] New Zealand Building Code (Amendment 20); MBIE; November 2021
[6] NZS 4431:2022 - "Engineered fill construction for lightweight structures
[7] Earthquake Geotechnical Engineering Practice Documents - Modules 1-6" – MBIE/New Zealand Geotechnical Society; November 2021.

4 TOPOGRAPHY AND SLOPE STABILITY

4.1 SITE TOPOGRAPHY

Based on contour data from the Waikato Regional Council GIS, the subject investigated site comprise the eastern section of the property, which is generally near level to gently sloping towards the south into an existing shallow pond with a wetland situated within the middle of the overall property i.e., to the west of the subject ground. The subject investigated area is located at elevations of approximately between 71m and 73m RL. (all RL's are relative to the Moturiki Datum).

- Neither signs of erosion or soil creep were noticed, nor the indications of slope instability were observed on or near the proposed building site.
- The gradient of the discussed topography and slopes has been determined to:
  - Not exceed the 3:1 (horizontal/vertical) gradient for a safe slope.
  - **As a result of the above findings: slope stability satisfies the requirements of NZS3604: 2011.**

5 SEISMIC HAZARD AND LIQUEFACTION

5.1 DESIGN LIFE AND IMPORTANCE LEVEL

Design life and importance level have been assessed in accordance with "AS/NZS 1170.0:2002 – Structural Design Actions, Part 0: General Principles (NZS1170.0:2002)[8]. A design life of 50 years with an Importance Level 2 (IL2) has been adopted appropriate for a residential development with an Importance Level 1 (IL1) for the detached garage.

5.2 SITE SUBSOIL CLASSIFICATION

The site subsoil class has been assessed in accordance with 'AS/NZS 1170.5:2004 – Structural Design Actions – Part 5: Earthquake actions – New Zealand' (NZS1170.5:2004)[9]. Based on the interpretation of the available information, as detailed in Section 3, the site can be considered as a 'Class D' – Deep Soil site. However, for the purpose of the liquefaction assessment and in accordance with the MBIE/NZGS:2021 guidance, the analysis has been undertaken for a PGA based on a 'Class C' – Shallow Soil site. ***It should be noted, however, that the site should still be considered as a 'Class D – Deep or Soft Soil' site for structural design purposes.***

5.3 EARTHQUAKE SCENARIOS

NZS1170.5:2004 specifies that, to meet the requirements of the NZBC, design of structures is to allow for two earthquake scenarios:

- (SLS) "Serviceability Limit State" for earthquake loading are to… "avoid damage to the structure and non-structural components that would prevent the structure from being used as originally intended without repair after the SLS earthquake."
- (ULS) "Ultimate Limit State" for earthquake loading shall provide for... "avoidance of collapse of the structural system or loss of support to parts and damage to non-structural systems necessary for emergency building evacuation that renders them inoperative."

5.4 SEISMIC HAZARD PGA VALUES

The seismic hazard in terms of peak ground acceleration (PGA) for the area has been assessed based on the 'Table A1: Appendix A – Module 1' of MBIE/NZGS 2021. A summary of the seismic design parameters determined to be appropriate for the site is presented in Table 1.

Table 1: Peak Ground Acceleration

25-YEAR Return Period		500-YEAR Return Period	
a_{max}(g) (m/s^2)	Magnitude (M)	a_{max}(g) (m/s^2)	Magnitude (M)
0.06	5.9	0.25	5.9

[8] AS/NZS 1170.0:2002 – Structural Design Actions, Part 0: General Principles.
[9] AS/NZS 1170.5:2004 – Structural Design Actions – Part 5: Earthquake actions – New Zealand

6 LIQUEFACTION

Based on the Probase Report "P24465_Geotechnical Assessment_102D Maungakawa Road, Cambridge_18.02.2025_FINAL" dated 18th February 2025, in accordance with the "Canterbury Guidance"[10] for foundations, the site has been classified as Technical Category 'TC2'.

7 SITE SUITABILTY - BUILDING DEVELOPMENT RECOMMENDATIONS

Preliminary Foundation recommendations for Southern Section of Site (MA01 and MA02):

- The GI beneath the site identified organic soils, including PEAT, to a depth of up to 1.7m begl. Liquefiable soils have also been identified below a depth of from 2.6m begl.
- It should be noted, however, that the ground investigation undertaken for the proposed development to the west of the site identified improving ground below the organic soils, with piled foundations recommended
- Specific Engineer Designed Pile type foundations to support suspended timber floor or concrete raft.

Preliminary Foundation recommendations for Northern Section of Site (MA03 and MA04):

- Option 1: Specific Engineer Designed 'TC2' raft type foundations.
- Option 2: **'**TC2' 'Type A or B' pile foundations with suspended timber floors.

Results are based off limited information available at the time of preliminary investigations. To confirm the recommendations, it is recommended that further testing and considerations be made once detailed development plans becomes available at ***the Building Consent stage.***

8 THREE WATERS MANAGEMENT

8.1 STORMWATER REQUIREMENTS FOR PROPOSED DEVELOPMENT

Stormwater Management for the proposed new lots will be mitigated by utilising detention tanks to accommodate temporary detention storage on-site for roof water runoff using a controlled outflow device.

- Controlled outflows must be designed to match pre-development, equivalent greenfield flows and be discharged downstream.
- It is recommended that the overflow pipe is directed towards a swale or dispersal trench. Secondary drainage for the 10-year, 10% AEP storm event or larger will pass through the tanks and be discharged into a swale, dispersal trench or similar approved methodology. Overflows will be released (at a rate equivalent to Greenfields flows) to the natural downstream environment.

Methodology of overland flows, outlet locations and construction will be specifically designed and confirmed at time of building consent by a suitably qualified civil engineer once development plans are finalized.

8.2 GROUND WATER LEVELS

The ground water level at the time of testing was encountered:

- **Southern Section of Investigated Site (MA01 and MA02):** Groundwater was encountered at **1700mm** depth begl.
- **Northern Section of Investigated Site (MA03 and MA04):** Groundwater was encountered at **2500mm** depth begl.

8.3 FLOODING

The site does not site in a flood defined zone as per the Waipa District Flood Viewer or Waikato Regional Council Hazzard Portal.

[10] "Repairing and rebuilding houses affected by the Canterbury Earthquakes – Guidance"; MBIE; 2012

8.4 WASTEWATER MANAGEMENT

The design must be in accordance with current standard AS/NZS 1547:2012 and up-to-date engineering practice in on-site wastewater disposal.

Primary treatment - Land application after treatment via discharge control trenches. Discharge to the disposal field is via gravity or pumping.

Secondary treatment - Land application after treatment via subsoil drippers lines (irrigation). Discharge to the disposal field, drip line system is via pumping. This option requires ongoing maintenance and associated costs. However, it has the added benefit of recycling water via the irrigation lines, reusing water for plants and gardens.

Both Primary and Secondary wastewater treatment systems are viable options for the site. Soils investigations revealed that the soil is made up of Sandy Loams or Cat 3.

It is recommended to confirm the soil category when the final position of effluent system has been determined.

9 CIVIL SITE RECOMMENDATIONS SUMMARY

Site Requirements summary in accordance with NZS 3304:2011 and MBIW guidance documents

Table 2: Civil Site Recommendations

Parameters	Civil Site Recommendations
Stormwater	Probase Engineering recommends the use of above ground detention tanks to mitigate stormwater discharges (with a portion available for potable water use for a new dwelling). It is recommended that the overflow pipe is directed to a swale or soakage trench
Wastewater	Wastewater treatment and disposal via Primary or Secondary Treatment.

Results are based off limited information available at the time of suitability investigations. To confirm the preliminary recommendations, it is recommended investigation, assessment and design be made once detailed development plans are available such as scope of build, exact positioning of proposed dwelling and type of structure.

10 LIMITATIONS

Recommendations given in this report are based on site data retrieved from the bore holes from discreet locations, soil exposures, Scala Penetrometer results and other test results. Inferences about subsurface soils away from the test locations at the site can be made but cannot be guaranteed. Variations in ground conditions from those described in this report could exist across the site and that ground conditions can vary with seasonal changes. Allowances for construction should be made for these conditions.

This report has been prepared specifically for our client based on their project brief and no responsibility is accepted for the use of any part of this report by others or for any other purpose. It contains my professional opinion regarding foundation stability based on the data retrieved from the specific tests and boreholes completed and is not to be construed as a guarantee that the whole site is suitable for the foundations originally proposed.

Contamination risks are not covered and outside the scope of this report.

11 APPENDICIES

APPENDIX A – Test Location Plan

APPENDIX B – Soil Logs

APPENDIX C – Natural Hazard Risk Assessment.

PROBASE
ENGINEERING

APPENDIX A

TEST LOCATION PLAN

LEGEND

- MA — Machine Auger
- HA — Hand Auger
- HA/DCP — Hand Auger with DCP
- DCP — Dynamic Cone Penetrometer
- CPT — CPT Test
- TP — Test Pit
- ST — Soakage Test

PROBASE FOUNDING EXCELLENCE

PROJECT: 102D Maungakawa Road, Cambridge

TITLE: GEOTECHNICAL INVESTIGATION TEST LOCATION PLAN

REV	DATE	DETAIL	DRAWN	APPROVED

JOB No: P24465 | DATE: 28/01/25
DRAWN: PS | APPROVED: JH
SCALE: NTS | STATUS: BC
DWG NUMBER: | REVISION: 0

PROBASE
ENGINEERING

APPENDIX B

SOIL LOGS

PROBASE ENGINEERING — FOUNDING EXCELLENCE

PROJECT:	Soils Investigation	JOB No.	P25145
CLIENT:	Warren Swain	DATE:	19/03/2025
LOCATION:	102D Maungakawa Road, Cambridge	TESTED BY :	PS
	Refer to attached Site Plan for testing locations	SHEAR VANE ID:	2688

BOREHOLE ID: MA01

Depth (m)	No of Blows[1]	Scala Penetrometer (Blows / 100mm) 2 4 6 8 10	SOIL DESCRIPTION[2]	Depth (m)	Undrained [3] (kPa)	Geologic Unit	Ground Water
			Uncontrolled Fill: Sand, Silt and Topsoil; brown mottled dark brown.			Uncontrolled Fill and Topsoil	Groundwater Encountered at 2.6m BEGL During Testing, Rose to 1.7m BEGL After Testing.
0.5			Buried Topsoil; dark brown. Moist.	0.5			
			slightly to moderately organic clayey SILT; greyish brown mottled brown. Stiff, moist, high plasticity.		55/16	Hinuera Formation	
1.0				1.0	60/15		
			PEAT, plastic, amorphous; black mottled dark brown. Moist, firm.		52/16		
1.5			CLAY, minor silt; light grey. Stiff becoming firm, moist to wet, high plasticity.	1.5	62/16		
2.0			trace fine sand; brownish grey. Wet.	2.0	32/13		
2.5			minor fine sand.	2.5			
3.0			silty SAND, trace clay; light bluish grey. Saturated. Sand; fine to coarse.	3.0			
3.5			minor fine to coarse gravel.	3.5			
4.0				4.0			
4.5				4.5			
			End of borehole at 4.5m - Target depth.				

Notes:

UTE = Unable to Extract

UTP = Unable to Penetrate

UTRS = Unable to Retain Sample

Shear Vane readings (Undrained - Shear/ Re-molded) - Example: 120/32 kPa

Pocket Penetrometer readings (Undrained - UCS) - Example: 180 kPa

Reference:

1 = Results obtained in accordance with NZS4402, Test 6.5.2:1988

2 = Refer NZGS Field Description of Soil and Rock Dec 2005 for further information

3 = Refer to Guideline for Hand Held Shear Vane Test; NZGS August 2001

4 = https://data.gns.cri.nz/geology/

PROJECT:	Soils Investigation	JOB No.	P25145
CLIENT:	Warren Swain	DATE:	19/03/2025
LOCATION:	102D Maungakawa Road, Cambridge	TESTED BY :	PS
	Refer to attached Site Plan for testing locations	SHEAR VANE ID:	2688

BOREHOLE ID: MA02

Depth (m)	No of Blows	Scala Penetrometer (Blows / 100mm) 2 4 6 8 10	SOIL DESCRIPTION[2]	Depth (m)	Undrained [3] (kPa)	Geologic Unit	Ground Water
0.5			Uncontrolled Fill: Sand, Silt and Topsoil; brown mottled dark brown.	0.5		Uncontrolled Fill and Topsoil	Groundwater Encountered at 1.7m BEGL During Testing,
			Buried Topsoil; dark brown. Moist.				
1.0			CLAY, trace organics, minor silt; light brownish grey mottled dark brown and orange. Stiff becoming firm, dry to moist, high plasticity.	1.0		Hinuera Formation	
1.5			clayey SILT, slightly organic becoming highly organic; light brownish grey becoming greyish brown. Moist.	1.5			
			PEAT, plastic, amorphous; black mottled dark brown. Moist, firm.				
2.0			silty SAND/ sandy SILT; light brownish grey. Wet to moist. Sand; fine.	2.0			
2.5			silty CLAY, trace sand, trace organics; light grey mottled light brownish grey. Wet, high plasticity.	2.5			
3.0				3.0			
3.5			End of borehole at 3.0m - Target depth.	3.5			
4.0				4.0			
4.5				4.5			

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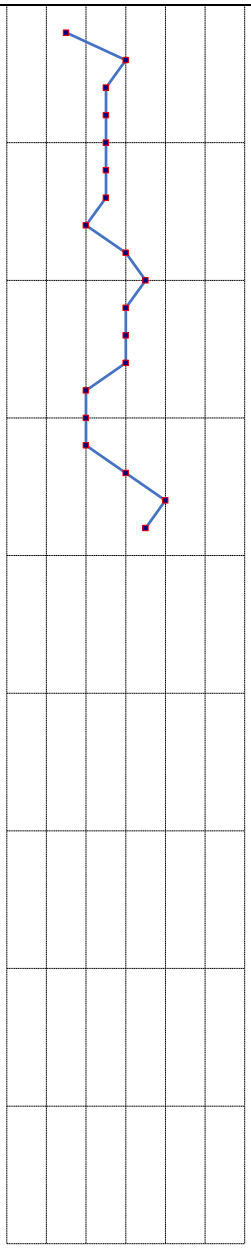
PROJECT:	Soils Investigation	JOB No.	P25145
CLIENT:	Warren Swain	DATE:	19/03/2025
LOCATION:	102D Maungakawa Road, Cambridge	TESTED BY :	PS
	Refer to attached Site Plan for testing locations	SHEAR VANE ID:	2688

BOREHOLE ID: MA03



Depth (m)	No of Blows	SOIL DESCRIPTION[2]	Depth (m)	Undrained [3] (kPa)	Geologic Unit	Ground Water
	3	TOPSOIL; dark brown. Moist.			T/S	Groundwater Not Encountered.
	6					
	5	SILT, trace sand; light grey mottled light orange streaks. Hard, dry. Sand: fine.			Hinuera Formation	
	5			UTP		
0.5	5		0.5			
	5	silty SAND; light grey mottled light orange streaks. Medium dense, dry to moist. Sand: fine.				
	5					
	4					
	6	silty SAND/ sandy SILT; light grey mottled light orange streaks. Medium dense to dense, moist. Sand: fine.				
1.0	7		1.0			
	6	wet.				
	6					
	6					
	4	trace clay.				
1.5	4		1.5			
	4	mottled dark orange from 1.5m to 1.7m.				
	6					
	8					
	7	silty SAND; light grey mottled light orange streaks. Medium dense, wet. Sand: fine to coarse.				
2.0			2.0			
		End of borehole at 2.0m - Target depth.				
2.5			2.5			
3.0			3.0			
3.5			3.5			
4.0			4.0			
4.5			4.5			

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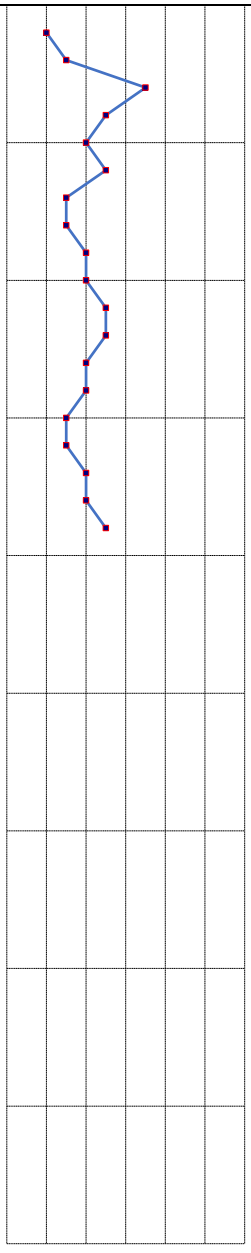
PROJECT:	Soils Investigation	JOB No.	P25145
CLIENT:	Warren Swain	DATE:	19/03/2025
LOCATION:	102D Maungakawa Road, Cambridge	TESTED BY :	PS
	Refer to attached Site Plan for testing locations	SHEAR VANE ID:	2688

BOREHOLE ID: MA04



Depth (m)	No of Blows	SOIL DESCRIPTION[2]	Depth (m)	Undrained [3] (kPa)	Geologic Unit	Ground Water
	2	TOPSOIL; dark brown. Moist.			Uncontrolled Fill and Topsoil	Groundwater Encountered at 2.5m BEGL During Testing,
	3					
	7					
	5	Uncontrolled Fill: Topsoil, Silt and Sand; light brown becoming dark brown. Dry.				
0.5	4		0.5			
	5					
	3	silty SAND; whitish grey. Medium dense, dry. Sand: fine.			Hinuera Formation	
	3					
	4					
1.0	4		1.0			
	5	mottled light brownish grey.				
	5					
	4	mottled dark orange from 1.2m to 1.3m.				
	4	trace fine gravel; light blusih grey. Wet.				
1.5	3		1.5			
	3	dark orange brown.				
	4	minor fine to medium gravel.				
	4					
	5					
2.0			2.0			
		silty SAND/ sandy SILT; light grey. Medium dense to dense, wet. Sand: fine to coarse.				
2.5			2.5			
		minor Sand.				
3.0			3.0			
		End of borehole at 3.0m - Target depth.				
3.5			3.5			
4.0			4.0			
4.5			4.5			

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UTP = Unable to Penetrate

UTRS = Unable to Retain Sample

Shear Vane readings (Undrained - Shear/ Re-molded) - Example: 120/32 kPa

Pocket Penetrometer readings (Undrained - UCS) - Example: 180 kPa

Reference:

1 = Results obtained in accordance with NZS4402, Test 6.5.2:1988

2 = Refer NZGS Field Description of Soil and Rock Dec 2005 for further information

3 = Refer to Guideline for Hand Held Shear Vane Test; NZGS August 2001

4 = https://data.gns.cri.nz/geology/

PROBASE
ENGINEERING

APPENDIX C

NATURAL HAZARD RISK ASSESSMENT

PROBASE JOB P25145
DATE 01.05.2025
BY CB

NATURAL HAZARDS RISK ASSESSMENT

Table 1: Risk Potential Matrix

POTENTIAL DAMAGE LEVEL	PROBABILITY OF NATURAL HAZARD EVENT				
	VERY UNLIKELY	UNLIKELY	POSSIBLE	LIKELY	VERY LIKELY
	(0-5%)	(5-45%)	(45-55%)	(55-95%)	(95-100%)
SEVERE	minor	minor	moderate	high	very high
MODERATE	low	minor	moderate	moderate	high
MINOR	low	minor	minor	moderate	moderate
LOW	low	low	low	minor	minor

Table 2: Risk Classficiation

RISK FACTOR	SECTION 106 COMPLIANT	POTENTIAL DAMAGE FROM THE NATURAL HAZARD EVENT
LOW	YES	No significant damage
MINOR	YES	Possible minor damage
MODERATE	NO	Possible moderate damage
HIGH	NO	Likely moderate damage
VERY HIGH	NO	Likely severe damage

Table 3: Subject Site Analysis

HAZARD	PROBABILITY	POTENTIAL DAMAGE	RISK FACTOR	MITIGATION MEASURES
LIQUEFACTION	Possible	Severe	moderate	Site has Moderate Liquefaction vulnerability. Foundations can be designed to category TC2.
SLOPE STABILITY	Unlikely	Severe	low	Site is within the requirements set in NZS3604:2011. No further slope stability required.
SETTLEMENTS	Very Unlikely	Moderate	moderate	Up to 50mm of vertical settlements
SOFT/ COMPRESSIBLE SOILS	Very Likely	Moderate	moderate	Presence of organic soil depostits below the site
SOIL EXPANSIVITY	Possible	Moderate	low	Near surface soils do not show any expansive properties.
UNDERGROUND SERVICES	Likely	Moderate	low	Presence of underground services is unlikely/ Greenfield site.
FLOODING	Unlikely	Minor to Moderate	low	Site does not sit within concil defined flood maps
WIND	Unlikely	Minor	moderate	The site Is located in a rural open area. Wind zone categorised as Moderate to High and to be confirmed further at Building consent stage.
SUBSIDENCE	Very Unlikely	Severe	low	No potential natural causes known as site is not near any known fault lines/mining or water extraction
TSUNAMI	Very Unlikely	Minor	low	No mitigating actions possible. Site is approx. Xkm from nearest coastline.
VOLCANIC	Very Unlikely	Moderate	low	Site is not in the vincinity of active volcanos or geothermal activity.