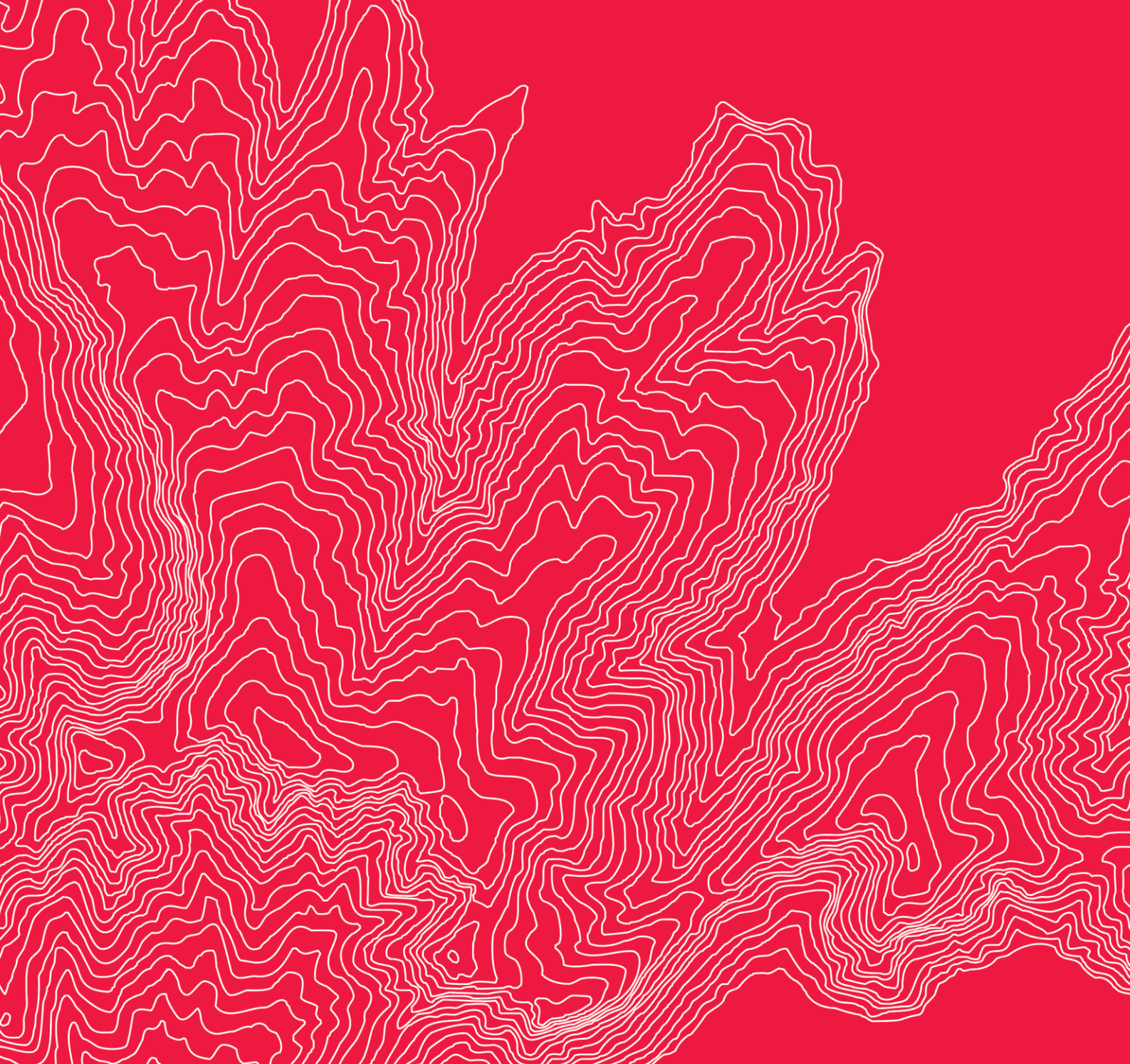




Subdivision Suitability Report

**eliot
sinclair**

Section 39 SO 13711

Prepared for Tauranga Bay Holdings Ltd
510402

Subdivision Suitability Report

Section 39 SO 13711

Prepared for Tauranga Bay Holdings Ltd

510402

Quality Control Certificate

Eliot Sinclair & Partners Limited

eliotsinclair.co.nz

Action	Name	Signature	Date
Prepared by:	Emily Wilson Civil Engineer BE(Hons) Civil MEM		6 May 2022
Directed, reviewed, and approved for release by:	Stuart Challenger Civil Engineer Branch Manager, Hokitika BE NatRes BSc CMEngNZ CPEng		25 May 2022
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1. Introduction

1.1. Scope of Works

Eliot Sinclair has been engaged by Tauranga Bay Holdings Ltd to undertake a geotechnical investigation on Section 39 SO 13711, Tauranga Bay Road, Cape Foulwind. The purpose of the investigation was to:

- Assess the site's environmental hazards to determine site suitability for subdivision and ensure future dwellings would be safe from hazards, and.
- Investigate the shallow ground conditions to determine minimum foundation requirements for future dwellings.

2. Site Description

2.1. Legal Description

The legal description of the site is Section 39 SO 13711 and is around 7.75Ha in area. This site is located on the northern side of Wilsons Lead Road almost 500m south of the Wilsons Lead Road intersection with Tauranga Bay Road. The site is in Cape Foulwind, which is roughly 14km west of Westport. Figure 1 below illustrates an overview of the site location.



Figure 1. Figure showing location of site (Eliot Sinclair, 2022)

2.2. Proposed Subdivision

We understand the scheme plan for the proposed subdivision is yet to be finalised. The site is proposed to be subdivided into two or three lots. Three areas were investigated geotechnically to identify potential building sites for the proposed subdivision to be finalised. Figure 2 below indicates the three areas which were investigated across the site.

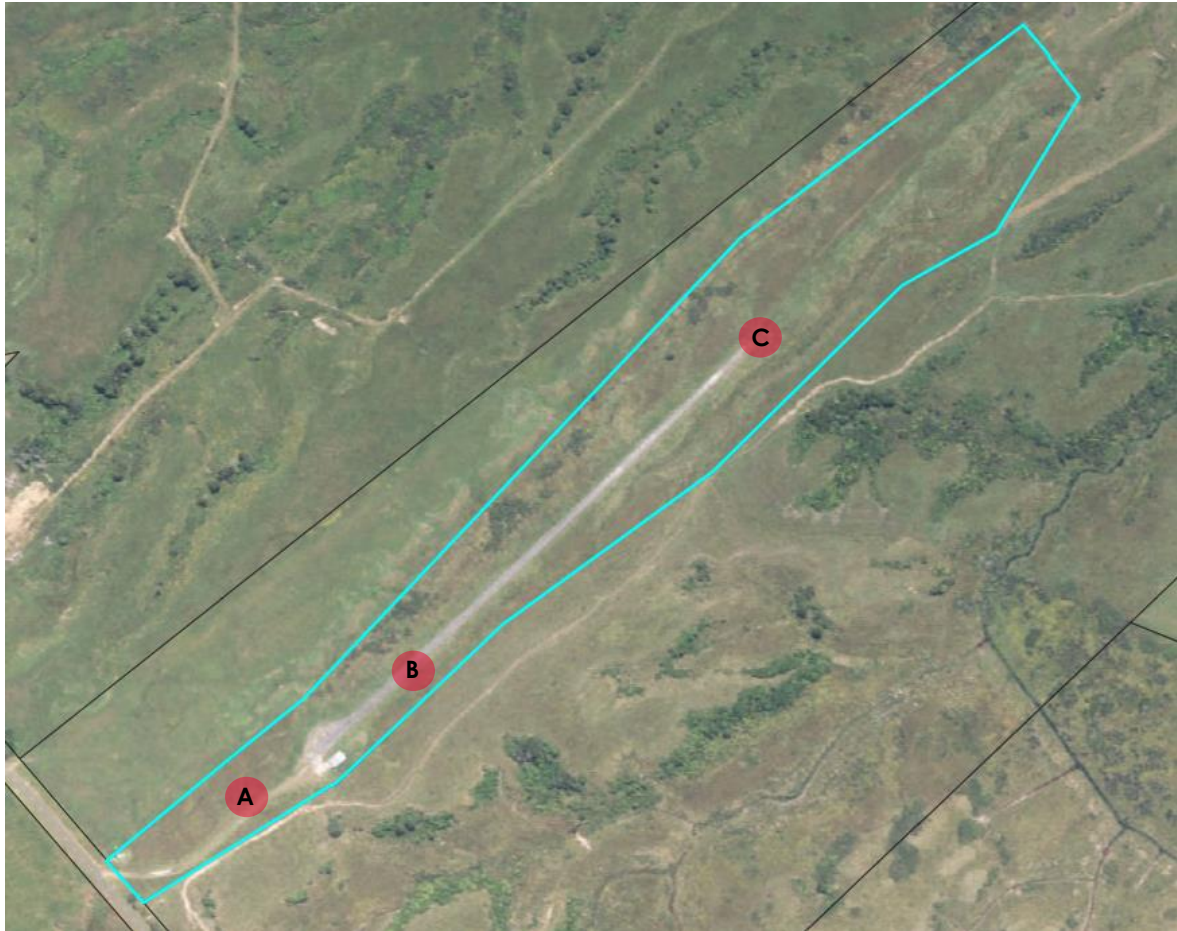


Figure 2. Aerial of the site indicating the area investigated on each of the proposed lots, (Eliot Sinclair, 2022).

2.3. Geology

Geological mapping¹ of the area notes the site is underlain with Late Pleistocene shoreline deposits (Q5b) consisting of marine sand and gravel.

The GNS database² indicates the closest active fault is the Lower Buller Fault, which lies approximately 13km south-east of the site. The area is in the NZS3604: 2011 Zone 3 earthquake rating zone.

2.4. Topography

The site has a narrow edge adjacent to Wilsons Lead Road and extends perpendicular to the road a little more than 900m. The width of the site varies between around 40m and 110m. The site has previously been used as an airway and still has a historic runway perpendicular to Wilsons Lead Road. The site is cleared and undulating in level, ranging between 25 – 40m above sea level, with a gully adjacent and to the western side of the runway where it is understood an 11kV power cable is located. There is an existing shed on the site which sits towards the south-eastern edge of the site, between where test areas A and B were located.

¹ Nathan, S., Rattenbury, M.S., Suggate, R.P. (compilers) 2002. Geology of the Greymouth area. Institute of Geological and Nuclear Sciences 1: 250 000 geological map 12. 1 sheet + 58p. Lower Hutt, New Zealand. Institute of Geological and Nuclear Sciences Limited

² [GNS Science - Active Faults Database](#)

3. Geotechnical Investigation

On 3rd May 2022 we undertook our geotechnical site investigation which consisted of a site walkover, five scala penetrometer tests, and the inspection of three machine dug test pits. The tests were located within the three potential building areas A, B, & C, as illustrated in Figure 2. The full Site Investigation Records can be found in Appendix B.

3.1. Area A

Figure 3 below illustrates the test locations which were undertaken within area A. Scalas 01 and 02 encountered very firm ground from 0.1m and 0.3m below the existing ground level respectively. There was soft bearing above this, which we anticipate being the overlying silty topsoil before encountering firm iron pan. Scala 03 encountered firm bearing at 0.2m before likely encountering iron pan at 0.3m below existing ground level.

The test pit undertaken at location 04 encountered silty topsoil over silt with minor sand. At a depth of 0.5m a firm iron pan was encountered, over firm fine to medium coarse bound sandstone. The test pit was terminated at a depth of 2.0m and did not encounter ground water.

The test pit undertaken at location 05 encountered the iron pan layer under silty topsoil at a depth of 0.2m. below this was orange bound firm sandstone. At a depth of around 1.2m, there was a layer change and the sand continued to be firm but became less bounded. The test pit was terminated at a depth of 3.0m and did not encounter groundwater.



Figure 3. Approximate locations of the 5 tests undertaken within Area A

3.2. Area B

Figure 4 below illustrates the test locations which were undertaken within area B. Test pit 06 was undertaken in Area B and encountered a 600m thick layer of silty topsoil before reaching an iron pan layer. Below this was firm orange brown sandstone before the test pit was terminated at a depth of 1.9m without encountering groundwater.

Scala 07 encountered firm bearing capacity consistent with iron pan at a depth of 0.3m below the existing ground level.



Figure 4. Approximate locations of the 2 tests undertaken within Area B

3.3. Area C

Figure 5 below illustrates the test locations which were undertaken within area C. The scala undertaken in area C encountered soft bearing capacity before it increased at 0.5m before becoming very firm at 0.6m below existing ground level.



Figure 5. Approximate locations of the test undertaken within Area C

3.4. Geotechnical Summary

From our geotechnical investigation we confirm the presence of shallow iron pan which was consistent across the three areas we tested at depths ranging from 0.2 to 0.6m across the sites tested. The iron pan layer, and the sandstone we encountered below, can provide strong bearing capacity more than "Good Ground" requirements as defined in NZS3604: 2011. Infiltration capacity through the iron pan and sandstone is restricted as it acts as a confining layer which will need to be considered for wastewater treatment and disposal.

4. Suitability for Subdivision

Council can refuse subdivision consent if there is a significant risk from natural hazards. To determine whether there is a significant risk from natural hazards, decision-makers are guided by the requirements of RMA Section 106(1A). This requires a combined assessment of:

- The likelihood of natural hazards occurring (whether individual or in combination);
- The material damage that would result from natural hazards to land where the consent is sought, neighbouring land, or structures;
- Any likely subsequent use of the land where the consent is sought that would accelerate, worsen, or result in material damage of the kind referred to in the previous point.

Decision-makers are required to consider the magnitude of risk of natural hazards, including natural hazards that have a high impact but low probability of occurrence. This aligns the assessment with the definition of 'effect' Section 3 of the RMA.

The RMA defines natural hazards as: *Any atmospheric or earth or water related occurrence (including earthquake, tsunami, erosion, volcanic and geothermal activity, landslip, subsidence, sedimentation, wind, drought, fire, or flooding) the action of which adversely affects or may adversely affect human life, property, or other aspects of the environment.*

Hazard identification is a key component of any site-specific risk assessment. The risk assessment for relevant natural hazards at the site is presented below, which considers the likelihood and consequences of the hazard at the site in the context of the proposed activity (rural residential subdivision) as compared against the current site context.

We have considered the risk of subsidence, falling debris, erosion, tsunami, land slippage, sedimentation, wind, drought, fire, geothermal activity, climate change, sea level rise, and volcanic activity and conclude these are very unlikely to pose an unacceptable risk to life at this site.

In relation to other potential natural hazards, we comment as follows;

4.1. Earthquake Shaking

NZ is a seismically active country. New buildings and infrastructure will be designed, consented, and built to acceptable industry standards and New Zealand Building Code requirements and as such will be designed for any likely shaking as detailed in the current design codes, which will address the risk.

4.2. Earthquake Fault Rupture

There are no recorded active fault traces across the site. The site is not located within a fault hazard area or fault avoidance zone. The closest active fault is the Lower Buller Fault, which lies approximately 7km south-east of the site.

4.3. Liquefaction

The site is classified in the West Coast Regional Liquefaction Assessment³ as being in an area where liquefaction damage is unlikely. The site is underlain with Late Pleistocene shoreline deposits (Q5b) consisting of marine sand and gravel. This composition, which was confirmed onsite during our geotechnical investigation, are not susceptible to liquifying and therefore we consider there to be negligible risk of damage caused by liquefaction from a seismic event.

³ Beca Limited. West Coast Regional Liquefaction Assessment, 1 November 2021

5. Foundation Recommendations

Based on our geotechnical investigation, we consider the shallow iron pan can provide bearing capacity strength more than “Good Ground” as defined in NZS3604: 2011. Our testing confirms the three areas we undertook our testing are appropriate building areas. The iron pan layer in these areas was encountered within the top 600mm from the existing surface. We consider the most appropriate foundation treatment for the new residential dwellings in these areas to be foundations in accordance with NZS3604: 2011 which extend into the Good Ground we consider the iron pan layer. Areas infilled or built up will need to be done so with compacted clean sandy gravels.

If on site the iron pan layer is found to be deeper than 600mm, we recommend constructing a gravel raft to found a concrete slab-on-grade in accordance with NZS3604: 2011. Excavation to the iron pan will be required and backfilled with compacted clean sandy gravels. We have included a copy of our Excavation and Backfill Specification in Appendix C which states excavation and backfill methodology, compaction standards, and required engineering inspections.

For building locations different to the areas investigated, we recommend that site specific geotechnical investigation is undertaken once building location is determined, to confirm the appropriate foundation requirements for proposed dwellings.

6. Infrastructure Requirements

6.1. Potable Water

There is no Council reticulated water available to the site. Rainwater tanks will be required for water supply. We recommend a minimum of 45 cubic meters of water storage onsite to allow for residential firefighting purposes. It is also recommended that a leaf diverter and a first flush diverter be installed.

6.2. Wastewater

There is no Council sewer available to the site. Onsite wastewater treatment and disposal will be required. Even though our test pits did not encounter groundwater within 3.0m of the ground surface, the firm iron pan and sandstone underlying layers create a limiting layer with little to no infiltration capacity. We recommend for new dwellings on the sites the implementation of secondary wastewater treatment systems. The design of these systems will need to be undertaken once the number of bedrooms is known so the septic tank and land application field can be sized appropriately. From our observations, we consider the overlying silty topsoil with some sand to have some infiltration and treatment capacity and we would classify the soil as category 3 sandy loam.

The site complies with the requirements of rule 79 of the WCRC Land and Water Plan and resource consent will not be required.

6.3. Stormwater

There are no Council storm water drains in the local area, stormwater overflow from the rainwater tank will need to be discharged appropriately without causing erosion or ponding. If onsite stormwater disposal is required, the underlying iron pan and sandstone is a limiting infiltration layer and will need to be considered appropriately.

6.4. Vehicle Access

There is currently access to the site from Wilsons Lead Road. A right-of-way will be required to access the back lots.

7. Conclusion

Based on our geotechnical investigation, we consider Section 39 SO 13711 Wilsons Lead Road suitable for subdivision. The subdivision scheme is yet to be finalised; however, we have identified three appropriate building locations which we have confirmed to be appropriate for the construction of new residential dwellings. We recommend that new building foundations be in accordance with NZS3604: 2011 and extend into the Good Ground we anticipate being a shallow iron pan layer within the top 600mm from the surface. We do not consider the proposed Lots will be subject to any natural hazards and will not create any hazards once developed.

Disclaimer

Comments made in this geotechnical report are based on Eliot Sinclair's visual inspection and shallow soil investigations of the site on 3rd May 2022 comprising shallow Dynamic Cone Penetration (DCP) testing, and the inspection of machine dug test pits, and the most recent version of the Ministry of Business, Innovation and Employment Guidelines.

Whilst every care was taken during our investigation and interpretation of subsurface conditions, there is a risk there could be subsoil strata or features at depth that we are unaware of. Additionally, on-going seismicity in the general area may lead to deterioration or additional ground settlement that could not have been anticipated at time of writing of this report.

At time of foundation excavation, should the exposed soil conditions vary from those described in this report then Eliot Sinclair & Partners Ltd should be contacted to advise if the recommendations of this report remain valid. Further, should the requirements of MBIE's guidelines, NZ Standards or the NZBC that relate to foundations and floors be updated, then Eliot Sinclair should be contacted to advise if the recommendations of this report remain valid.

This report has been prepared for the benefit of Tauranga Bay Holdings Ltd, and the Buller District Council.

No liability is accepted by this company, or any employee of this company, with respect to the use of this report by any other party or for any purpose other than what is described in Section 1 of this report.

Appendix A. Site Photographs



Figure 1. Facing north-east across building area A.



Figure 2. Shallow iron pan over sandstone encountered at test pit 04.



Figure 3. Test pit 05 in area A.



Figure 4. Gully adjacent to the historic runway.



Figure 5. Facing south-west towards Wilsons Lead Road, showing the historic runway and undulations towards the southern boundary of the site by area B.



Figure 6. Test pit 06 undertaken in area B.



Figure 7. Facing north-east at the end of the historic runway across test area C.

Appendix B. Site Investigation Records

Site Investigation Record

Client: Tauranga Bay Holdings Ltd

Site: Section 39 SO 13711, Tauranga Bay Road, Westport

Technical Category:

Lot: Section 39

D.P.: SO 13711

Date Tested: 3-May-2022

Log Sheet No.: 1 of 1

Project No.: 510402

Dynamic Cone Penetrometer (DCP) Test Results														Soil Profile			
Number of Blows per 100mm														Test Location 04		Water	
1	2	3	4	5	6	7	8	9	10	11	12	13	14	Depth (m)			
														0.2	TS	TOPSOIL & SILT; brown.	Groundwater Not Encountered
														0.4		SILT, with minor sand; light brown.	
														0.6		SAND; orange. Iron pan.	
														0.8		Fine to medium SAND; orange. Firm; Bound, sand stone.	
														1.0			
														1.2			
														1.4			
														1.6			
														1.8			
														2.0		EOH: 2m - Target Depth.	
														2.2			
														2.4			
														2.6			
														2.8			
														3.0			
														3.2			

— 01 - - - - 02

Minimum penetration resistance (based on 300mm wide footing founded at 300mm depth) required for 'Good Ground' as defined in the Acceptable Solutions and Verification Methods for NZBC Clause B1 Structure.

Comments:

Field Staff: SHJ & EAW	Prepared By: EAW	Soil Profile From: ☐ Hand Auger ☐ Spade Hole ☒ Test Pit
Job Manager: SCC	Approved By: SCC	

Site Plan: (Not to Scale)

Note: This record identifies the geotechnical conditions encountered at the noted test location(s) only. It is possible that ground conditions could be different away from the point(s) of testing.

Site Investigation Record

Client: Tauranga Bay Holdings Ltd

Site: Section 39 SO 13711, Tauranga Bay Road, Westport

Technical Category:

Lot: Section 39

D.P.: SO 13711

Date Tested: 3-May-2022

Log Sheet No.: 1 of 1

Project No.: 510402

Dynamic Cone Penetrometer (DCP) Test Results															Soil Profile		
Number of Blows per 100mm															Test Location 05		Water
1	2	3	4	5	6	7	8	9	10	11	12	13	14	Depth (m)			
														0.2	TS	TOPSOIL & SILT, with some sand; brown.	
														0.4		SAND; orange. Iron pan.	
														0.6		SAND; orange. Bound sand stone.	
														0.8			
														1.0			
														1.2		SAND; orange brown.	
														1.4			
														1.6			
														1.8			
														2.0			
														2.2			
														2.4			
														2.6			
														2.8			
														3.0			
														3.2		EOH: 3m - Target Depth.	

03

Minimum penetration resistance (based on 300mm wide footing founded at 300mm depth) required for 'Good Ground' as defined in the Acceptable Solutions and Verification Methods for NZBC Clause B1 Structure.

Comments:

Field Staff:	Prepared By:	Soil Profile From:
SHJ & EAW	EAW	☐ Hand Auger
Job Manager:	Approved By:	☐ Spade Hole
SCC	SCC	☒ Test Pit

Site Plan: (Not to Scale)

Note: This record identifies the geotechnical conditions encountered at the noted test location(s) only. It is possible that ground conditions could be different away from the point(s) of testing.

Site Investigation Record

Client: Tauranga Bay Holdings Ltd

Site: Section 39 SO 13711, Tauranga Bay Road, Westport

Technical Category:

Lot: Section 39

D.P.: SO 13711

Date Tested: 3-May-2022

Log Sheet No.: 1 of 1

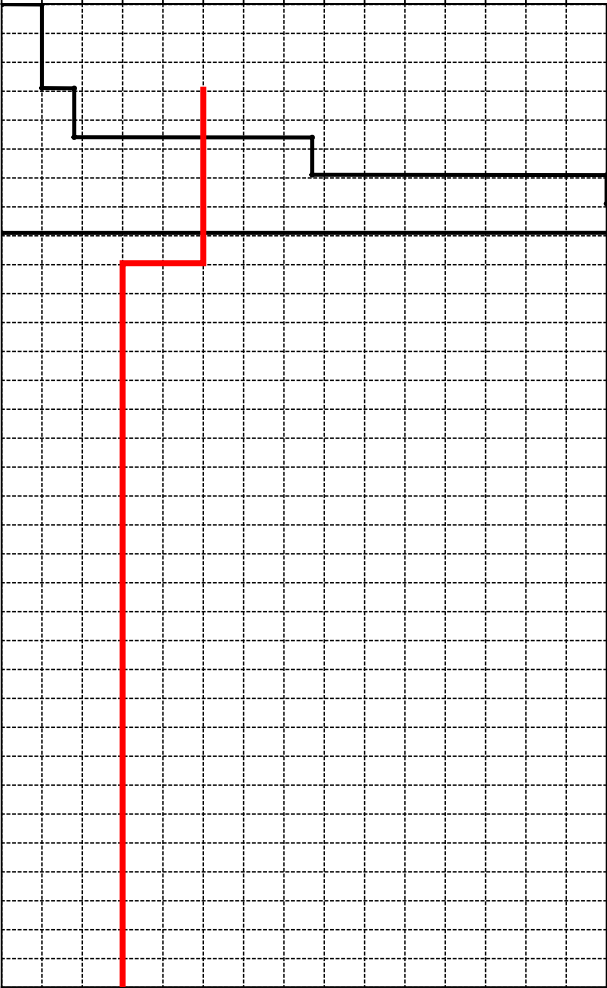
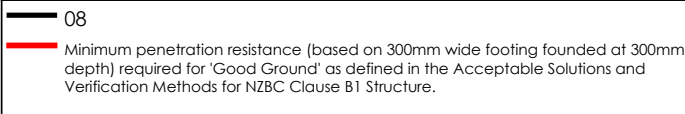
Project No.: 510402

Dynamic Cone Penetrometer (DCP) Test Results															Soil Profile		
Number of Blows per 100mm															Test Location 06		Water
1	2	3	4	5	6	7	8	9	10	11	12	13	14	Depth (m)			
														0.2	TS	Groundwater Not Encountered	
														0.4	TS		
														0.6	TS		
														0.8			
														1.0			
														1.2			
														1.4			
														1.6			
														1.8			
														2.0			
														2.2			
														2.4			
														2.6			
														2.8			
														3.0			
														3.2			
07 Minimum penetration resistance (based on 300mm wide footing founded at 300mm depth) required for 'Good Ground' as defined in the Acceptable Solutions and Verification Methods for NZBC Clause B1 Structure.															Site Plan: (Not to Scale)		
Comments:																	
Field Staff:		Prepared By:		Soil Profile From:													
SHJ & EAW		EAW		☐ Hand Auger													
Job Manager:		Approved By:		☐ Spade Hole													
SCC		SCC		☒ Test Pit													

Note: This record identifies the geotechnical conditions encountered at the noted test location(s) only. It is possible that ground conditions could be different away from the point(s) of testing.

Site Investigation Record

Client: Tauranga Bay Holdings Ltd	Site: Section 39 SO 13711, Tauranga Bay Road, Westport	
Technical Category:	Lot: Section 39	D.P.: SO 13711
Date Tested: 3-May-2022	Log Sheet No.: 1 of 1	Project No.: 510402

Dynamic Cone Penetrometer (DCP) Test Results															Soil Profile	
Number of Blows per 100mm															Depth (m)	Water
1	2	3	4	5	6	7	8	9	10	11	12	13	14			
															>>15	
															>>19	
															>>50	
															0.2	
															0.4	
															0.6	
															0.8	
															1.0	
															1.2	
															1.4	
															1.6	
															1.8	
															2.0	
															2.2	
															2.4	
															2.6	
															2.8	
															3.0	
															3.2	
																
Comments:															Site Plan: (Not to Scale)	
																
Field Staff:		Prepared By:		Soil Profile From:												
SHJ & EAW		EAW		☐ Hand Auger												
Job Manager:		Approved By:		☐ Spade Hole												
SCC		SCC		☐ Test Pit												

Note: This record identifies the geotechnical conditions encountered at the noted test location(s) only. It is possible that ground conditions could be different away from the point(s) of testing.

Appendix C. Excavate and Backfill Specification

Excavation and Backfill Specification

- The excavation is to be down to firm gravels below the building platform and extend beyond the building platform by either 1m or the depth to firm ground, whichever is greatest.
- The base of the excavation shall be clear of any loose material and if necessary, shall be benched and compacted.
- The sides of the excavation are to be no steeper than 2 vertical to 1 horizontal.
- The backfill shall consist of clean pit run or river gravel 65mm down, with no organic matter.
- If the excavation base is sloping, it shall be benched to create level platforms, prior to placing any backfill.
- The backfill shall be placed in layers with a maximum un-compacted thickness of 200mm and a minimum thickness of 150mm.
- If the backfill material has not been tested within the previous 3 months, the Contractor shall have a 25kg sample of the backfill material tested at an accredited laboratory for maximum dry density and optimum moisture content. The test results shall be supplied to the engineer for approval at least 24 hours prior to starting backfilling.
- When the fill is to be brought above the surrounding ground level, the fill shall be battered at least 1.0m from the building foundation and at a slope no steeper than 1 in 3 (1 vertical to 3 horizontal).
- Each layer shall be compacted to a minimum density of 92% and an average of no less than 95% of the maximum dry density achieved in the laboratory tests before the subsequent layer is placed. The test method is the vibrating hammer compaction (NZS 4402: 1988 – Test 4.1.3)

The following inspections are required:

1. Completed excavation prior to backfilling;
2. Following 2 layers of compacted gravels (400mm maximum lift), with either Nuclear Density Testing or Clegg Impact Hammer testing or Scala Penetrometer – 7 blows per 100mm; and
3. Completion of the final compacted gravel layer with Nuclear Density Testing.

The contractor is to contact the engineer 72 hours before they start the excavation so we can arrange the inspections.

The Engineers Contact details are:

Eliot Sinclair & Partners Ltd
Como House 51 Tancred Street,
PO Box 298
Hokitika 7842

Phone 03 755 8184 cell 027 224 2635

Email cushla.stone@eliot Sinclair.co.nz or stuart.challenger@eliot Sinclair.co.nz

Appendix D. Statement of Professional Opinion

SCHEDULE 2A

STATEMENT OF PROFESSIONAL OPINION ON SUITABILITY OF LAND FOR BUILDING

CONSTRUCTION

Development 2-3-lot subdivision.....

Developer Tauranga Bay Holdings Ltd.....

Location Section 39 SO 13711.....

I Stuart Charles Challenger..... of Eliot Sinclair and Partners Ltd.....

(Full name) (Name and address of firm)

Hereby confirm that:

1. I am a geo—professional as defined in clause 1.2.2 of NZS 4404:2010 and was retained by the developer as the geo-professional on the above development.
2. The extent of my preliminary investigations are described in my Report(s) number 510402, dated 13 June 2022, and the conclusions and recommendations of that/those document(s) have been re-evaluated in the preparation of this report. ~~The extent of my inspections during construction, and the results of all tests and/or re-evaluations carried out are as described in my geotechnical completion report dated~~
3. In my professional opinion, not to be construed as a guarantee, I consider that (delete as appropriate):
 - ~~a) The earth fills shown on the attached Plan No..... have been placed in compliance with the requirements of the Council and my specification~~
 - ~~b) The completed works take into account land slope and foundation stability considerations, subject to the appended foundation recommendations and earthworks restrictions, (which should be read in conjunction with the appended final site contour plan).~~
 - c) Subject to 3(a) and 3(b) of this Schedule, the original ground not affected by filling is suitable for the erection of buildings designed according to NZS 3604 provided that:
 - i) Buildings are founded on the underlying good ground.
 - ii)
 - ~~d) Subject to 3(a) and 3(b) of this Schedule, the filled ground is suitable for the erection of buildings designed according to NZS 3604 provided that:~~
 - ~~i)~~
 - ~~ii)~~
 - e) The original ground not affected by filling and the filled ground are not subject to erosion, subsidence, or slippage in accordance with the provisions of section 106 of the Resource Management Act 1991 provided that:
 - i) Buildings are founded on the underlying good ground.
 - ii)

NOTE — These subclauses may be deleted or added to as appropriate, to include such considerations as expansive soils where excluded from NZS 3604, and site seismic characteristics as covered in clause 3.1.3 of NZS 1170.5.

4. This professional opinion is furnished to the TA and the 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.
5. This certificate shall be read in conjunction with my geotechnical report referred to in clause 2 above and shall not be copied or reproduced except in conjunction with the full geotechnical completion report.



Signed Date 13 June 2022

Stuart Challenger

Branch Manager, Hokitika

BE BSc CMEngNZ (171997) CPEng

(Name, title, and professional qualifications)

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