



Appendix O

Geotechnical Factual Report

Part 1 of 2



ENGEO

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Geotechnical Factual Report

Wairakei South, Papamoa, Bay of Plenty

Submitted to:

Bell Road Limited Partnership

Level 1, Excelsa Centre

1 Golden Sands Drive

Papamoa Beach, Bay of Plenty

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1 Introduction

ENGEO Ltd was engaged by Bell Road Limited Partnership (BRLP) to undertake geotechnical investigations and provide geotechnical consulting services for the proposed Wairakei South residential and commercial development at Papamoa.

The approximate 350 ha development includes a master planned development including residential and commercial zones, neighbourhood and local commercial centres, provision for a primary school with associated infrastructure including stormwater conveyance swales and wetland areas for stormwater attenuation. Access to the development is from Bell Road through the centre of the site and SH2 in the northeast via the Papamoa East Interchange (PEI), with future access connections to Te Puke being provisioned in the south proposed.

This report provides the factual results of geotechnical investigations undertaken by ENGEO in 2025 and includes copies of available geotechnical information utilised for ground model development across the site from prior investigations (by others) and publicly available from the New Zealand Geotechnical Database (NZGD).

This work has been undertaken in general accordance with our signed proposal (ref. P19630.000.001_08, dated 20 March 2025) and Variation 03 (P19630.000.001_13, dated 29 July 2025).

2 Previous Investigations & Reporting

A number of previous geotechnical investigations and lab testing have been carried out within portions of the site are described in the following reports:

- Golden Sands Development, Papamoa, Geophysical and Geotechnical Investigations Factual Report, dated 7 February 2020 (Golder Associated (NZ) Limited, 2020). Field investigations comprised ten Test Pits (TPs) to depths of up to 3.1 m and 6,646 m of Multi-channel Analysis of Surface Waves (MASW) geophysics arrays. Laboratory testing comprised six organic content, wet density and water content tests, and four one-dimensional consolidation tests within the surficial peats.
- Ground Investigation Report for Bell Road Properties, Papamoa, dated 10 December 2019 (Land Development & Engineering Ltd, 2019). Field investigations comprised 19 Cone Penetrometer Tests (CPTs) to depths of 20.2 m.
- Preliminary Geotechnical Assessment Report, Bell Road, Wairakei South, dated 21 February 2022 (ENGEO Ltd, 2022). As part of that engagement nine piezometers were installed across the north block, with groundwater monitoring undertaken from May 2022 to April 2024.

Additional investigations are available on the New Zealand Geotechnical Database (NZGD, 2025), accessed July 2025, including within the SH2 alignment to the north and limited investigations within the Kopuaroa Canal to the south.

The approximate surface investigation and piezometer locations are presented on Drawings 100 to 102 (Appendix 1), with a summary of relevant investigation data, including coordinates, elevation and depths, provided in Section 4 below.

3 Scope & Methodology of ENGEO 2025 Investigation

ENGEO completed the following investigations between May and August 2025:

- Five machine boreholes (BH) to maximum depths of 20 m below ground level (bgl). Push tubes were taken as undisturbed core for laboratory testing at two machine boreholes as outlined in Section 3.7 below.
- Thirty-Four Cone Penetration Tests (CPT's) to maximum depths of 30 m bgl.
- Three Seismic Cone Penetration Tests (sCPT's) to maximum depths of 30 m bgl.
- Ten test pits (TPs) to depths between 1.0 m and 2.2 m bgl with target depths of base of surficial peat deposits.
- Eight Hand Auger Boreholes to maximum depths of 4.4 m bgl generally targeting the surficial pumice airfall deposits and underlying peat deposits.
- Eleven Piezometer well installations to 4.5 m depth bgl.

The approximate investigation and piezometer locations are presented on Drawings 100 to 102 (Appendix 1).

3.1 Machine Boreholes

Machine boreholes, denoted BH01 to BH05, were completed by Perry Geotech Limited (Perrys) between 26 and 28 May 2025 and 6 and 7 August 2025, using morooka and tractor drill rigs, with drilling undertaken using rotary core drilling techniques. Standard Penetration Tests (SPTs) were typically carried out at 1.5 m intervals, using techniques described in ASTM D4663-16 with a SPT hammer efficiency of between 79% and 84% depending on what rig was used.

All samples were logged on-site in general accordance with the New Zealand Geotechnical Society (NZGS) Guidelines: Field Description for Soil and Rock (NZGS, 2005).

A summary of machine boreholes is presented in Section 4.1 below. Engineering logs and core photographs are presented in Appendix 2.

3.2 Cone Penetration Tests

Cone Penetrometer Tests, denoted CPT100 to CPT134, were completed by Perrys between 26 and 30 May 2025 and 6 to 8 August 2025. Tests were advanced to maximum depths of 30 m below existing ground levels using a track mounted CPT rig in general accordance with ASTM D5778-12.

A summary of CPTs is presented in Section 4.2 below. Results of the CPTs, presented as traces of tip resistance (q_c), sleeve friction (sf), friction ratio (R_f), dynamic pore pressure (u_2) and soil classification (I_c) are presented in Appendix 3.

Dissipation testing was undertaken in CPT130 and CPT133 at depths of 13 m and 7.5 m respectively, within estuarine muds. Tests were held for 570 seconds (9.5 minutes). Graphical dissipation testing results are presented in Appendix 4.

3.3 Seismic Cone Penetrometer Tests

Seismic CPT's, denoted sCPT01 to sCPT03, were completed by Perrys between 26 and 28 May 2025. Seismic shear and compression wave measurements were obtained following the general procedure outlined in ATSM D7400 using a track mounted CPT rig. Results were submitted to BCE Sub-surface Diagnostics for shear wave analysis and interpretation, using their software BCE SC3-RAV (version 2020).

Interference of the signal waves was noted due to the presence of soft surface peat materials in sCPT01 and sCPT03. The depth was limited to 20 m in sCPT01. sCPT02 was undertaken on an area of shallow ground improvement where peat deposits had been undercut and replaced and provided better resolution of shear wave profiles with depth.

A summary of sCPTs is presented in Section 4.2 below. The graphical results of the CPTs, presented as traces of tip resistance (q_c), sleeve friction (s_f), friction ratio (R_f), dynamic pore pressure (u_2) and soil classification (I_c) are presented in Appendix 3, while VS30 results, in the form of the BCE report is presented in Appendix 5.

3.4 Test Pits

Test pits, denoted TP101 to TP110, were completed using a 1.7-tonne excavator and supervised by an ENGEO Geotechnical Engineer. The test pits were undertaken to maximum depths of 2.2 m, with target termination criteria at the base of the peat. Within TP101, TP102, TP105 and TP107, due to limitations with the reach / capability of the small excavator (typically to remove logs within the base of the peat), the base of the peat was not visually observed, however sands were inferred by resistance of a DCP rod pushed through the base of the test pit. TP106 and TP108 did not encounter the base of the peat due to collapse of the test pit.

Test pits were logged on-site in general accordance with the NZGS Guidelines (NZGS, 2005).

A summary of test pits is presented in Section 4.3 below. Engineering logs and photographs are presented in Appendix 6.

3.5 Hand Auger Boreholes

Hand auger boreholes, denoted HA01 to HA08, were drilled and logged on site by an ENGEO Geotechnical Engineer in general accordance with the NZGS Guidelines (NZGS, 2005).

Hand auger boreholes were drilled using a 50 mm diameter auger to depths of up to 4.4 m below existing ground level. Dynamic Cone Penetrometer (DCP) tests were undertaken throughout the depth of the hand auger boreholes in accordance with the NZS4402.

A summary of hand auger boreholes is presented in Section 4.4 below. Engineering logs including DCP test results are presented in Appendix 7.

3.6 Piezometer Installation

ENGEO has installed 21 piezometers, denoted PZ01 to PZ21, to depths of 4m across the site. All piezometers were installed by Perrys using morooka and tractor drill rigs. A 600 mm upstand lockable toby was installed at each location.

PZ01 to PZ09 were installed in May 2022 using wash bore techniques. PZ10 to PZ16 were installed between 26 and 29 May 2025 and PZ17 to PZ21 installed between 5 and 6 August 2025 using rotary core techniques.

Table 1: Piezometer Installation Details

Test ID	Coordinates ¹		Elevation ² (mRL)	Depth (m)	Peat Depth ³ (m)	Details
	mN	mE				
PZ01	802509.73	389733.45	0.63	4.0	-	50 mm PVC pipe, screened entire length
PZ02	802847.12	388446.46	1.29	4.0	-	50 mm PVC pipe, screened entire length
PZ03	802880.92	387700.41	1.43	4.0	-	50 mm PVC pipe, screened entire length
PZ04	803143.13	388269.69	1.59	4.0	-	50 mm PVC pipe, screened entire length
PZ05	802830.71	388912.1	0.81	4.0	-	50 mm PVC pipe, screened entire length
PZ06	802496.8	389237.48	1.46	4.0	-	50 mm PVC pipe, screened entire length
PZ07	803474.02	387814.88	1.59	4.0	-	50 mm PVC pipe, screened entire length
PZ08	802871.65	389390.15	0.94	4.0	-	50 mm PVC pipe, screened entire length
PZ09	803257.17	388792.74	4.0	4.0	-	50 mm PVC pipe, screened entire length
PZ10	801538.113	387140.354	2.8	4.0	-	50 mm PVC pipe, screened entire length
PZ11	801022.442	387617.78	3.0	4.0	4.0+	50 mm PVC pipe, screened entire length
PZ12	801719.003	387847.191	1.49	4.0	3.2	50 mm PVC pipe, screened entire length
PZ13	802650.359	388076.09	1.38	4.0	1.8	50 mm PVC pipe, screened entire length
PZ14	801473.588	387432.077	1.62	4.0	2.8	50 mm PVC pipe, screened entire length
PZ15	802056.503	387619.983	1.21	4.0	2.0	50 mm PVC pipe, screened entire length
PZ16	802342.83	387755.098	1.33	4.0	1.4	50 mm PVC pipe, screened entire length
PZ17	801190.738	388324.566	1.0	4.5	1.0	50 mm PVC pipe, screened between 1.2 – 4 m in sand
PZ18	801310.808	387976.067	0.85	4.5	1.5	50 mm PVC pipe, screened between 1.5 – 4 m in sand

Test ID	Coordinates ¹		Elevation ² (mRL)	Depth (m)	Peat Depth ³ (m)	Details
	mN	mE				
PZ19	802273.639	388599.867	0.82	4.5	3.5	50 mm PVC pipe, screened between 0.7 – 2.2 m in peat
PZ20	801830.386	388380.217	1.06	4.5	3.0	50 mm PVC pipe, screened between 1.4 – 2.4 m in peat
PZ21	802326.558	388250.241	1.17	4.5	3.0	50 mm PVC pipe, screened between 3 – 4 m in sand

Notes: ¹ Locations from hand-held GPS. Coordinate system is Bay of Plenty Circuit 2000. ² Elevation in m RL. Vertical datum is NZVD2016. ³ Peat depth not recorded for PZ01 to PZ09 due to washbore installation techniques.

3.7 Laboratory Testing

Push tube samples containing undisturbed core comprising estuarine muds for one-dimensional consolidation analyses were obtained from BH04 and BH05 at depths of 8.5 m to 9.0 m. Laboratory testing was carried out by Geotechnics, and IANZ accredited laboratory.

A summary of laboratory testing is presented in Section 4.6 below. Copies of laboratory testing results are included as Appendix 9.

4 Summary of Geotechnical Data

A summary of all geotechnical data utilised for ground model preparation and geotechnical assessment is presented in the following section.

4.1 Machine Boreholes

Table 2: Machine Borehole Summary

Borehole ID	Investigation Ref.	Date	Coordinates ¹		Elevation (mRL) ²	Total Depth m (bgl)
			mN	mE		
BH01	ENGEO 2025	27/05/2025	802906.6	387771.1	1.34	19.95
BH02	ENGEO 2025	26/05/2025	802339.8	387762.4	1.42	19.95
BH03	ENGEO 2025	28/05/2025	802670.5	388738.5	0.78	19.95
BH04	ENGEO 2025	06/08/2025	802011.4	387633.4	1.08	13.95
BH05	ENGEO 2025	07/08/2025	802360.2	387527.5	1.65	9.0
BH_89252	NZGD	22-23/02/2011	803603.0	388232.8	5.81	25.95
BH_89253	NZGD	04/02/2011	802310.4	389968.6	2.0	22.00
BH_93008	NZGD	20/11/2006	802893.2	389539.4	5.7	30.45
BH_93010	NZGD	16/11/2006	801738.9	390177.5	2.8	30.45
BH_93087	NZGD	2-4/04/2008	801902.4	390108.2	2.2	59.10
BH_93131	NZGD	16/11/2006	801985.4	390091.2	0.6	30.45
BH_107550	NZGD	24-27/02/2006	802780.9	389564.0	2.0	22.50
BH_112218	NZGD	30/08/2018	800957.3	387710.1	1.8	10.50

Notes: ¹ Locations from hand-held GPS. Coordinate system is Bay of Plenty Circuit 2000. ² Elevation in m RL. Vertical datum is NZVD2016.

4.2 Cone Penetration Tests & Seismic Cone Penetrometer Tests

Table 3: CPT and sCPT Summary

CPT ID	Investigation Ref.	Date	Coordinates ¹		Elevation (mRL) ²	Total Depth m (bgl)
			mN	mE		
CPT01	LDE 2019	21/11/2019	803555.475	387847.591	2.2	20.2
CPT02	LDE 2019	21/11/2019	803310.259	388246.690	2.3	20.2
CPT03	LDE 2019	21/11/2019	803424.296	388463.469	3.5	20.2
CPT04	LDE 2019	21/11/2019	803253.529	388577.801	2.0	20.2
CPT05	LDE 2019	21/11/2019	803085.095	388755.047	1.5	20.2
CPT06	LDE 2019	20/11/2019	802940.632	389066.408	0.9	20.0
CPT07	LDE 2019	21/11/2019	803216.077	387756.167	1.8	19.0
CPT08	LDE 2019	21/11/2019	803175.435	388035.681	1.6	20.2
CPT09	LDE 2019	22/11/2019	802998.166	388433.262	1.3	20.2
CPT10	LDE 2019	20/11/2019	802887.069	388862.389	0.9	20.3
CPT11	LDE 2019	19/11/2019	802705.963	389480.114	0.9	19.0
CPT12	LDE 2019	21/11/2019	803015.569	387796.600	1.7	18.2
CPT13	LDE 2019	22/11/2019	802971.305	388140.250	1.4	20.2
CPT14	LDE 2019	21/11/2019	802799.254	388597.638	0.8	18.0
CPT15	LDE 2019	20/11/2019	802730.173	388946.207	0.7	20.0
CPT16	LDE 2019	20/11/2019	802599.138	389269.070	0.7	17.7
CPT17	LDE 2019	19/11/2019	802480.606	389605.470	0.7	20.2
CPT101	ENGEO 2025	28/05/2025	802799.434	387698.976	1.63	20.0
CPT102	ENGEO 2025	28/05/2025	802459.210	388053.845	1.95	20.0
CPT103	ENGEO 2025	27/05/2025	802360.204	387527.524	1.65	20.0
CPT104	ENGEO 2025	28/05/2025	802655.587	388121.997	1.06	20.0

CPT ID	Investigation Ref.	Date	Coordinates ¹		Elevation (mRL) ²	Total Depth m (bgl)
			mN	mE		
CPT105	ENGEO 2025	27/05/2025	802246.286	387986.955	1.0	19.9
CPT106	ENGEO 2025	28/05/2025	802500.057	387789.628	1.48	19.9
CPT107	ENGEO 2025	27/05/2025	802062.376	387401.125	1.27	20.0
CPT108	ENGEO 2025	27/05/2025	801964.951	387907.891	0.75	20.0
CPT109	ENGEO 2025	27/05/2025	801686.788	387190.641	1.51	20.0
CPT110	ENGEO 2025	27/05/2025	801775.383	387554.276	1.63	20.0
CPT111	ENGEO 2025	27/05/2025	801706.425	387837.744	1.08	20.0
CPT112	ENGEO 2025	26/05/2025	801257.509	387129.855	2.0	20.0
CPT113	ENGEO 2025	26/05/2025	801026.661	387383.909	2.45	20.0
CPT114	ENGEO 2025	26/05/2025	801316.158	387719.977	1.06	20.0
CPT115	ENGEO 2025	26/05/2025	803385.753	387943.106	1.67	17.3
CPT116	ENGEO 2025	28/05/2025	802810.790	388256.251	1.14	18.7
CPT117	ENGEO 2025	30/05/2025	802400.029	389825.261	0.6	20.0
CPT118	ENGEO 2025	28/05/2025	802563.902	387568.380	1.67	20.0
CPT119	ENGEO 2025	27/05/2025	802370.363	387766.850	1.33	20.0
CPT120	ENGEO 2025	8/08/2025	802570.000	388362.895	0.82	20.0
CPT121	ENGEO 2025	8/08/2025	802583.697	388666.534	0.91	30.0
CPT122	ENGEO 2025	8/08/2025	802258.859	388579.236	0.66	20.0
CPT123	ENGEO 2025	8/08/2025	802317.175	388255.763	0.98	30.0
CPT124	ENGEO 2025	7/08/2025	802020.438	388138.988	1.06	20.0
CPT125	ENGEO 2025	7/08/2025	801992.410	388529.639	1.12	30.0
CPT126	ENGEO 2025	7/08/2025	801571.291	388034.402	1.03	20.0

CPT ID	Investigation Ref.	Date	Coordinates ¹		Elevation (mRL) ²	Total Depth m (bgl)
			mN	mE		
CPT127	ENGEO 2025	7/08/2025	801103.342	388292.593	0.85	30.0
CPT128	ENGEO 2025	7/08/2025	801191.707	387925.848	0.87	30.0
CPT129	ENGEO 2025	7/08/2025	801417.951	388372.576	0.83	30.0
CPT130	ENGEO 2025	7/08/2025	801783.099	388283.044	1.41	20.0
CPT131	ENGEO 2025	7/08/2025	801694.980	388351.835	0.88	30.0
CPT132	ENGEO 2025	7/08/2025	801717.212	387935.153	1.39	20.0
CPT133	ENGEO 2025	6/08/2025	802011.882	387633.649	1.08	30.0
CPT134	ENGEO 2025	6/08/2025	801884.252	388070.481	0.97	30.0
SCPT1	ENGEO 2025	27/05/2025	801425.469	387422.244	1.9	20.5
SCPT2	ENGEO 2025	28/05/2025	802656.834	387820.406	2.6	30.5
SCPT3	ENGEO 2025	26/05/2025	803146.673	387940.211	1.79	30.5
CPT_92228	NZGD	28/02/2007	803846.4	387672.8	7.5	22.6
CPT_92229	NZGD	28/02/2007	803682.7	388043.6	7.6	23.2
CPT_92230	NZGD	28/02/2007	803357.4	388773.5	5.8	18.3
CPT_92231	NZGD	28/02/2007	803194.3	389137.0	6.8	26.0
CPT_92233	NZGD	12/12/2006	802841.0	389487.4	0.9	18.5
CPT_92234	NZGD	12/12/2006	802775.1	389424.9	1.3	17.0
CPT_92237	NZGD	28/02/2007	802711.9	389760.6	3.2	19.1
CPT_92238	NZGD	28/02/2007	802579.4	389832.3	1.3	26.4
CPT_92239	NZGD	12/12/2006	802443.8	389893.2	1.3	24.5
CPT_92240	NZGD	12/12/2006	802311.9	389955.7	1.3	30.1
CPT_94735	NZGD	30/11/2008	803484.6	388526.3	5.7	14.8

CPT ID	Investigation Ref.	Date	Coordinates ¹		Elevation (mRL) ²	Total Depth m (bgl)
			mN	mE		
CPT_94813	NZGD	21/06/2010	802253.4	389978.8	0.4	30.0
CPT_94888	NZGD	14/11/2011	802319.2	389934.7	1.8	30.0
CPT_106822	NZGD	23/02/2006	802643.7	389279.0	-	18.5
CPT_106823	NZGD	23/02/2006	802765.0	389386.4	-	18.8
CPT_106824	NZGD	23/02/2006	802900.0	389539.3	-	18.5
CPT_110980	NZGD	17/08/2018	800957.3	387710.1	2.2	20.0
CPT_110983	NZGD	17/08/2018	800971.3	387706.1	3.8	20.0
CPT_110985	NZGD	16/08/2018	800948.1	387155.7	2.2	20.0
CPT_126068	NZGD	17/05/2017	802945.0	389478.6	2.8	20.1
CPT_126069	NZGD	17/05/2017	802831.2	389608.0	2.8	17.8
CPT_233188	NZGD	17/05/2017	802793.8	389647.6	1.8	17.8
CPT_233338	NZGD	5/03/2019	802961.1	389368.9	1.2	20.0
CPT_233393	NZGD	5/03/2019	802569.3	389801.0	1.3	20.5
CPT_233394	NZGD	5/03/2019	802499.1	389840.8	1.2	20.5

Notes: ¹ Locations from hand-held GPS. Coordinate system is Bay of Plenty Circuit 2000. ² Elevation in m RL. Vertical datum is NZVD2016.

4.3 Test pits

Table 4: Test Pit Summary

TP ID	Investigation Ref.	Date	Coordinates ¹		Elevation (mRL) ²	Total Depth m (bgl)
			mN	mE		
TP01	GOLDER 2020	29/01/2020	803562.281	387869.340	2.2	2.1
TP02	GOLDER 2020	29/01/2020	802963.016	387997.553	1.6	2.1
TP03	GOLDER 2020	29/01/2020	803097.990	388266.558	1.5	1.9
TP04	GOLDER 2020	29/01/2020	802810.083	388296.230	1.1	1.9
TP05	GOLDER 2020	29/01/2020	802989.518	388658.588	1.3	2.2
TP06	GOLDER 2020	29/01/2020	802849.521	388631.776	0.7	3.1
TP07	GOLDER 2020	29/01/2020	802967.336	389031.418	0.8	2.9
TP08	GOLDER 2020	28/01/2020	802728.288	389003.278	0.5	2.0
TP09	GOLDER 2020	28/01/2020	802703.332	389328.209	0.6	2.4
TP10	GOLDER 2020	28/01/2020	802488.485	389629.178	0.6	2.1
TP101	ENGEO 2025	03/06/2025	803090.471	388672.123	1.4	1.6
TP102	ENGEO 2025	03/06/2025	802977.099	388643.824	1.1	2.0
TP103	ENGEO 2025	03/06/2025	803013.968	388845.547	1.2	1.0
TP104	ENGEO 2025	03/06/2025	803089.289	389012.833	2.4	1.1
TP105	ENGEO 2025	03/06/2025	802706.912	388123.677	1.1	1.5
TP106	ENGEO 2025	03/06/2025	802722.014	387884.436	2.3	2.2
TP107	ENGEO 2025	03/06/2025	801671.585	387474.406	1.8	1.2
TP108	ENGEO 2025	03/06/2025	801657.413	387468.153	1.8	1.9
TP109	ENGEO 2025	03/06/2025	801574.742	387176.679	2.2	1.0
TP110	ENGEO 2025	03/06/2025	801569.543	387310.042	2.4	1.1
TP_93105	NZGD	02/04/2008	803767.0	387860.0	7.7	3.9

TP ID	Investigation Ref.	Date	Coordinates ¹		Elevation (mRL) ²	Total Depth m (bgl)
			mN	mE		
TP_93106	NZGD	02/04/2008	803628.0	388176.0	3.7	3.9
TP_93107	NZGD	03/04/2008	803436.0	388594.0	8.7	3.5
TP_93108	NZGD	02/04/2008	803242.0	389028.0	6.9	3.4
TP_93142	NZGD	07/12/2006	802266.0	389958.0	1.4	3.4
TP_95362	NZGD	09/04/2010	803720.7	387950.4	8.6	4.0
TP_95363	NZGD	09/04/2010	803565.9	388316.4	10.1	4.2
TP_95364	NZGD	09/04/2010	803520.7	388418.4	8.6	4.2
TP_95365	NZGD	09/04/2010	803403.8	388683.6	8.1	4.0
TP_95366	NZGD	12/04/2010	803275.2	388956.6	5.8	3.7
TP_95367	NZGD	12/04/2010	803127.8	389235.6	7.9	4.3
TP_125950	NZGD	17/05/2017	802827.0	389614.6	1.8	2.7
TP_125952	NZGD	17/05/2017	802716.1	389728.4	1.8	2.2
TP_125955	NZGD	17/05/2017	802873.3	389539.2	1.8	2.8
TP_125957	NZGD	17/05/2017	802946.6	389471.2	3.8	2.0
TP_125959	NZGD	17/05/2017	803066.4	389353.2	5.8	2.0
TP_125960	NZGD	17/05/2017	803149.7	389176.7	6.8	1.7

Notes: ¹ Locations from hand-held GPS. Coordinate system is Bay of Plenty Circuit 2000. ² Elevation in m RL. Vertical datum is NZVD2016.

4.4 Hand Auger Boreholes

Table 5: Hand Auger Summary

HA ID	Investigation Ref.	Date	Coordinates ¹		Elevation (mRL) ²	Total Depth (m bgl)
			mN	mE		
HA01	ENGEO 2025	08/08/2025	801783.264	388290.015	1.5	2.2
HA02	ENGEO 2025	08/08/2025	801745.268	388201.378	1.1	2.8
HA03	ENGEO 2025	07/08/2025	801079.008	387981.023	0.8	2.5
HA04	ENGEO 2025	08/08/2025	801696.011	388351.014	0.9	2.2
HA05	ENGEO 2025	07/08/2025	801652.542	387360.213	2.1	4.3
HA06	ENGEO 2025	07/08/2025	801738.251	387448.296	1.7	4.4
HA07	ENGEO 2025	04/08/2025	801583.698	387641.351	1.4	1.8
HA08	ENGEO 2025	08/08/2025	801667.850	387955.399	1.0	2.4
HA_89276	NZGD	24/05/2011	803734.4	387931.7	5.1	3.0
HA_89277	NZGD	25/05/2011	803498.8	388461.4	7.5	3.0
HA_89278	NZGD	25/05/2011	803341.5	388799.6	5.8	4.3
HA_126045	NZGD	18/05/2017	802704.9	389715.9	2.0	1.5

Notes: ¹ Locations from hand-held GPS. Coordinate system is Bay of Plenty Circuit 2000. ² Elevation in m RL. Vertical datum is NZVD2016.

4.5 MASW Lines

MASW Survey lines were undertaken during preparation of the 2020 Golder Report (Golder Associated (NZ) Limited). An extract from that report, including MASW survey process and results are included as Appendix 8.

Table 6: MASW Survey Location Summary

Test ID.	Investigation Ref.	Start of Line Coordinates ¹		End of Line Coordinates ¹		Survey Length (m)
		mN	mE	mN	mE	
L01	GOLDER 2020	802610.628	388850.636	802426.937	389587.459	754
L02	GOLDER 2020	803323.747	387774.177	802511.568	389739.324	2123
L03	GOLDER 2020	802886.813	387668.368	803632.371	387844.742	773
L04	GOLDER 2020	802766.064	388160.858	803340.960	388319.554	598
L05	GOLDER 2020	802664.731	388556.624	803241.516	388847.252	723
L06	GOLDER 2020	802507.409	389222.469	802962.835	389422.592	498
L07	GOLDER 2020	802933.423	387873.647	803363.995	387996.692	448
L08	GOLDER 2020	802702.379	388412.225	803256.969	388562.673	573
L09	GOLDER 2020	803173.517	388226.758	803196.819	388234.894	23
L10	GOLDER 2020	802620.154	389512.295	803093.441	388278.727	73
TP03	GOLDER 2020	803104.277	388247.324	802977.127	388675.047	23
TP05	GOLDER 2020	802468.548	389603.916	802977.127	388675.047	23
MASW-17	GOLDER 2020	802468.548	389603.916	802491.776	389610.056	23

Notes: ¹ Coordinate system is Bay of Plenty Circuit 2000.

4.6 Laboratory Testing

Golder undertook laboratory testing within the peat deposits during preparation of their 2020 report (Golder Associated (NZ) Limited). Samples were collected using push tubes (dia. ranging from 54-60 mm) at varying depths in their test pits. Tests were carried out in accordance with NZS 4402:1986 Tests 2.1, 3.1.2, 5.1.3, 7.1 by IANZ Accredited Laboratory. Applied vertical pressures for one-dimensional consolidation tests were between 5 kPa to 800 kPa.

ENGEO undertook two one-dimensional consolidation tests within the Estuarine Muds. Samples were collected in 50mm push tubes at depths of 8.5m in MBH04 and MBH05. Tests were carried out in accordance with NZS 4402:1986 Test 2.1 and Test 7.1 by IANZ Accredited Laboratory. Applied vertical pressures for one-dimensional consolidation tests were between 3 kPa to 400 kPa.

Copies of test results are included as Appendix 9.

Table 7: Basic Soil Properties of Peat Deposits

Lab Report #	Lab Ref #	Location ID	Sample Depth (m bgl)	Organic Matter (%)	Water Content (%)	Wet Density (t/m ³)	Dry Density (t/m ³)	Air Voids (%)
2-68135.00 HA5500_1_6_OC; 2-681351.00 HA5500_1_5_PSD	HA550_1	TP03	0.4 – 1.0	55	270	1.06	0.28	11
	HA550_2	TP05	0.3 – 0.6	70	255	1.00	0.28	16
	HA550_3	TP07	0.3 – 0.9	85	405	1.04	0.20	8.7
	HA550_4	TP08	1.0 – 1.6	50	424	1.16	0.22	-3.8
	HA550_5	TP10	0.3 – 0.9	40	317	1.04	0.24	11
	HA550_6	TP10	0.3 – 0.9	50	461	0.92	0.16	17

Table 8: Summary of 1D Consolidation Test Results

Soil Unit	Lab Report #	Lab Ref #	Location ID	Sample Depth (m bgl)	e ₀ ¹	C _c ²	C _r ³	Soil Description
PEAT	2-68135.00	HA5500_7_oed	TP01	0.95 – 1.00	9.29	5.13	0.37	Fibrous PEAT
		HA5500_8_oed	TP01	1.50 – 1.55	9.02	4.78	0.43	Spongy PEAT
		HA5500_9_oed	TP05	1.00 – 1.05	6.57	2.81	0.24	Organic SILT
		HA5500_10_oed	TP08	0.70 – 0.75	13.63	7.02	0.54	Fibrous PEAT
ESTUARINE MUDDS	1099908.0000.0.0/Rep1		MBH04	8.84 - 8.86	1.88	0.47	0.04	SILT
			MBH05	8.68 - 8.70	2.27	0.71	0.06	SILT

Notes: ¹ Initial Void Ratio, ² Compression Index, ³ Recompression Index

5 Groundwater Summary

Table 9 below outlines the groundwater levels, as observed at the time of investigation.

Table 9: Summary of Groundwater Observations

Test ID.	Elevation (mRL) ¹	Groundwater Depth (m bgl)	Groundwater Elevation ¹ (mRL)	Time of Year	Test ID.	Elevation (mRL) ¹	Groundwater Depth (m bgl)	Groundwater Elevation ¹ (mRL)	Time of Year
BH01	1.3	1.7	-0.4	AUTUMN 2025	CPT_92233	5.1	0.7	4.4	SUMMER 2006
BH02	1.4	1.2	0.2	AUTUMN 2025	CPT_92234	6.2	0.8	5.4	SUMMER 2006
BH03	0.8	0.6	0.2	AUTUMN 2025	CPT_92237	3.2	1.3	1.9	SUMMER 2007
BH04	1.1	0.5	0.6	WINTER 2025	CPT_92238	1.3	1.7	-0.4	SUMMER 2007
BH05	1.7	0.4	1.3	WINTER 2025	CPT_92239	1.3	1.7	-0.5	SUMMER 2006
BH_89252	5.8	3.0	2.8	SUMMER 2011	CPT_92240	1.3	2.0	-0.7	SUMMER 2006
BH_89253	1.8	-	-	SUMMER 2011	CPT_94735	5.7	4.3	1.4	SPRING 2008
BH_93008	5.7	-	-	SPRING 2006	CPT_94813	0.4	0.5	-0.1	WINTER 2010
BH_93010	2.8	-	-	SPRING 2006	CPT_94888	1.8	1.6	0.2	SPRING 2011
BH_93087	2.2	-	-	AUTUMN 2008	CPT_106822	-	0.8	-	SUMMER 2006
BH_93131	0.6	0.6	0.0	SPRING 2006	CPT_106823	-	0.6	-	SUMMER 2006
BH_107550	2.0	-	-	SUMMER 2006	CPT_106824	-	0.4	-	SUMMER 2006
BH_112218	1.8	0.5	1.3	WINTER 2018	CPT_110980	2.2	0.6	1.6	WINTER 2018
CPT01	2.2	0.9	1.3	SPRING 2019	CPT_110983	3.8	3.9	-0.2	WINTER 2018
CPT02	2.3	1.5	0.8	SPRING 2019	CPT_110985	2.2	0.6	1.6	WINTER 2018
CPT03	3.5	1.6	1.9	SPRING 2019	CPT_126068	2.8	1.1	1.7	AUTUMN 2017
CPT04	2.0	0.9	1.1	SPRING 2019	CPT_126069	2.8	0.5	2.3	AUTUMN 2017
CPT05	1.5	1.0	0.5	SPRING 2019	CPT_233188	1.8	0.5	1.3	AUTUMN 2017

Test ID.	Elevation (mRL) ¹	Groundwater Depth (m bgl)	Groundwater Elevation ¹ (mRL)	Time of Year	Test ID.	Elevation (mRL) ¹	Groundwater Depth (m bgl)	Groundwater Elevation ¹ (mRL)	Time of Year
CPT06	0.9	0.5	0.4	SPRING 2019	CPT_233338	1.2	1.3	-0.1	AUTUMN 2019
CPT07	1.8	0.9	0.9	SPRING 2019	CPT_233393	1.3	0.9	0.4	AUTUMN 2019
CPT08	1.6	1.0	0.6	SPRING 2019	CPT_233394	1.2	0.8	0.4	AUTUMN 2019
CPT09	1.3	0.9	0.4	SPRING 2019	TP01	2.2	1.8	0.4	SUMMER 2020
CPT10	0.9	0.5	0.4	SPRING 2019	TP02	1.6	1.6	-0.1	SUMMER 2020
CPT11	0.9	0.5	0.4	SPRING 2019	TP03	1.5	1.5	0.0	SUMMER 2020
CPT12	1.7	1.0	0.7	SPRING 2019	TP04	1.1	1.2	-0.1	SUMMER 2020
CPT13	1.4	0.9	0.5	SPRING 2019	TP05	1.3	1.2	0.1	SUMMER 2020
CPT14	0.8	0.4	0.4	SPRING 2019	TP06	0.7	1.2	-0.5	SUMMER 2020
CPT15	0.7	0.4	0.3	SPRING 2019	TP07	0.8	1.4	-0.6	SUMMER 2020
CPT16	0.7	0.5	0.2	SPRING 2019	TP08	0.5	1.0	-0.5	SUMMER 2020
CPT17	0.7	0.5	0.2	SPRING 2019	TP09	0.6	1.0	-0.4	SUMMER 2020
CPT101	1.6	0.2	1.4	AUTUMN 2025	TP10	0.6	1.1	-0.5	SUMMER 2020
CPT102	2.0	0.2	1.8	AUTUMN 2025	TP101	1.4	0.5	0.9	WINTER 2025
CPT103	1.7	0.4	1.3	AUTUMN 2025	TP102	1.1	1.2	-0.1	WINTER 2025
CPT104	1.1	0.1	1.0	AUTUMN 2025	TP103	1.2	1.0	0.2	WINTER 2025
CPT105	1.0	0.4	0.6	AUTUMN 2025	TP104	2.4	-	-	WINTER 2025
CPT106	1.5	0.6	0.9	AUTUMN 2025	TP105	1.1	0.5	0.6	WINTER 2025
CPT107	1.3	0.2	1.1	AUTUMN 2025	TP106	2.3	0.7	1.6	WINTER 2025

Test ID.	Elevation (mRL) ¹	Groundwater Depth (m bgl)	Groundwater Elevation ¹ (mRL)	Time of Year	Test ID.	Elevation (mRL) ¹	Groundwater Depth (m bgl)	Groundwater Elevation ¹ (mRL)	Time of Year
CPT108	0.8	0.1	0.7	AUTUMN 2025	TP107	1.8	0.7	1.1	WINTER 2025
CPT109	1.5	0.1	1.4	AUTUMN 2025	TP108	1.8	1.1	0.7	WINTER 2025
CPT110	1.6	0.6	1.0	AUTUMN 2025	TP109	2.2	1.0	1.2	WINTER 2025
CPT111	1.1	0.5	0.6	AUTUMN 2025	TP110	2.4	1.0	1.4	WINTER 2025
CPT112	2.0	1.0	1.0	AUTUMN 2025	TP_93105	7.7	-	-	AUTUMN 2008
CPT113	2.5	1.3	1.2	AUTUMN 2025	TP_93106	3.7	-	-	AUTUMN 2008
CPT114	1.1	0.9	0.2	AUTUMN 2025	TP_93107	8.7	-	-	AUTUMN 2008
CPT115	1.7	0.6	1.1	AUTUMN 2025	TP_93108	6.9	-	-	AUTUMN 2008
CPT116	1.1	0.2	0.9	AUTUMN 2025	TP_93142	1.4	0.4	1.0	SUMMER 2006
CPT117	0.6	0.1	0.5	AUTUMN 2025	TP_95362	8.6	-	-	AUTUMN 2010
CPT118	1.7	1.0	0.7	AUTUMN 2025	TP_95363	10.1	-	-	AUTUMN 2010
CPT119	1.3	0.2	1.1	AUTUMN 2025	TP_95364	8.6	-	-	AUTUMN 2010
CPT120	0.8	0.8	0.0	WINTER 2025	TP_95365	8.1	-	-	AUTUMN 2010
CPT121	0.9	0.8	0.1	WINTER 2025	TP_95366	5.8	-	-	AUTUMN 2010
CPT122	0.7	0.7	0.0	WINTER 2025	TP_95367	7.9	-	-	AUTUMN 2010
CPT123	1.0	0.7	0.3	WINTER 2025	TP_125950	1.8	0.5	1.3	AUTUMN 2017
CPT124	1.1	0.8	0.3	WINTER 2025	TP_125952	1.8	0.3	1.5	AUTUMN 2017
CPT125	1.1	1.1	0.0	WINTER 2025	TP_125955	1.8	1.7	0.1	AUTUMN 2017
CPT126	1.0	1.0	0.0	WINTER 2025	TP_125957	3.8	1.8	2.0	AUTUMN 2017

Test ID.	Elevation (mRL) ¹	Groundwater Depth (m bgl)	Groundwater Elevation ¹ (mRL)	Time of Year	Test ID.	Elevation (mRL) ¹	Groundwater Depth (m bgl)	Groundwater Elevation ¹ (mRL)	Time of Year
CPT127	0.9	0.8	0.0	WINTER 2025	TP_125959	5.8	1.3	4.5	AUTUMN 2017
CPT128	0.9	0.8	0.1	WINTER 2025	TP_125960	6.8	1.2	5.6	AUTUMN 2017
CPT129	0.8	0.7	0.1	WINTER 2025	HA01	1.5	0.5	1.0	WINTER 2025
CPT130	1.4	0.7	0.7	WINTER 2025	HA02	1.1	0.4	0.7	WINTER 2025
CPT131	0.9	0.7	0.2	WINTER 2025	HA03	0.8	0.1	0.7	WINTER 2025
CPT132	1.4	0.7	0.7	WINTER 2025	HA04	0.9	0.5	0.4	WINTER 2025
CPT133	1.1	0.5	0.6	WINTER 2025	HA05	2.1	0.5	1.6	WINTER 2025
CPT134	1.0	0.6	0.4	WINTER 2025	HA06	1.7	0.3	1.4	WINTER 2025
SCPT1	1.9	0.5	1.4	AUTUMN 2025	HA07	1.4	0.3	1.1	WINTER 2025
SCPT2	2.6	1.9	0.7	AUTUMN 2025	HA08	1.0	0.6	0.4	WINTER 2025
SCPT3	1.8	0.1	1.7	AUTUMN 2025	HA_89276	5.1	1.5	3.6	AUTUMN 2011
CPT_92228	7.5	7.2	0.3	SUMMER 2007	HA_89277	7.5	1.6	5.9	AUTUMN 2011
CPT_92229	7.6	6.1	1.5	SUMMER 2007	HA_89278	5.8	3.6	2.2	AUTUMN 2011
CPT_92230	5.8	8.0	-2.2	SUMMER 2007	HA_126045	1.8	0.8	1.0	AUTUMN 2017
CPT_92231	6.8	7.3	-0.5	SUMMER 2007					

Notes: ¹ Elevation in m RL. Vertical datum is NZVD2016.

6 Limitations

- i. We have prepared this report in accordance with the brief as provided. This report has been prepared for the use of our client, Bell Road Limited Partnership, their professional advisers, relevant Territorial Authorities and the appointed Fast Track Panel in relation to the specified project brief described in this report. No liability is accepted for the use of any part of the report for any other purpose or by any other person or entity.
- ii. Subsurface conditions relevant to construction works should be assessed by contractors who can make their own interpretation of the factual data provided. They should perform any additional tests as necessary for their own purposes.
- iii. This Limitation should be read in conjunction with the Engineering NZ / ACENZ Standard Terms of Engagement.
- iv. This report is not to be reproduced either wholly or in part without our prior written permission.

We trust that this information meets your current requirements. Please do not hesitate to contact the undersigned on (07) 777 0209 if you require any further information.

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Senior Geotechnical Engineer

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Associate Engineering Geologist

7 References

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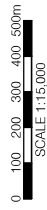
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APPENDIX 1: Investigation Locations



NOTES:

1. SURVEY, DRONE AERIAL, AND EXISTING CONTOURS PROVIDED BY MAVEN, RECEIVED MAY 29 2025 and August 26, 2025.
2. COORDINATE ORIGIN: BAY OF PLENTY.
3. PROJECTION: GEODETIC 2000.
4. VERTICAL DATUM: NZVD 2016.
5. PARCELS SOURCED FROM LINZ DATA SERVICE AND LICENSED FOR RE-USE UNDER THE CREATIVE COMMONS ATTRIBUTION 4.0 NEW ZEALAND LICENSE (SOURCE DATE: JUNE 30 2025).
6. AERIAL IMAGE SOURCED FROM LINZ DATA SERVICE AND LICENSED FOR RE-USE UNDER THE CREATIVE COMMONS ATTRIBUTION 4.0 NEW ZEALAND LICENSE (BAY OF PLENTY 0.2m RURAL AERIAL PHOTOS 2023-2024).
7. NZ TOPO250 MAP SOURCED FROM LINZ DATA SERVICE AND LICENSED FOR RE-USE UNDER THE CREATIVE COMMONS ATTRIBUTION 4.0 NEW ZEALAND LICENSE.

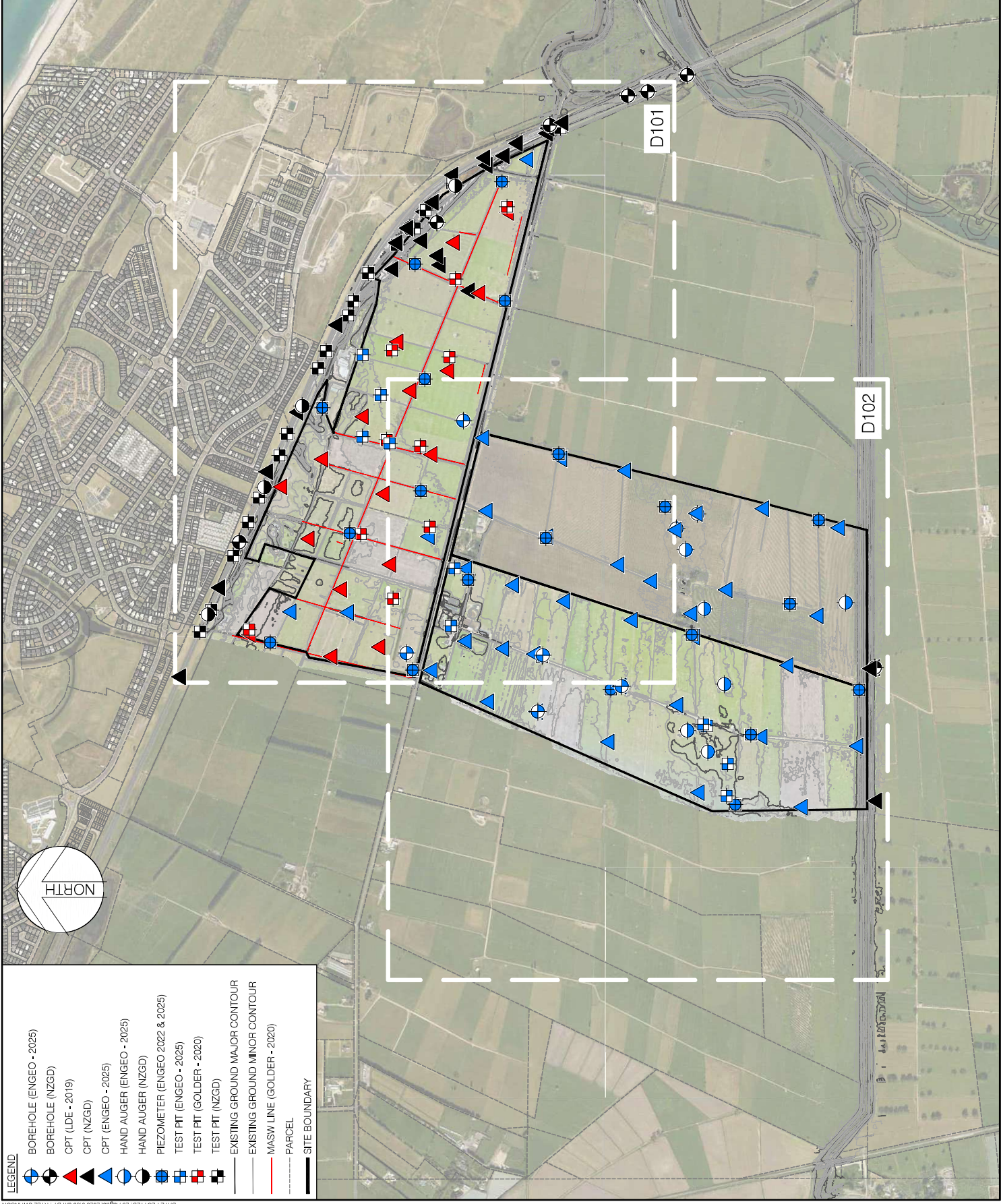


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Rev	Date	Description	Drawn	Checked
A	29.08.25	Client Issue	KS	GS

**GEOTECHNICAL SITE
PLAN - OVERVIEW**

Client: Bell Road Limited Partnership		Drawing:	
Project:	Design: DHT	Drawn:	KS
Bell Road Development	Checked: GS	Date:	28.08.25
Papamoa	Scale:	Sheet:	A3
Tauranga	Project No:	Rev:	A
	19630,000,001		



LEGEND

	BOREHOLE (ENGEO - 2025)
	BOREHOLE (NZGD)
	CPT (LDE - 2019)
	CPT (NZGD)
	CPT (ENGEO - 2025)
	HAND AUGER (ENGEO - 2025)
	HAND AUGER (NZGD)
	PIEZOMETER (ENGEO 2022 & 2025)
	TEST PIT (ENGEO - 2025)
	TEST PIT (GOLDER - 2020)
	TEST PIT (NZGD)
	EXISTING GROUND MAJOR CONTOUR
	EXISTING GROUND MINOR CONTOUR
	MASW LINE (GOLDER - 2020)
	PARCEL
	SITE BOUNDARY

