RILEY CONSULTANTS

GEOTECHNICAL ASSESSMENT PROPOSED RETIREMENT VILLAGE 578 TO 606 SPRINGS ROAD, PREBBLETON

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GEOTECHNICAL ASSESSMENT
PROPOSED RETIREMENT VILLAGE
578 TO 606 SPRINGS ROAD, PREBBLETON

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GEOTECHNICAL ASSESSMENT
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1.0 Introduction

This geotechnical assessment report has been prepared by Riley Consultants Ltd (RILEY) at the request of Summerset Villages Ltd (Summerset) for a proposed retirement village and associated infrastructure at 578 to 606 Springs Road, Prebbleton (herein referred to as the site). It presents the findings of a geotechnical investigation at the site, and includes comment on geology, geomorphology, natural hazards, and foundation considerations with respect to future development of the site.

The report has been prepared to support a resource consent application and should be read in conjunction with our environmental assessment report (RILEY Ref: 190417-H).

2.0 Scope of Work

The following scope of work was undertaken:

- Visual site inspection, service clearance, and mark out of geotechnical test locations.
- Shallow subsurface investigation comprising:
    - Eleven test pits to a target depth of 1m below gravel.
    - Ten hand auger boreholes to a target depth of 3m below ground level.
    - Eight falling head soakage tests to a target depth of 4m below ground level.
    - Scala penetrometer and shear vane tests were undertaken in conjunction with the test pits and hand auger boreholes.
- Deep subsurface investigation comprising four machine boreholes to a target depth of 15m below ground level. Standard Penetration Tests (SPTs) were undertaken at 0.75m centres in silt and 1.5m centres in gravel.
- Installation of piezometers for groundwater monitoring in two of the machine boreholes.
- Analysis of investigation data and assessment of geotechnical hazards including seismicity, groundwater conditions, liquefaction, and lateral spreading.
- Assessment of bearing capacity and California Bearing Ratio (CBR).
- Provision of conceptual foundation solutions for the proposed buildings.
- Discussion of site development requirements.

3.0 Proposed Development

It is understood that the proposed development will comprise a central multi-storey main building of area approximately 4000m^2 surrounded by 224 single-storey villas, several ancillary buildings, roads, carparks, and gardens.

4.0 Site Description

Figure 1 shows an oblique birds-eye view of the site. The site is located in Prebbleton, a small town approximately 12km south-west from Christchurch city centre. The site measures approximately 330m by 280m (approximately 9Ha) and is surrounded by residential areas to the north, east, and south. A mushroom factory currently occupies the northern half of the site and comprises several large warehouses and factory buildings. Most of the factory area is paved with concrete or smaller areas of gravel fill. It is understood that the southern half of the site used to be used as a horse training facility, and currently comprises grassed fields with several bunds up to 2m high separating the fields. A number of mature trees are present towards the south-east of the site, and a residential property is currently located in the south-east corner. A 40m wide strip of grassed land with a 2.5m high bund borders the northern boundary of the site.

Figure 1: Oblique birds-eye view of the site (image courtesy of Google Earth)

5.0 Existing Information

5.1 Geology and Groundwater

The GNS Science (GNS) geological map of the area (Map 16, Christchurch, 1:250,000, 2008) indicates that the site is underlain by Holocene grey river alluvium several hundred metres thick.

Logs from existing boreholes with a 500m radius of the site (available on Environment Canterbury (ECan) well database) indicate ground conditions likely comprise 0.2m to 0.3m of topsoil and fill, underlain by sandy silt or silty sand to 0.7m to 6m depth (increasing towards the north and east), underlain by gravel to greater than 100m depth. Based on ECan borehole data and groundwater contours, groundwater is likely between 5m to 6m depth, with some seasonal variation.

In 2019, RILEY undertook a shallow geotechnical investigation comprising 20 hand auger boreholes (HA01 to HA20). The hand auger boreholes encountered silt and fine to medium sand beneath topsoil, to a maximum depth of 2.3m.

5.2 Earthquake Performance

The GNS Active Fault database indicates the Greendale Fault is the closest active fault to the site, located approximately 10km west of the site. The New Zealand Geotechnical Database (NZGD) has been reviewed for ground damage at or near the site, and site performance following the major Canterbury Earthquake Sequence (CES) events (September 2010, and February, June, and December 2011). No liquefaction ejecta or ground cracking was noted at or near the site.

A review of the peak ground accelerations (PGA) experienced at the site during the major CES events indicates the site experienced PGA up to 0.36g (September 2010 event), with PGA exceeding the serviceability limit state (SLS) design level of 0.13g. In accordance with Section 13.5 of the Ministry of Business, Innovation and Employment (MBIE) Guidelines, the site may be regarded as being “sufficiently tested” for SLS seismic loading conditions where the site has experience at least 170% of the design SLS loading criteria.

6.0 Site Investigation

6.1 Methodology

A geotechnical site investigation was undertaken between 8 June and 19 June 2020 by RILEY, McMillan Drilling (McMillan), Taggart, and Geotechnics. The investigation was supervised on-site by a RILEY engineering geologist and samples were logged on site in general accordance with the New Zealand Geotechnical Society (NZGS) Guidelines. A plan showing test locations is attached in Appendix E.

Four 15m machine boreholes were drilled by McMillan using a sonic track mounted Geoprobe 8140LC rig. SPT testing was undertaken at 0.75m centres within silt and 1.5m centres within gravel. A piezometer with a screened interval between 4m and 10m depth was installed in BH202 and BH203 upon completion of the drilling. The remaining boreholes were grouted back to surface upon completion. Borehole logs and photography are attached in Appendices A and B.

Eleven test pits to a target depth of 1m below gravel were excavated by Taggart using a 13-tonne excavator. All test pits achieved target depth to a maximum depth of 4.0m, with the exception of TP211 which suffered a mechanical breakdown at 1.2m. A hand auger borehole was instead completed at this location. RILEY undertook a Scala penetrometer test at each test pit location and shear vanes where appropriate. Representative samples were selected for laboratory testing. Test pit logs are attached in Appendix A, and laboratory reports in Appendix C.

Ten hand auger boreholes to a target depth of 3m or practical refusal with Scala penetrometer testing to 2m depth were undertaken by RILEY. Several hand augers and Scalas did not achieve target depth due to refusal on gravel, fill, roots, or hard ground. Hand auger logs are attached in Appendix A.

Eight falling head soakage tests were undertaken by Geotechnics. A 0.3m diameter auger hole to a target depth of 4.0m (or 1m to 2m below gravel) was excavated by Taggart at each test location, and geotechnics installed a 100mm diameter PVC pipe prior to undertaking the tests. The PVC pipes have been left in place. Geotechnics test reports are attached in Appendix D.

7.0 Geotechnical Assessment

7.1 Ground Conditions

Table 1 summarises the primary geological units encountered on-site. In general topsoil was encountered from 0.0m to 0.2m depth. This was underlain by sandy silt to an average depth of 2.0m (minimum 1.0m, maximum 3.5m), underlain by sandy gravel. Sandy gravel was observed to a maximum depth of 15.2m and is expected to be several hundred metres thick in total.

The bunds in the fields to the north and south of site were of variable composition. To the north of site, the bunds comprised silt and gravel of an apparently similar nature to the natural subsurface materials. To the south of site, the bunds comprised dry compacted organic topsoil.

Groundwater was not encountered in any of the shallow tests (test pits, hand augers, soakage tests) and is therefore expected to be at greater than 4.0m depth and within the gravel. Groundwater was measured after being left to stand overnight upon completion of BH201 and BH203 at 6.3m and 7.0m depth, respectively. It was measured again after a week of heavy rain on 3 July 2020 in piezometers installed in BH202 and BH203 at 6.2m and 6.1m depth, respectively.

Table 1: Summary of Primary Geologic Units

Unit	Generalised NZGS Description	Depth (m)	Strength
Topsoil	SILT with some organics; dark brown; loose to medium dense; dry. Organics, rootlets.	Range 0.0 – 0.5 Typical 0.0 – 0.2	N/A
Silt	SILT with some sand; light orange brown with grey mottling; stiff to very stiff; dry to moist. Sand, fine. May grade to fine medium dense to dense sand with depth or contain lenses of fine sand.	Range 0.1 – 3.5 Typical 0.2 – 2.0	*SPT-N_{60} (Avg):* 15 *Shear Vane (Avg):* Peak: 150kPa Remoulded: 38kPa
Gravel	GRAVEL with some sand cobbles; grey; dense to very dense; moist. Gravel, fine to coarse; subangular to rounded; sandstone. Sand, fine to coarse. Cobbles rounded; maximum intermediate axis 150mm. May contain lenses of clean sand up to 0.3m thick at intervals of several metres.	Range 1.0 – Unknown Typical 2.0 – Unknown	*SPT-N_{60} (Avg):* 50+ (with isolated values of 25-35, likely within sand lenses)

7.1.1 Laboratory Testing

Table 2 summarises laboratory test results. Grading, standard compaction, and plasticity index tests were undertaken. In general, the tests confirm the descriptions given in the field.

Table 2: Summary of Laboratory Test Results

Material	Test	Location	Result
Silt	Grading	TP201 1.9m – 2.1m	9% Sand, 91% Silt (1)
		TP205 1.5m – 1.7m	20% Sand, 80% Silt (1)
		TP206 0.5m – 0.7m	20% Sand, 80% Silt (1)
		TP209 1.0m – 1.3m	14% Sand, 86% Silt (1)
	Compaction	TP205 1.5m – 1.7m	Water Content (As Received) 12.2% Maximum Dry Density 1.83t/m^3 Optimum Water Content 15.0%
		TP209 1.0m – 1.3m	Water Content (As Received) 12.3% Maximum Dry Density 1.73t/m^3 Optimum Water Content 15.5%
	Plasticity Index	TP205 1.5m – 1.7m	Water Content (As Received) 12.2% Liquid Limit 25 Plastic Limit 19 Plasticity Index 6
		TP209 1.0m – 1.3m	Water Content (As Received) 12.3% Liquid Limit N/A (2) Plastic Limit 24 Plasticity Index N/A (1)
Gravel	Grading	TP201 3.3m – 3.5m	17% Cobbles, 60% Gravel, 17% Sand, 6% Silt (1)
		TP204 2.5m – 2.7m	10% Cobbles, 65% Gravel, 21% Sand, 4% Silt (1)

Notes: 1) Grading test did not distinguish between fraction smaller than 0.063mm i.e. silt or clay.
2) Liquid limit test reported as not applicable, unable to cut groove past 12 blows at water content of 27.4%.

7.2 Bearing Capacity – Villas

The MBIE Guidance for Repairing and Rebuilding Houses Affected by the Canterbury Earthquakes states that for ground to be deemed to have a geotechnical ultimate bearing capacity (GUBC) of 200kPa, Scala penetrometer tests shall achieve a minimum of two blows per 100mm.

NZS 3604:2011 states that soil shall be assumed to have a GUBC of not less than 300kPa where Scala penetrometer tests exceed five blows per 100mm at a depth equal to twice the width of the widest footing below the underside of the proposed footing, and three blows at greater depths.

Table 3 provides a summary of the near surface GUBC as derived from Scala penetrometer tests using the above methods. Tests which were undertaken deeper than foundation level or did not penetrate past fill have been omitted. As shown, a GUBC of 300kPa is not available in several test locations at a depth suitable for standard shallow foundations according to the NZS 3604:2011 criteria. However, all tests (except ES209, see Table 3) achieved a GUBC of 200kPa immediately beneath topsoil according to the MBIE Guidelines. A specifically designed waffle slab is considered the most appropriate foundation solution for single-storey villas founded on soils of a 200kPa GUBC.

Alternatively, it can be shown that a GUBC of 300kPa is available in the majority of test locations using the method outlined by Stockwell (1977) and applying corrections for soil type and foundation dimensions relevant to the site and development. Table 3 shows that for a foundation footing 0.3m wide embedded 0.3m below topsoil or fill, a GUBC of 300kPa is available in all but four test locations (HA203, TP203, TP208, WS209). HA203, TP203, and TP208 encountered sand below 0.2m depth which provides a lower GUBC than silt which was otherwise present. TP208 was located near the ponds towards the north-west of the site. Seepage was observed within TP208, and it is likely that water from the existing ponds had leaked into the surrounding ground thereby lowing GUBC. This area may require ground remediation, most likely excavation, and replacement of soils.

In summary, a specifically designed waffle slab is considered the most appropriate option and may be utilised across the whole site for soils of a 200kPa GUBC. Only WS209 did not achieve 200kPa at 0.4m to 0.5m below topsoil, further testing prior to construction is recommended at this location and minor ground improvement works may be required. Alternatively, Stockwell (1977) shows that standard shallow foundations consistent with NZS 3604:2011 are appropriate for the majority of the site, subject to further testing in support of building consent.

Table 3: Depth to Geotechnical Ultimate Bearing Capacity

Scala ID	Total Depth (m)	Thickness of Topsoil/Fill (m)	200kPa GUBC, Depth Below Topsoil/Fill (m) (MBIE, 2 Blows per 100mm)	300 kPa GUBC, Depth Below Topsoil/Fill (m) (NZS Method, 5 Blows Per 100mm)	300kPa GUBC (Stockwell Method)
HA201	2.00	0.15	0	0	Achieved
HA202	2.00	0.20	0	0	Achieved
HA203	2.35	0.20	0	0.05	Not Achieved
HA204	2.00	0.25	0	0	Achieved
HA205	1.25	0.15	0	0	Achieved
HA206	3.05	0.30	0	1.95	Achieved
HA207	3.20	0.15	0	1.80	Achieved
TP201	1.95	0.30	0	0.40	Achieved
TP203	1.95	0.20	0	0.10	Not Achieved
TP204	1.50	0.15	0	0	Achieved
TP205	1.20	0.30	0	0	Achieved
TP206	1.95	0.40	0	0.90	Achieved
TP207	2.00	0.15	0	≥1.85	Achieved
TP208	1.75	0.15	0	0.50	Not Achieved
TP209	1.25	0.20	0	0	Achieved
TP210	1.40	0.00	0	0.15	Achieved
TPHA211	1.35	0.30	0	0.40	Achieved
WS209	1.60	0.40	0.50 (1)	0.60	Not Achieved
WS210	1.50	0.50	0	1.2	Achieved
WS211	1.35	0.25 (Concrete)	0	0	Achieved
EHSC210	1.20	0.20	0	0.05	Achieved
HA05	1.90	0.20	0	1.40	Achieved
HA13	0.95	0.50 (Assumed) (1)	0	0	Achieved

Notes: 1) One blow per 100mm recorded at 0.4m to 0.5m depth below topsoil, minimum of 2 blows per 100mm achieved above and below this interval.
2) HA13 unable to penetrate tree roots, fill assumed to 0.5m depth based on TP202.

7.3 California Bearing Ratio

CBR was assessed using the correlation with Scala blows given in Austroads Guide to Pavement Technology Part 2 (2017). According to the guide, a minimum CBR of 3.5 is available immediately beneath topsoil across the whole site.

7.4 Foundation Options for Villas

A specifically designed waffle slab is considered the most conservative option and may be constructed on soils of a 200kPa GUBC. This was achieved immediately and consistently below topsoil or fill in all tests (excluding WS209 at 0.4m to 0.5m depth below fill).

Alternatively, standard foundation designs as given in NZS 3604:2011 may be used where Stockwell (1977) shows that a 300kPa GUBC is available.

7.5 Foundation Options for Main Building

The proposed main building has standardised layout employed by Summerset on multiple other sites around the country. It comprises a substantial two to three-storey structure housing residential apartments and hospital facilities. Design occupation rates typically result in the building incorporating both importance Level 2 and Level 3 zones in terms of NZS 1170:2004. Previous design iterations for the main building incorporate concrete structural elements, resulting in a relatively heavy structure.

The selection of an appropriate foundation solution for this building needs to consider the following:

- Bearing capacity of the soils on which it is founded.
- The potential for settlement.
- The liquefaction potential of the soils.
- The lateral seismic capacity.

Review of the ground conditions encountered within the building footprint indicate that adequate bearing capacity is likely to be available within the surficial silts and sands underlying topsoil to support a shallow foundation system. However, detailed consideration of foundation stiffness and settlement behaviour will be required once actual foundation layouts and loads are available.

Liquefaction risk has been assessed as low, with none predicted for serviceability limit state shaking, and possible liquefaction of discrete lenses at depth for ultimate limit state shaking. Liquefaction risk is unlikely to constrain the available foundation options, though this will need further consideration at the detailed design phase.

Lateral capacity of the foundation system, which is required to resist foundation sliding in seismic load cases, has been a key consideration for other main building designs. Various options exist to enhance the lateral capacity of the foundation system such as provision of a high-friction granular fill raft beneath the foundation system.

On the basis of these preliminary observations, a shallow foundation system comprising a ground beam grid with integral slab together with a granular fill raft is likely to be suitable for the site. To support the development of this foundation option, it is recommended that further investigation be completed to confirm the strength, compressibility and variability of the soils overlying gravel within the building footprint. This could take the form of CPT soundings.

In the event that the surficial silt and sand soils cannot be shown to possess sufficient strength and stiffness for heavily loaded foundation elements, partial or full excavation and replacement of the soils overlying gravel in relevant portions of the building footprint could be a relatively low cost remedial option, depending on final development levels.

8.0 Geotechnical Considerations and Hazards

8.1 Seismicity

Design peak ground accelerations (PGA) for the proposed low-rise residential-type structures are summarised in Table 5. Values are as recommended in the MBIE Guidelines for Earthquake Geotechnical Engineering Practice (Module 1, Page 13) for Importance Level 2 structures (defined in NZ 1170:2004 as medium consequence for loss of human life, and normal structures not falling into other categories), and Class D soil sites (deep or soft soil) within the Canterbury Earthquake region.

Table 5: MBIE Recommended PGA Values for Geotechnical Design in Prebbleton - IL2

Importance Level 2	SLS1 (1)	SLS2 (1)	ULS (2)
Annual Probability of Exceedance	1/25	1/25	1/500
Moment Magnitude	7.5	6	7.5
Unweighted Peak Ground Acceleration Co-Efficient	0.13g	0.19g	0.35g

Notes: 1) SLS – Serviceability Limit State.
2) ULS – Ultimate Limit State.

Portions of the proposed main building are classed as an Importance Level 3 structure (defined in NZ 1170:2004 as high consequence for human life, and major structures affecting crowds) and must be designed for a higher PGA. Design PGAs for the main building are given in Table 6.

Table 6: MBIE Recommended PGA Values for Geotechnical Design in Prebbleton – IL3

Importance Level 3	SLS (2)	ULS (3)
Annual Probability of Exceedance	1/25	1/1000
Moment Magnitude	7.5	7.5
Unweighted Peak Ground Acceleration Co-Efficient	0.13g	0.46g

Notes: 1) SLS – Serviceability Limit State.
2) ULS – Ultimate Limit State.

8.2 Liquefaction and Lateral Spreading

Liquefaction typically occurs in recent (i.e. typically less than 10,000-years old), normally consolidated silt and sand below the groundwater table. It is dependent on soil density, grain size, and soil composition.

Groundwater measurements indicate a groundwater table between 6m to 7m depth, firmly within the sandy gravel unit underlying silt. Gravels are not typically considered liquefiable and materials of an SPT-N value above 25 are commonly regarded as too dense to be liquefiable. All SPT tests undertaken within gravel recorded values greater than 25, thus liquefaction is not considered a hazard at the site. However, TP206 and TP208 encountered partially saturated silt and sand at depths above the surrounding groundwater table. These tests were located near the existing ponds towards the north-west of the site, and it is likely that water has leaked from the ponds, and locally increased the natural water content of the surrounding soils. This excess groundwater is expected to drain once the ponds have been removed.

Lateral spreading is a mechanism whereby liquefied soils experience differential or translational movement towards a free face (eg riverbank, slope) during a seismic event. The presence of non-liquefiable soils precludes lateral spreading as a hazard. Any proposed cuts for swales or rain gardens are likely to be shallow and above the water table, therefore not susceptible to liquefaction.

8.3 Static Settlement

Settlement is not expected to pose a significant risk to lightweight structures such as villas on the site. Soils prone to excessive settlement include soft, saturated fine grain soils, or those with a high organic matter content. Such soils were not encountered at the site. Silt was typically firm to very stiff and sand was typically medium dense to dense. However, loose sand and soft silt was encountered in TP206 and TP208 near the existing ponds towards the north-west of the site. As noted above, it is likely that water from the ponds has leaked into the ground, partially saturating, and lowering the density and consistency of the surrounding soils. Elsewhere across site, soils were dry or moist, and the groundwater table was within gravel.

Between 0.2m and 0.6m of fill is proposed across the majority of the site. Up to 1m of fill is currently proposed in the western corner of the site. Based on the strength of underlying soils, this is not expected to result in excess settlement. However, it is recommended this is confirmed during the detailed design phase.

8.4 Erosion

No major erosional features were observed on-site. However, the silts and fine sands encountered below topsoil are likely to be easily eroded if exposed to wind and water over a prolonged timeframe. This is also likely to be the case if vegetation (including topsoil) is removed.

8.5 Earthworks

Earthmoving activities to form site development profiles are expected to occur within silt and silty sand. Site-won materials are considered suitable for use as engineered fill; however, care will be required to control moisture content and compactive effort. Earthworks activities should be programmed to avoid winter and early spring, as site soils are expected to be moisture sensitive and subject to damage during seasonal wet periods. Further lab testing to determine optimal soil compaction parameters is recommended.

The bunds along the northern boundary of the site generally consisted of silt and fine to medium gravel and was similar to natural soils. It is anticipated this material will be suitable for reuse as fill. However, laboratory testing will be required to confirm material properties. The bunds in the fields towards the south-west of site comprised dry, compacted organic topsoil. It is not likely this material will be suitable for reuse as fill.

Cuts for the rain gardens and swales are currently proposed up to 1m high at a batter angle of 1V:4H. It is recommended that these slopes are vegetated, and buildings should not be positioned closer than 3m from the edge of a cut. Any buildings positioned closer than 3m from the edge of a cut should be subject to geotechnical review.

9.0 Conclusions

The site is generally considered suitable for the proposed development. The following points summarise the findings.

- Ground conditions typically comprise stiff to very stiff silt to an average depth of 2.0m underlain by very dense sandy gravels likely several hundred metres thick. Silt grades to loose to dense sand in sand in some test locations or contains sand lenses.
- Groundwater was measured at 6.1m and 6.2m depth in piezometers installed in BH203 and BH202, respectively. Groundwater was not encountered in any shallow test locations and is expected to lie within gravel across the whole site.
- A GUBC of 200kPa was generally available immediately and consistently beneath topsoil. A GUBC of 300kPa according to NZS 3604:2011 was not available in all test locations. A GUBC of 300kPa according to Stockwell (1977) was available in 19 of 23 test locations.
- A CBR of 3.5 is recommended for the whole site.
- Specifically, designed waffle foundations are considered most suitable for the single-storey villas. Alternatively, standard foundations as given in NZS 3604:2011 may be used where a 300kPa GUBC is achieved.
- It is anticipated a shallow foundation system will be suitable for the multi-storey main building. A ground beam grid with integral slab or pads and beams is proposed at this stage, subject to further investigation and detailed design.
- The bund along the northern border of the site comprises silt and gravel and is likely suitable for reuse as fill. The bunds in the fields towards the south-west of the site comprise organic topsoil are likely not suitable for reuse as fill.
- Seepage and loose or soft soils were encountered within TP208. It is likely that water from the existing ponds had leaked into the surrounding ground thereby lowing GUBC. This area may require ground remediation, most likely excavation, and replacement of soils.
- Cuts ups to 1m high and battered at 1V:4H are proposed for the swales and rain gardens. It is recommended batters are vegetated, and buildings should not be located closer than 3m to proposed cuts.
- Up to 1m of fill is currently proposed in the western corner of the site. Based on the strength of underlying soils, this is not expected to result in excess settlement. However, it is recommended this is confirmed during the detailed design phase.
- Soils surrounding the ponds towards the northern corner of site were partially saturated and comprised loose sand and soft silt. It is likely that water from the ponds has leaked into the surrounding ground. However, should this be an area of naturally high groundwater, specific engineering design or remediation may be required for buildings in this area. Further investigation should be undertaken during construction.

10.0 Limitation

This report has been prepared solely for the benefit of Summerset Group Holdings Ltd as our client, with respect to the brief, and consent authorities in processing the consent(s). The reliance by other parties on the information or opinions contained in the report will, without our prior review and agreement in writing, be at such parties' sole risk.

Recommendations and opinions in this report are based on data from limited test positions. The nature and continuity of subsoil conditions away from the test positions are inferred, and it must be appreciated that actual conditions could vary considerably from the assumed model.

During excavation and construction, the site should be examined by an engineer or engineering geologist competent to judge whether the exposed subsoils are compatible with the inferred conditions on which the report has been based. It is possible that the nature of the exposed subsoils may require further investigation and the modification of the design based upon this report.

Riley Consultants Ltd would be pleased to provide this service to Summerset Group Holdings Ltd and believes the project would benefit from such continuity. In any event, it is essential Riley Consultants Ltd is contacted if there is any variation in subsoil conditions from those described in the report as it may affect the design parameters recommended in the report.

APPENDIX A

Test Logs

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GEOTECHNICAL AND GEOLOGICAL INFORMATION

SOIL TYPES AND SYMBOLS


FILL


TOPSOIL


SILT


SAND


GRAVEL


CLAY


PEAT


GROUNDWATER LEVEL


10,11,10

SCALA PENETROMETER
LAST 3 NUMBER OF BLOWS PER 50mm INCREMENT

ROCK TYPES AND SYMBOLS


SANDSTONE


SILTSTONE


MUDSTONE


LIMESTONE


BASALT


TUFF


IGNIMBRITE


GREYWACKE

SOIL STRENGTH CLASSIFICATION

FINE GRAINED COHESIVE SOILS

TERM	FIELD IDENTIFICATION	UNDRAINED SHEAR STRENGTH (KPa)
Very Soft (Vs)	Exudes between fingers when squeezed.	<12
Soft (S)	Easily indented by fingers.	12 – 25
Firm (F)	Indented only by strong finger pressure.	25 – 50
Stiff (St)	Indented by thumb pressure.	50 – 100
Very Stiff (VSt)	Indented by thumbnail.	100 – 200
Hard (H)	Difficult to indent by thumbnail.	200+

SPT & SCALA PENETROMETER RESULTS

TERM	SPT VALUE No. of BLOWS/300mm	SCALA PENETROMETER No. of BLOWS/100mm
very dense	>50	17+
dense	30 – 50	7 – 17
medium dense	10 – 30	3 – 7
loose	4 – 10	1 – 3
very loose	0 – 4	0 – 2

ROCK STRENGTH CLASSIFICATION

TERM		FIELD IDENTIFICATION	UNCONFINED UNIAXIAL COMPRESSIVE STRENGTH (MPa)
Extremely weak	(EW)	Indented by thumbnail.	< 1
Very weak	(VW)	Crumbles under firm blows with point of geological hammer. Can be peeled with pocket knife.	1 – 5
Weak	(W)	Difficult to peel with pocket knife.	5 – 20
Moderately strong	(MS)	Cannot be scraped or peeled with pocket knife.	20 – 50
Strong	(S)	More than one blow of geological hammer to fracture.	50 – 100
Very strong	(VS)	Many blows of geological hammer to break.	100 – 250
Extremely strong	(ES)	Can only be chipped with geological hammer.	250+

MOISTURE CONDITION

Dry (D)	Looks and feels dry; powdery and friable.
Moist (M)	Feels cool; darkened in colour; no free water when remoulded.
Wet (W)	Feels cool; darkened in colour; free water forms on hands.
Saturated (S)	Free water is present on sample.

SAMPLE TYPES


UNDISTURBED


MACHINE AUGER DISTURBED

D
HAND AUGER DISTURBED


STANDARD PENETRATION TEST (solid cone)


STANDARD PENETRATION TEST (hollow cone)

DRILLING METHOD

OB	OPEN BARREL
TT	TRIPLE TUBE
WB	WASH BORE
SH	UNDISTURBED SHELBY TUBE
RC	ROCK CORE
SPT	STANDARD PENETRATION TEST

FIELD TESTS

V	SHEAR VANE (corrected to BS:1377)
R	REMOULDED STRENGTH
P	POCKET PENETROMETER
CH	CLEGG HAMMER

INFORMATION BASED ON THE NZ GEOTECHNICAL SOCIETY INC. GUIDELINES FOR THE CLASSIFICATION AND DESCRIPTION OF SOIL AND ROCK FOR ENGINEERING PURPOSES

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BORE HOLE LOG

Project:	Location:	Hole position:	No.:
Geotech Assessment Resource Consent	578-606 Springs Road, Prebbleton	Refer to Site Plan	BH201

Job No.:	Start Date: 08-06-20 Finish Date: 08-06-20	Ground Level (m NZVD2016):	Co-Ordinates (NZTM2000):	Sheet:
190417		21.10	E 1,560,234.0 N 5,174,326.4	1 of 2

Client:	Hole Depth:	Direction:
Summerset Group Holdings Ltd	15.00 m	-90° NZTM2000

Type	Run / Core box end (m) [TCR%]	Fluid & Water	Legend	Geological Interpretation / Geological Description (recovered as):	Elevation (m NZVD2016)	Depth (m)	Tests	Material or Defect Description	Backfill / Piezometer
SONIC GEOPROBE 8140LC (150Hz)	0.00 [100]			*SILT with some organics; dark brown; firm; moist. Organics, rootlets.* (TOPSOIL)	+21.00	0	SPT 0.00 m 0, 1, 2, 2, 3, 4; N = 11	**SPTLS - ; 0-0.45**	
	0.75 [87]			*Silty fine SAND; orangish brown with grey mottling; medium dense; moist.* (SPRINGSTON FORMATION)	+19.75	1	SPT 0.75 m 3, 4, 4, 4, 6, 7; N = 21	**C - ; 0.75-1.3** **SPTLS - ; 0.75-1.09**	
	1.50 [106]			*Sandy GRAVEL with some cobbles; grey; dense to very dense; moist. Gravel, fine to coarse; subangular to rounded; sandstone. Sand, fine to coarse. Cobbles, rounded; maximum intermediate axis 150mm.* 1.35m - 1.50m CORE LOSS 1.40m - 9.50m Fines washed out. Drilling with water injection.		2	SPT 1.50 m 12, 9, 8, 9, 10, 13; Nc = 40		
	3.04 [100]					3	SPT 3.04 m 11, 15, 17, 18, 23, 2/8mm; Nc > 50		
	4.56 [79]			4.25m - 4.56m Fine to medium SAND with some gravel. Gravel, fine to coarse; subangular to rounded, sandstone.		4	SPT 4.56 m 17, 30, 43, 17/20mm; Nc > 50		
	6.08 [75]	1		5.76m - 6.08m CORE LOSS		5	SPT 6.08 m 20, 22, 33, 27/70mm; Nc > 50		
	7.60			7.22m - 7.60m CORE LOSS		6	SPT 7.60 m 5, 6, 6, 7, 5, 6; Nc = 24		
						7			
						8			

Explanations:

- Water Strike (1st, 2nd ...)
- Water Rise (1st, 2nd ...) and Rise Time (minutes)
- Small Disturbed Sample (SDS)
- Large Disturbed Sample (LDS)
- Shelby Tube Sample (TNX)
- Standard Penetration Test (SPT)

Soil Types:

CLAY, SILT, SAND, GRAVEL, TOPSOIL, PEAT, FILL, NO RECOVERY *

Backfill:

Bentonite, Grout, Drill arisings or collapsed hole, Filter material

Remarks

1. Coordinates based on handheld GPS and subject to survey confirmation. Elevation based on data from Graham Surveying (27/02/2020).
2. Strength terms for soil layers are based on correlation with SPT results.
3. Drilled with water injection from 1.4m to 9.5m. Water topped up from above 9.5m to 15m.
4. Groundwater at 6.3m after being left to stand overnight with casing at 15m depth.
5. Inferred cobble description based in part on nearby test pits.
6. Majority of core loss attributed to wash out of finer material and/or blockage of sampling barrel with coarse gravel/cobbles.
7. SPT tests: Nc indicates solid cone; remaining tests undertaken with split spoon.
8. SPT efficiency 94.7%.

All dimensions in metres Scale 1:50	Contractor: McMillan Drilling Ltd.	Rig/Plant Used: Geoprobe Sonic (McMillan)	Driller: Brian McMahon	Logged by: DDH	Checked by: AVD

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Engineers and Geologists

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BORE HOLE LOG

Project:	Location:	Hole position:	No.:
Geotech Assessment Resource Consent	578-606 Springs Road, Prebbleton	Refer to Site Plan	**BH201**

Job No.:	Start Date: 08-06-20 Finish Date: 08-06-20	Ground Level (m NZVD2016):	Co-Ordinates (NZTM2000):
190417		21.10	E 1,560,234.0 N 5,174,326.4

Client:	Hole Depth:	Direction:	Sheet:
Summerset Group Holdings Ltd	15.00 m	-90° NZTM2000	2 of 2

Type	Run / Core box end (m) [TCR%]	Fluid & Water	Legend	Geological Interpretation / Geological Description (recovered as):	Elevation (m NZVD2016)	Depth (m)	Tests	Material or Defect Description	Backfill / Piezometer
	7.39 [39]			8.20m - 9.12m CORE LOSS *Sandy GRAVEL with some cobbles; grey; dense to very dense; moist. Gravel, fine to coarse; subangular to rounded; sandstone. Sand, fine to coarse. Cobbles, rounded; maximum intermediate axis 150mm.* *(continued)*		9	SPT 9.12 m 11, 11, 9, 7, 9, 12; Nc = 37		
	9.12 [95]					10			
	10.64 [118]			10.57m - 10.64m CORE LOSS 11.30m - 12.45m Recovered as clean GRAVEL; fine to coarse. Drilling with no water injection but water standing in hole.		11	SPT 10.64 m 28, 19, 15, 11, 9, 8; Nc = 43		
	12.16 [100]			12.16m - 13.68m Grades to medium dense.		12	SPT 12.16 m 13, 11, 9, 6, 7, 7; Nc = 29		
	13.68 [100]			13.00m - 13.30m Fine to medium SAND with minor gravel; brown; moist. Gravel, fine.		13	SPT 13.68 m 10, 10, 12, 12, 8, 6; Nc = 38		
					+6.10	14			
				EOH @ 15.00 m		15	SPT 15.00 m 16, 19, 13, 8, 6, 9; Nc = 36		
						16			

SONIC GEOPROBE 8140LC (150Hz)

Explanations:

- Water Strike (1st, 2nd ...)
- Water Rise (1st, 2nd ...) and Rise Time (minutes)
- Small Disturbed Sample (SDS)
- Large Disturbed Sample (LDS)
- Shelby Tube Sample (TNX)
- Standard Penetration Test (SPT)

Soil Types:

CLAY, SILT, SAND, GRAVEL, TOPSOIL, PEAT, FILL, NO RECOVERY *

Backfill:

Bentonite, Grout, Drill arisings or collapsed hole, Filter material

Remarks

1. Coordinates based on handheld GPS and subject to survey confirmation. Elevation based on data from Graham Surveying (27/02/2020).
2. Strength terms for soil layers are based on correlation with SPT results.
3. Drilled with water injection from 1.4m to 9.5m. Water topped up from above 9.5m to 15m.
4. Groundwater at 6.3m after being left to stand overnight with casing at 15m depth.
5. Inferred cobble description based in part on nearby test pits.
6. Majority of core loss attributed to wash out of finer material and/or blockage of sampling barrel with coarse gravel/cobbles.
7. SPT tests: Nc indicates solid cone; remaining tests undertaken with split spoon.
8. SPT efficiency 94.7%.

All dimensions in metres Scale 1:50	Contractor: McMillan Drilling Ltd.	Rig/Plant Used: Geoprobe Sonic (McMillan)	Driller: Brian McMahon	Logged by: DDH	Checked by: AVD

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BORE HOLE LOG

Project:	Location:	Hole position:	No.:
Geotech Assessment Resource Consent	578-606 Springs Road, Prebbleton	Refer to Site Plan	**BH202**

Job No.:	Start Date: 09-06-20 Finish Date: 10-06-20	Ground Level (m NZVD2016):	Co-Ordinates (NZTM2000):
190417		21.00	E 1,560,263.4 N 5,174,290.9

Client:	Hole Depth:	Direction:	Sheet:
Summerset Group Holdings Ltd	15.20 m	-90° NZTM2000	1 of 2

Type	Run / Core box end (m) [TCR%]	Fluid & Water	Legend	Geological Interpretation / Geological Description (recovered as):	Elevation (m NZVD2016)	Depth (m)	Tests	Material or Defect Description	Backfill / Piezometer
	0.00 [100]			*SILT with some gravel and organics; dark brown; firm; moist. Gravel, medium to coarse; angular. Organics, rootlets.* (TOPSOIL)	+20.85		SPT 0.00 m 1, 0, 1, 2, 2, 3; N = 8	SPTLS -	
				SILT; dark brown; firm to stiff; moist. (SPRINGSTON FORMATION)				C -	
	0.75 [160]			0.75m - 1.10m Grades to medium brown; dry to moist.	+19.90	1	SPT 0.75 m 3, 3, 4, 4, 4, 4; N = 16	SPTLS -	
				Silty fine SAND; light yellowish brown; medium dense; dry.					
	1.50 [160]				+19.00	2	SPT 1.50 m 3, 3, 4, 3, 3, 3; N = 13	C -	
	[78]			*Sandy GRAVEL with some cobbles; grey; dense to very dense; moist. Gravel, fine to coarse; subangular to rounded; sandstone. Sand, fine to coarse. Cobbles, rounded; maximum intermediate axis 150mm.*			SPT 2.25 m 17, 26, 25, 30, 5/10 mm; N > 50	SPTLS -	
				2.70m - 3.04m CORE LOSS					
SONIC GEOPROBE 8140LC (150Hz)	3.04 [100]			3.00m - 3.60m Fines washed out.		3	SPT 3.04 m 13, 16, 15, 13, 11, 12; Nc = 51		
						4			
	4.56 [118]					5	SPT 4.56 m 9, 17, 27, 23, 10/15 mm; Nc > 50		
				5.76m - 6.08m Gravelly fine to medium SAND. Gravel, fine to coarse; subrounded to rounded.		6			
	6.08 [75]						SPT 6.08 m 9, 17, 16, 18, 12, 13; Nc = 59		
				7.22m - 7.60m CORE LOSS		7			
	7.60			7.60m - 7.80m Grades to with some some cobbles.		8	SPT 7.60 m 5, 8, 10, 10, 10, 13/43mm; Nc > 50		

Explanations:

- Water Strike (1st, 2nd ...)
- Water Rise (1st, 2nd ...) and Rise Time (minutes)
- Small Disturbed Sample (SDS)
- Large Disturbed Sample (LDS)
- Shelby Tube Sample (TNX)
- Standard Penetration Test (SPT)

Soil Types:

CLAY, SILT, SAND, GRAVEL, TOPSOIL, PEAT, FILL, NO RECOVERY *

Backfill:

Bentonite, Grout, Drill arisings or collapsed hole, Filter material

Remarks

1. Coordinates based on handheld GPS and subject to survey confirmation. Elevation based on data from Graham Surveying (27/02/2020).
2. Strength terms for soil layers are based on correlation with SPT results.
3. Drilled with water injection from 3m to 15m.
4. Inferred cobble description based in part on nearby test pits.
5. Majority of core loss attributed to wash out of finer material and/or blockage of sampling barrel with coarse gravel/cobbles.
6. SPT tests: Nc indicates solid cone; remaining tests undertaken with split spoon.
7. SPT efficiency 94.7%.

All dimensions in metres Scale 1:50	Contractor: McMillan Drilling Ltd.	Rig/Plant Used: Geoprobe Sonic (McMillan)	Driller: Paul Taulava	Logged by: DDH	Checked by: AVD

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BORE HOLE LOG

Project:	Location:	Hole position:	No.:
Geotech Assessment Resource Consent	578-606 Springs Road, Prebbleton	Refer to Site Plan	**BH202**

Job No.:	Start Date: 09-06-20 Finish Date: 10-06-20	Ground Level (m NZVD2016):	Co-Ordinates (NZTM2000):
190417		21.00	E 1,560,263.4 N 5,174,290.9

Client:	Hole Depth:	Direction:	Sheet:
Summerset Group Holdings Ltd	15.20 m	-90° NZTM2000	2 of 2

Type	Run / Core box end (m) [TCR%]	Fluid & Water	Legend	Geological Interpretation / Geological Description (recovered as):	Elevation (m NZVD2016)	Depth (m)	Tests	Material or Defect Description	Backfill / Piezometer
	7 [59%] 0			*Sandy GRAVEL with some cobbles; grey; dense to very dense; moist. Gravel, fine to coarse; subangular to rounded; sandstone. Sand, fine to coarse. Cobbles, rounded; maximum intermediate axis 150mm.* *(continued)* 8.50m - 9.12m CORE LOSS		9	SPT 9.12 m 6, 8, 15, 15, 15, 18; Nc = 60+		
	9.12 [100]					10			
	10.64 [100]					11	SPT 10.64 m 8, 8, 10, 12, 12, 23; Nc = 57		
	12.16 [100]					12	SPT 12.16 m 10, 16, 16, 15, 16, 16; Nc = 60+		
	13.68 [115]					13	SPT 13.68 m 7, 5, 5, 15, 15, 22; Nc = 57		
					+5.80	14			
				EOH @ 15.20 m		15	SPT 15.20 m 17, 15, 15, 19, 25, 5/10mm; Nc > 50		
						16			

Defects (depth, type, description)

Samples (type, reference, description)

Lab testing (depth, type(s))

Explanations:

- Water Strike (1st, 2nd ...)
- Water Rise (1st, 2nd ...) and Rise Time (minutes)
- Small Disturbed Sample (SDS)
- Large Disturbed Sample (LDS)
- Shelby Tube Sample (TNX)
- Standard Penetration Test (SPT)

Soil Types:

CLAY, SILT, SAND, GRAVEL, TOPSOIL, PEAT, FILL, NO RECOVERY *

Backfill:

Bentonite, Grout, Drill arisings or collapsed hole, Filter material

Remarks

1. Coordinates based on handheld GPS and subject to survey confirmation. Elevation based on data from Graham Surveying (27/02/2020).
2. Strength terms for soil layers are based on correlation with SPT results.
3. Drilled with water injection from 3m to 15m.
4. Inferred cobble description based in part on nearby test pits.
5. Majority of core loss attributed to wash out of finer material and/or blockage of sampling barrel with coarse gravel/cobbles.
6. SPT tests: Nc indicates solid cone; remaining tests undertaken with split spoon.
7. SPT efficiency 94.7%.

All dimensions in metres Scale 1:50	Contractor: McMillan Drilling Ltd.	Rig/Plant Used: Geoprobe Sonic (McMillan)	Driller: Paul Taulava	Logged by: DDH	Checked by: AVD

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BORE HOLE LOG

Project:	Location:	Hole position:	No.:
Geotech Assessment Resource Consent	578-606 Springs Road, Prebbleton	Refer to Site Plan	**BH203**

Job No.:	Start Date: 11-06-20 Finish Date: 12-06-20	Ground Level (m NZVD2016):	Co-Ordinates (NZTM2000):
190417		21.00	E 1,560,265.1 N 5,174,401.1

Client:	Hole Depth:	Direction:	Sheet:
Summerset Group Holdings Ltd	15.20 m	-90° NZTM2000	1 of 2

Type	Run / Core box end (m) [TCR%]	Fluid & Water	Legend	Geological Interpretation / Geological Description (recovered as):	Elevation (m NZVD2016)	Depth (m)	Tests	Material or Defect Description	Backfill / Piezometer
SONIC GEOPROBE 8140LC (150Hz)	0.00 [100]			*GRAVEL with some sand and minor silt; dark brown; moist. Gravel, fine to coarse; subangular to rounded. Sand, fine to coarse.* (FILL)	+20.70		SPT 0.00 m 3, 5, 7, 8, 8, 5; Nc = 28		
	0.75 [100]			*Fine SAND; dark grey; moist.* (FILL) 0.50m - 1.80m Fines washed out.	+20.25	1	SPT 0.75 m 2, 3, 3, 3, 4, 10; N = 20	SPTLS -	
	1.50 [100]			*SILT with some sand; light orangish brown; moist. Gravel, fine to medium; rounded.* (SPRINGSTON FORMATION)	+19.90		SPT 1.50 m 9, 9, 7, 6, 3, 3; Nc = 19		
	3.04 [100]			*Gravelly SILT with some sand; light orangish brown; moist. Gravel, fine to medium; rounded.*	+19.50	2	SPT 3.04 m 15, 20, 30, 25, 5/10 mm; Nc > 50		
	4.56 [100]			*Sandy GRAVEL with some cobbles; grey; dense to very dense; moist. Gravel, fine to coarse; subangular to rounded; sandstone. Sand, fine to coarse. Cobbles, rounded; maximum intermediate axis 150mm.* 1.80m - 3.00m Gravel predominantly fine to medium, higher proportion of coarse sand. 3.00m - 4.40m Gravel predominantly fine to medium, becoming silty.		3	SPT 4.56 m 10, 18, 20, 30, 10/15 mm; Nc > 50		
	6.08 [100]	1		6.08m - 6.20m Fines washed out.		4	SPT 6.08 m 6, 8, 8, 8, 9, 12; Nc = 37		
	7.60					5	SPT 7.60 m 10, 12, 12, 10, 12, 7; Nc = 41		
						6			
						7			
						8			

RILEY AGS 3_1 NZ LIB 13.GLB Log RILEY RAKAIA BH (A4) 190417 - SUMMERSET PREBBLETON SPRINGS ROAD - 2020.GPJ <<DrawingFile>> 17/07/2020 14:23 Produced by gINT Professional

Explanations:

- Water Strike (1st, 2nd ...)
- Water Rise (1st, 2nd ...) and Rise Time (minutes)
- Small Disturbed Sample (SDS)
- Large Disturbed Sample (LDS)
- Shelby Tube Sample (TNX)
- Standard Penetration Test (SPT)

Soil Types:

CLAY, SILT, SAND, GRAVEL, TOPSOIL, PEAT, FILL, NO RECOVERY *

Backfill:

Bentonite, Grout, Drill arisings or collapsed hole, Filter material

Remarks

1. Coordinates based on handheld GPS and subject to survey confirmation. Elevation based on data from Graham Surveying (27/02/2020).
2. Strength terms for soil layers are based on correlation with SPT results.
3. Drilled with water injection from 3m to 6m.
4. Groundwater at 7m after being left to stand overnight with casing at 15.2m.
5. Inferred cobble description based in part on nearby test pits.
6. Majority of core loss attributed to wash out of finer material and/or blockage of sampling barrel with coarse gravel/cobbles.
7. PT tests: Nc indicates solid cone; remaining tests undertaken with split spoon.
8. SPT efficiency 94.7%.

All dimensions in metres Scale 1:50	Contractor: McMillan Drilling Ltd.	Rig/Plant Used: Geoprobe Sonic (McMillan)	Driller: Paul Taulava	Logged by: DDH	Checked by: AVD

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BORE HOLE LOG

Project:	Location:	Hole position:	No.:
Geotech Assessment Resource Consent	578-606 Springs Road, Prebbleton	Refer to Site Plan	BH203

Job No.:	Start Date: 11-06-20 Finish Date: 12-06-20	Ground Level (m NZVD2016):	Co-Ordinates (NZTM2000):	
190417		21.00	E 1,560,265.1	N 5,174,401.1

Client:	Hole Depth:	Direction:	Sheet:
Summerset Group Holdings Ltd	15.20 m	-90° NZTM2000	2 of 2

Type	Run / Core box end (m) [TCR%]	Fluid & Water	Legend	Geological Interpretation / Geological Description (recovered as):	Elevation (m NZVD2016)	Depth (m)	Tests	Material or Defect Description	Backfill / Piezometer
	7.50 [50]			*Sandy GRAVEL with some cobbles; grey; dense to very dense; moist. Gravel, fine to coarse; subangular to rounded; sandstone. Sand, fine to coarse. Cobbles, rounded; maximum intermediate axis 150mm.* *(continued)*		9	SPT 9.12 m 13, 12, 13, 15, 12, 17; Nc = 57		
	9.12 [100]					10			
	10.64 [90]					11	SPT 10.64 m 15, 17, 17, 16, 13, 15; Nc = 60+		
	12.16 [100]					12	SPT 12.16 m 12, 12, 17, 16, 14, 13/45mm; Nc > 50		
	13.68 [100]					13			
				14.80m - 15.00m Silty fine SAND.		14	SPT 13.68 m 25, 28, 28, 24, 12/35 mm; Nc > 50		
					+5.80	15			
				EOH @ 15.20 m		16	SPT 15.20 m 37, 23/20mm; Nc > 50		

SONIC GEOPROBE 8140LC (150Hz)

Explanations:

- Water Strike (1st, 2nd ...)
- Water Rise (1st, 2nd ...) and Rise Time (minutes)
- Small Disturbed Sample (SDS)
- Large Disturbed Sample (LDS)
- Shelby Tube Sample (TNX)
- Standard Penetration Test (SPT)

Soil Types:

CLAY, SILT, SAND, GRAVEL, TOPSOIL, PEAT, FILL, NO RECOVERY *

Backfill:

Bentonite, Grout, Drill arisings or collapsed hole, Filter material

Remarks

1. Coordinates based on handheld GPS and subject to survey confirmation. Elevation based on data from Graham Surveying (27/02/2020).
2. Strength terms for soil layers are based on correlation with SPT results.
3. Drilled with water injection from 3m to 6m.
4. Groundwater at 7m after being left to stand overnight with casing at 15.2m.
5. Inferred cobble description based in part on nearby test pits.
6. Majority of core loss attributed to wash out of finer material and/or blockage of sampling barrel with coarse gravel/cobbles.
7. PT tests: Nc indicates solid cone; remaining tests undertaken with split spoon.
8. SPT efficiency 94.7%.

All dimensions in metres Scale 1:50	Contractor: McMillan Drilling Ltd.	Rig/Plant Used: Geoprobe Sonic (McMillan)	Driller: Paul Taulava	Logged by: DDH	Checked by: AVD

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BORE HOLE LOG

Project:	Location:	Hole position:	No.:
Geotech Assessment Resource Consent	578-606 Springs Road, Prebbleton	Refer to Site Plan	**BH204**

Job No.:	Start Date: 15-06-20 Finish Date: 15-06-20	Ground Level (m NZVD2016):	Co-Ordinates (NZTM2000):
190417		21.00	E 1,560,310.6 N 5,174,375.5

Client:	Hole Depth:	Direction:	Sheet:
Summerset Group Holdings Ltd	15.00 m	-90° NZTM2000	1 of 2

Type	Run / Core box end (m)	TCR%	Fluid & Water	Legend	Geological Interpretation / Geological Description (recovered as):	Elevation (m NZVD2016)	Depth (m)	Tests	Material or Defect Description / Samples / Lab testing	Backfill / Piezometer
	0.00	[100]			*CONCRETE.* (FILL)	+20.85	0			
	0.30	[100]			*CLAY with some gravel; dark brown; moist. Gravel, fine to medium.* (FILL)	+20.70		SPT 0.30 m 1, 1, 2, 2, 3, 3; N = 10	SPTLS -	
	0.75	[100]			*SILT with some clay and minor gravel; medium brown; firm; moist. Gravel, fine.* (SPRINGSTON FORMATION)	+20.25	1	SPT 0.75 m 1, 0, 1, 1, 0, 1; N = 3	SPTLS - C -	
	1.50	[100]			*SILT with some sand and clay; medium brown; soft to firm; wet*			SPT 1.50 m 1, 0, 3, 2, 3, 3; N = 11	SPTLS -	
	2.25	[100]			*Fine SAND with some silt; orangish brown; dense; wet.* 2.40m - 2.55m Grades to with some fine to medium gravel.	+19.00 / +18.45	2	SPT 2.25 m 2, 2, 2, 6, 12, 11; N = 31	SPTLS -	
	3.00	[100]			*Sandy GRAVEL with some cobbles; grey; dense to very dense; moist. Gravel, fine to coarse; subangular to rounded; sandstone. Sand, fine to coarse. Cobbles, rounded; maximum intermediate axis 150mm.* 3.00m - 3.40m Fines washed out.		3	SPT 3.00 m 11, 15, 20, 23, 17/65 mm; Nc > 50		
	4.56	[100]			3.80m - 4.00m Fines washed out. 4.56m - 4.70m Fines washed out.		4	SPT 4.56 m 7, 9, 10, 14, 19, 17/65mm; Nc > 50		
	6.08	[100]			5.30m - 5.50m Grades to silty. 6.08m - 7.60m Grades to medium dense. 6.08m - 8.30m Fines washed out, some cobbles.		5 6 7	SPT 6.08 m 5, 6, 5, 5, 5, 6; Nc = 21		
	7.60						8	SPT 7.60 m 9, 12, 18, 16, 20, 6/40mm; Nc > 50		

SONIC GEOPROBE 8140LC (150Hz)

RILEY AGS 3_1 NZ LIB 13.GLB Log RILEY RAKAIA BH (A4) 190417 - SUMMERSET PREBBLETON SPRINGS ROAD - 2020.GPJ <<DrawingFile>> 17/07/2020 14:23 Produced by gINT Professional

Explanations:

- Water Strike (1st, 2nd ...)
- Water Rise (1st, 2nd ...) and Rise Time (minutes)
- Small Disturbed Sample (SDS)
- Large Disturbed Sample (LDS)
- Shelby Tube Sample (TNX)
- Standard Penetration Test (SPT)

Soil Types: CLAY, SILT, SAND, GRAVEL, TOPSOIL, PEAT, FILL, NO RECOVERY *

Backfill: Bentonite, Grout, Drill arisings or collapsed hole, Filter material

Remarks

1. Coordinates based on handheld GPS and subject to survey confirmation. Elevation based on data from Graham Surveying (27/02/2020).
2. Strength terms for soil layers are based on correlation with SPT results.
3. Groundwater at 6.3m after being left to stand overnight with casing at 15m depth.
4. Inferred cobble description based in part on nearby test pits.
5. Majority of core loss attributed to wash out of finer material and/or blockage of sampling barrel with coarse gravel/cobbles.
6. PT tests: Nc indicates solid cone; remaining tests undertaken with split spoon.
7. SPT efficiency 94.7%.

All dimensions in metres Scale 1:50	Contractor: McMillan Drilling Ltd.	Rig/Plant Used: Geoprobe Sonic (McMillan)	Driller: Brian McMahon	Logged by: DDH	Checked by: AVD

RILEY CONSULTANTS

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BORE HOLE LOG

Project:	Location:	Hole position:	No.:
Geotech Assessment Resource Consent	578-606 Springs Road, Prebbleton	Refer to Site Plan	**BH204**

Job No.:	Start Date: 15-06-20 Finish Date: 15-06-20	Ground Level (m NZVD2016):	Co-Ordinates (NZTM2000):
190417		21.00	E 1,560,310.6 N 5,174,375.5

Client:	Hole Depth:	Direction:	Sheet:
Summerset Group Holdings Ltd	15.00 m	-90° NZTM2000	2 of 2

Type	Run / Core box end (m)[TCR%]	Fluid & Water	Legend	Geological Interpretation / Geological Description (recovered as):	Elevation (m NZVD2016)	Depth (m)	Tests	Material or Defect Description	Backfill / Piezometer
SONIC GEOPROBE 8140LC (150Hz)	7.00 [100]			*Sandy GRAVEL with some cobbles; grey; dense to very dense; moist. Gravel, fine to coarse; subangular to rounded; sandstone. Sand, fine to coarse. Cobbles, rounded; maximum intermediate axis 150mm.* *(continued)*		9			
	9.12 [70]			9.12m - 10.50m Fines washed out, some cobbles.		10	SPT 9.12 m 16, 16, 12, 13, 13, 12; Nc = 50		
	10.64 [70]			10.64m - 11.00m Fines washed out. 11.00m - 12.16m Grades to silty.		11	SPT 10.64 m 4, 6, 12, 10, 10, 10; Nc = 42		
	12.16 [100]			12.16m - 13.68m Gravel predominantly fine to medium.		12	SPT 12.16 m 6, 8, 10, 13, 12, 11; Nc = 46		
	13.68 [76]			13.68m - 15.00m Fines washed out, gravel predominantly fine to medium.		13	SPT 13.68 m 20, 21, 28, 28, 4/5 mm; Nc > 50		
					+6.00	14			
				EOH @ 15.00 m		15	SPT 15.00 m 22, 38/75mm; Nc > 50		
						16			

Defects (depth, type, description)

Samples (type, reference, description)

Lab testing (depth, type(s))

Soil description (where applicable): Fraction (MAJOR / minor); colour; bedding. Strength, moisture; plasticity; additional

(refer to separate Geotechnical and Geological Information sheet for further information)

Rock Description (where applicable): Weathering; ROCK NAME; colour; texture; fabric and orientation; strength (GEOLOGICAL UNIT). Defect description
Soil description (where applicable): Fraction (MAJOR / minor); colour; bedding. Strength, moisture; plasticity; additional (GEOLOGICAL UNIT)

Explanations:

- Water Strike (1st, 2nd ...)
- Water Rise (1st, 2nd ...) and Rise Time (minutes)
- Small Disturbed Sample (SDS)
- Large Disturbed Sample (LDS)
- Shelby Tube Sample (TNX)
- Standard Penetration Test (SPT)

Soil Types:

CLAY, SILT, SAND, GRAVEL, TOPSOIL, PEAT, FILL, NO RECOVERY *

Backfill:

Bentonite, Grout, Drill arisings or collapsed hole, Filter material

Remarks

1. Coordinates based on handheld GPS and subject to survey confirmation. Elevation based on data from Graham Surveying (27/02/2020).
2. Strength terms for soil layers are based on correlation with SPT results.
3. Groundwater at 6.3m after being left to stand overnight with casing at 15m depth.
4. Inferred cobble description based in part on nearby test pits.
5. Majority of core loss attributed to wash out of finer material and/or blockage of sampling barrel with coarse gravel/cobbles.
6. PT tests: Nc indicates solid cone; remaining tests undertaken with split spoon.
7. SPT efficiency 94.7%.

All dimensions in metres Scale 1:50	Contractor: McMillan Drilling Ltd.	Rig/Plant Used: Geoprobe Sonic (McMillan)	Driller: Brian McMahon	Logged by: DDH	Checked by: AVD

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TEST PIT LOG

Project:	Location:	Hole position:	No.:
Geotech Assessment Resource Consent	578-606 Springs Road, Prebbleton	Refer to Site Plan	TP201

Job No.:	Start Date: 10-06-20 Finish Date: 10-06-20	Ground Level (NZVD2016):	Co-ordinates (NZTM2000):
190417		21.3m	E 1,560,286.8 N 5,174,318.7

Client:	Hole Depth:	Sheet:
Summerset Group Holdings Ltd	3.50 m	1 of 1

Elevation (m NZVD2016)	Depth (m)	Geological Description (refer to separate Geotechnical and Geological Information sheet for further information)
+21.30	0.00	
+21.00	0.30	SILT with some gravel and organics; dark brown; loose to medium dense; "stiff to very stiff"; moist. Gravel, medium to coarse. Organics, rootlets. (TOPSOIL)
	1	SILT with some sand; light orangey brown; "stiff to very stiff"; moist. Sand, fine. (SPRINGSTON FORMATION)
	2	
+18.80	2.50	
	3	Sandy medium to coarse GRAVEL with some cobbles; brownish grey; moist. Sand, fine to coarse. Gravel, subrounded to rounded. Cobbles max intermediate/long axis 150mm/200mm.
+17.80	3.50	END OF HOLE @ 3.50m
	4	
	5	

Legend

Field Strength: Soil | Rock — VS/VL, S/L, F/MD, St/D, VSt/VD, H/EW, W, Ms, VS, ES

Groundwater

Scala Penetrometer (blows / 50 mm): 0 3 6 9 12 15 18

Samples + Lab Testing

1.9m: Grading

3.3m: Grading

Field Testing Results

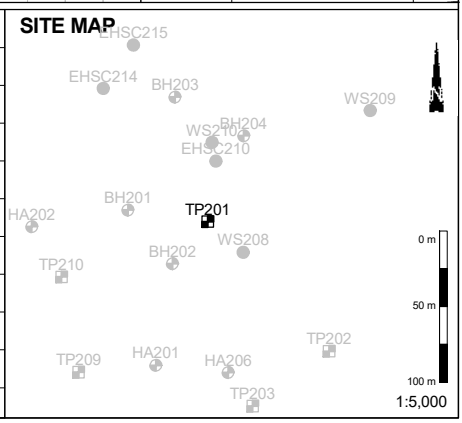
No. 1
1, 2, 2,
4, 4, 3,
2, 2, 2,
3, 2, 2,
3, 2, 2,
5, 4, 3,
4, 3

No. 2
4, 4, 4,
5, 3, 3,
3, 4, 3,
4, 3, 3,
3, 4, 4,
4, 3, 4,
3

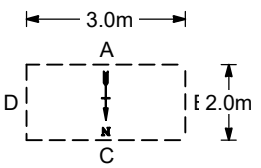
Instrument/ Backfill

SKETCH/PHOTO

SITE MAP



Shoring/Support:
Stability: Stable



SAMPLES AND TESTING
- Grab Sample (Disturbed)
- Bulk Sample (Disturbed)
- Scala Penetrometer (blows/50mm)
- Insitu Vane Shear Strength (kPa): P: Peak; R: Residual; UTP: Unable to penetrate
- Lab Testing: PSD: particle size dist. OMC: optimum moisture cont.; MDD: max dry density; Disp: dispersivity

GROUNDWATER
- [X] None
- [ ] Slow Seep
- [ ] Rapid Inflow
- Water Strike
- Water Rise
- Time (minutes)

TERMINATION DUE TO
- [X] Target depth
- [ ] Refusal
- [ ] Collapse
- [ ] Machine limit

Remarks
1. Coordinates based on handheld GPS and subject to survey confirmation. Elevation based on data from Graham Surveying (27/02/2020).
2. Strength terms for cohesive soils based on Scala test results, indicated in quotation marks.
3. Scala terminated at 2m depth due to practical limit of equipment.

All dimensions in metres Scale 1:50	Contractor: Taggart Earthmoving Ltd	Rig/Plant Used: Machine Excavator (13 tonne)	Logged by: DDH	Checked by: AVD

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TEST PIT LOG

Project:	Location:	Hole position:	No.:
Geotech Assessment Resource Consent	578-606 Springs Road, Prebbleton	Refer to Site Plan	TP202

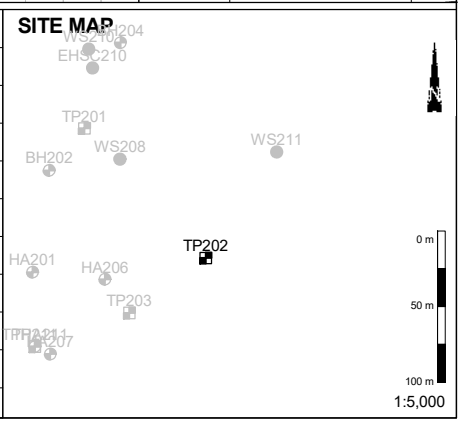
Job No.:	Start Date: 10-06-20 Finish Date: 10-06-20	Ground Level (NZVD2016):	Co-ordinates (NZTM2000):
190417		21.0m	E 1,560,367.0 N 5,174,233.0

Client:	Hole Depth:	Sheet:
Summerset Group Holdings Ltd	3.40 m	1 of 1

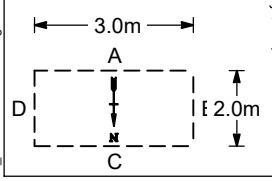
Elevation (m NZVD2016)	Depth (m)	Geological Description (refer to separate Geotechnical and Geological Information sheet for further information)	Legend	Field Strength (Soil / Rock)	Groundwater	Scala Penetrometer (blows / 50 mm)	Samples + Lab Testing	Field Testing Results	Instrument/ Backfill
+21.00									
+20.60	0.40	Sandy fine to coarse GRAVEL with some cobbles; brownish grey; dense; moist. Sand, fine to coarse. Gravel, subrounded to rounded. Cobbles, max size 150mm/100mm. (NON-ENGINEERED FILL).						No. 1 5, 7, 10, 10, 10, 10	
+20.50	0.50	SILT; dark brown; moist. (TOPSOIL)							
	1	Clayey SILT; orangish brown with grey mottling; very stiff; moist. (SPRINGSTON FORMATION)					0.9m: Not tested	P= 154 R= 37 P= 167 R= 31	
+18.90	2.10								
	2	Sandy medium to coarse GRAVEL with some cobbles; brownish grey; moist. Sand, fine to coarse. Gravel, subrounded to rounded. Cobbles max intermediate/long axis 150mm/200mm.							
+17.60	3.40								
	3	END OF HOLE @ 3.40m							
	4								
	5								

SKETCH/PHOTO

SITE MAP



Shoring/Support:
Stability: Stable



SAMPLES AND TESTING
- Grab Sample (Disturbed)
- Bulk Sample (Disturbed)
- Scala Penetrometer (blows/50mm)
- Insitu Vane Shear Strength (kPa): P: Peak; R: Residual; UTP: Unable to penetrate
- Lab Testing: PSD: particle size dist. OMC: optimum moisture cont.; MDD: max dry density; Disp: dispersivity

GROUNDWATER
- [X] None
- [ ] Slow Seep
- [ ] Rapid Inflow
- Water Strike 1
- Water Rise 2
- Time (minutes)

TERMINATION DUE TO
- [X] Target depth
- [ ] Refusal
- [ ] Collapse
- [ ] Machine limit

Remarks
1. Coordinates based on handheld GPS and subject to survey confirmation. Elevation based on data from Graham Surveying (27/02/2020).
2. Strength terms for cohesive soils based on Scala test results, indicated in quotation marks.
3. Scala refused on fill.

All dimensions in metres Scale 1:50	Contractor: Taggart Earthmoving Ltd	Rig/Plant Used: Machine Excavator (13 tonne)	Logged by: DDH	Checked by: AVD

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TEST PIT LOG

Project:	Location:	Hole position:	No.:
Geotech Assessment Resource Consent	578-606 Springs Road, Prebbleton	Refer to Site Plan	TP203

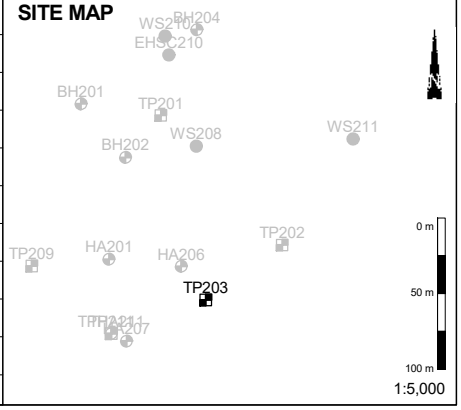
Job No.:	Start Date: 10-06-20 Finish Date: 10-06-20	Ground Level (NZVD2016): 21.2m	Co-ordinates (NZTM2000): E 1,560,316.5 N 5,174,196.7

Client:	Hole Depth:	Sheet:
Summerset Group Holdings Ltd	4.00 m	1 of 1

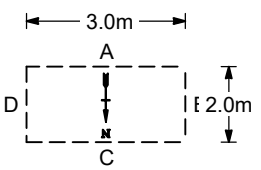
Elevation (m NZVD2016)	Depth (m)	Geological Description (refer to separate Geotechnical and Geological Information sheet for further information)	Legend	Field Strength (Soil / Rock)	Groundwater	Scala Penetrometer (blows / 50 mm)	Samples + Lab Testing	Field Testing Results	Instrument/ Backfill
+21.20						0 3 6 9 12 15 18			
+21.00	0.20	SILT with minor organics; dark brown; "firm to stiff"; moist. Organics, rootlets. (TOPSOIL)							
		Silty fine SAND with trace organics; light yellowish brown; dense; moist. Organics, rootlets. (SPRINGSTON FORMATION)					0.7m: Not tested	No. 1 1, 1, 2, 2, 2, 3, 4, 5, 4, 7, 5, 4, 4, 3, 4, 3, 5, 9, 10, 10 P= 139 R= 65 No. 2 10, 8, 8, 9, 7, 7, 6, 7, 7, 6, 8, 8, 6, 7, 7, 4, 4, 5, 4	
+17.70	3.50								
+17.20	4.00	Sandy medium to coarse GRAVEL with some cobbles; brownish grey; moist. Sand, fine to coarse. Gravel, subrounded to rounded. Cobbles max intermediate/long axis 150mm/200mm.							
		END OF HOLE @ 4.00m							

SKETCH/PHOTO

SITE MAP



Shoring/Support:
Stability: Stable



SAMPLES AND TESTING
- Grab Sample (Disturbed)
- Bulk Sample (Disturbed)
- Scala Penetrometer (blows/50mm)
- Insitu Vane Shear Strength (kPa): P: Peak; R: Residual; UTP: Unable to penetrate
- Lab Testing: PSD: particle size dist. OMC: optimum moisture cont.; MDD: max dry density; Disp: dispersivity

GROUNDWATER
- [X] None
- [ ] Slow Seep
- [ ] Rapid Inflow
- Water Strike
- Water Rise
- Time (minutes)

TERMINATION DUE TO
- [X] Target depth
- [ ] Refusal
- [ ] Collapse
- [ ] Machine limit

Remarks
1. Coordinates based on handheld GPS and subject to survey confirmation. Elevation based on data from Graham Surveying (27/02/2020).
2. Strength terms for cohesive soils based on Scala test results, indicated in quotation marks.

All dimensions in metres Scale 1:50	Contractor: Taggart Earthmoving Ltd	Rig/Plant Used: Machine Excavator (13 tonne)	Logged by: DDH	Checked by: AVD

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TEST PIT LOG

Project: Geotech Assessment Resource Consent	Location: 578-606 Springs Road, Prebbleton	Hole position: Refer to Site Plan	No.: TP204
Job No.: 190417	Start Date: 15-06-20; Finish Date: 15-06-20	Ground Level (NZVD2016): 23.4m; Co-Ordinates (NZTM2000): E 1,560,426.4 N 5,174,416.2	
Client: Summerset Group Holdings Ltd	Hole Depth: 5.10 m		Sheet: 1 of 1

Elevation (m NZVD2016)	Depth (m)	Geological Description (refer to separate Geotechnical and Geological Information sheet for further information)	Field Testing Results
+23.40			
	0.00–2.50	Gravelly SILT; light yellowish brown; dry. Gravel, medium to coarse; subangular to rounded. (NON-ENGINEERED FILL).	
+20.90	2.50		
+20.75	2.65	SILT; dark brown; "soft"; dry. (BURIED TOPSOIL)	No. 1 0, 1, 1, 2, 4, 4, 4, 4, 4, 4, 4, 4, 6, 5, 4, 3, 4, 5, 5, 5
		SILT; light yellowish brown; "very stiff to hard"; dry; low plasticity index. (SPRINGSTON FORMATION)	
+19.60	3.80	Sandy GRAVEL with minor cobbles; brownish grey; moist. Gravel, fine to coarse; subrounded to rounded. Sand, fine to coarse.	No. 2 6, 6, 4, 3, 4, 4, 5, 4, 12, 18
+18.30	5.10	END OF HOLE @ 5.10m	

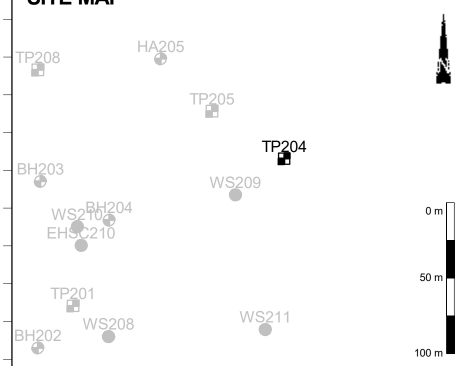
Field Strength: Soil | Rock (VS/VL, S/L, F/MD, St/D, VSt/VD, H/EW, VW, W, MS, S, VS, ES)

Scala Penetrometer (blows / 50 mm): 0, 3, 6, 9, 12, 15, 18

Columns: Legend; Groundwater; Samples + Lab Testing; Instrument/ Backfill

SKETCH/

SITE MAP



Shoring/Support:
Stability: Stable

4.0m
A
D
2.5m
N
C

SAMPLES AND TESTING
- Grab Sample (Disturbed)
- Bulk Sample (Disturbed)
- Scala Penetrometer (blows/50mm)
- Insitu Vane Shear Strength (kPa): P: Peak; R: Residual; UTP: Unable to penetrate

Lab Testing: PSD: particle size dist. OMC: optimum moisture cont.; MDD: max dry density; Disp: dispersivity

GROUNDWATER
- [X] None
- [ ] Slow Seep
- [ ] Rapid Inflow

Water Strike; Water Rise; Time (minutes)

TERMINATION DUE TO
- [X] Target depth
- [ ] Collapse
- [ ] Refusal
- [ ] Machine limit

Remarks
1. Coordinates based on handheld GPS and subject to survey confirmation. Elevation based on data from Graham Surveying (27/02/2020).
2. Strength terms for cohesive soils based on Scala test results, indicated in quotation marks.
3. Test pit starts within bund 2.5m above natural ground level.

All dimensions in metres Scale 1:50	Contractor: Taggart Earthmoving Ltd	Rig/Plant Used: Machine Excavator (13 tonne)	Logged by: DDH	Checked by: AVD

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TEST PIT LOG

Project:	Location:	Hole position:	No.:
Geotech Assessment Resource Consent	578-606 Springs Road, Prebbleton	Refer to Site Plan	TP205

Job No.:	Start Date: 15-06-20 Finish Date: 15-06-20	Ground Level (NZVD2016): 23.6m	Co-ordinates (NZTM2000): E 1,560,378.6 N 5,174,447.5

Client:	Hole Depth:	Sheet:
Summerset Group Holdings Ltd	5.00 m	1 of 1

Elevation (m NZVD2016)	Depth (m)	Geological Description (refer to separate Geotechnical and Geological Information sheet for further information)
+23.60	0	
	1	Gravelly SILT with trace organics. (NON-ENGINEERED FILL).
+21.40	2.20	
+21.10	2.50	SILT with trace organics; dark brown; "stiff to very stiff"; moist. (BURIED TOPSOIL)
	3	SILT with some sand and minor clay; light orangey brown with grey mottling; "very stiff to hard"; moist; low plasticity index. (SPRINGSTON FORMATION)
+19.50	4.10	
	4	Sandy GRAVEL; brownish grey; moist. Gravel, fine to coarse; subrounded to rounded. Sand, fine to coarse.
+18.60	5.00	
	5	END OF HOLE @ 5.00m

Legend

Field Strength: Soil | Rock — VS/VL, S/L, F/MD, St/VD, VSt/VD, H/EW, VW, W, Ms, Vs, ES

Groundwater

Scala Penetrometer (blows / 50 mm): 0 3 6 9 12 15 18

Samples + Lab Testing

- 3.7m: Grading plasticity index

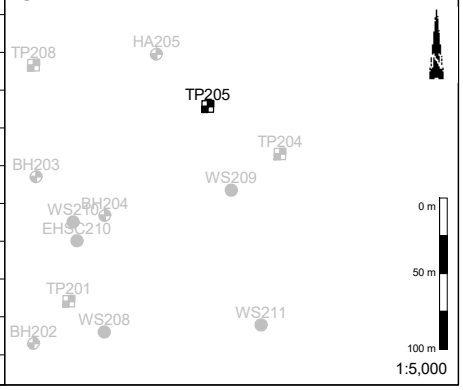
Field Testing Results

- No. 1: 1, 2, 3, 4, 3, 4, 4, 4, 4, 5, 6, 7, 5, 5, 2, 3, 4, 4, 5, 5
- No. 2: 6, 5, 9, 21

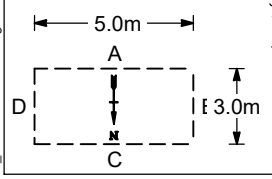
Instrument/ Backfill

SKETCH

SITE MAP



Shoring/Support:
Stability: Stable



SAMPLES AND TESTING
- Grab Sample (Disturbed)
- Bulk Sample (Disturbed)
- Scala Penetrometer (blows/50mm)
- Insitu Vane Shear Strength (kPa): P: Peak; R: Residual; UTP: Unable to penetrate
- Lab Testing: PSD: particle size dist. OMC: optimum moisture cont.; MDD: max dry density; Disp: dispersivity

GROUNDWATER
- [X] None
- [ ] Slow Seep
- [ ] Rapid Inflow
- Water Strike
- Water Rise
- Time (minutes)

TERMINATION DUE TO
- [X] Target depth
- [ ] Refusal
- [ ] Collapse
- [ ] Machine limit

Remarks
1. Coordinates based on handheld GPS and subject to survey confirmation. Elevation based on data from Graham Surveying (27/02/2020).
2. Strength terms for cohesive soils based on Scala test results, indicated in quotation marks.
3. Test pit starts within bund 2.2m above natural ground level.

All dimensions in metres Scale 1:50	Contractor: Taggart Earthmoving Ltd	Rig/Plant Used: Machine Excavator (13 tonne)	Logged by: DDH	Checked by: AVD

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TEST PIT LOG

Project:	Location:	Hole position:	No.:
Geotech Assessment Resource Consent	578-606 Springs Road, Prebbleton	Refer to Site Plan	TP206

Job No.:	Start Date: 15-06-20 Finish Date: 15-06-20	Ground Level (NZVD2016): 21.6m	Co-ordinates (NZTM2000): E 1,560,252.1 N 5,174,452.1

Client:	Hole Depth:	Sheet:
Summerset Group Holdings Ltd	3.40 m	1 of 1

Elevation (m NZVD2016)	Depth (m)	Geological Description (refer to separate Geotechnical and Geological Information sheet for further information)
+21.60	0	
+21.40	0.20	Gravelly SILT with minor organics; dark brown; "stiff to very stiff"; moist. Gravel, fine to coarse; angular to rounded. Organics, rootlets. (FILL)
+21.20	0.40	
+20.80	0.80	SILT with minor organics; dark brown; "very stiff"; moist. Organics, rootlets. (BURRIED TOPSOIL). West end of TP; sandy fine to medium GRAVEL; brown; moist. Sand, fine to coarse.
+20.10	1.50	SILT with some sand; light yellowish brown; very stiff; moist. Sand, fine. (SPRINGSTON FORMATION)
+19.70	1.90	Fine to medium SAND; medium brown; medium dense; moist.
		Sandy SILT; orangey brown with grey mottling; "very stiff"; moist.
+18.20	3.40	Sandy GRAVEL with some cobbles; brownish grey; moist. Gravel, fine to coarse; sunbrounded to rounded. Sand, fine to coarse. Cobbles max intermediate/long axis 150mm/200mm.
		END OF HOLE @ 3.40m

Legend

Field Strength: Soil | Rock — VS/VL, S/L, F/MD, S/VD, VS/VD, H/EW, W, Ms, VS, ES

Groundwater

Scala Penetrometer (blows / 50 mm): 0 3 6 9 12 15 18

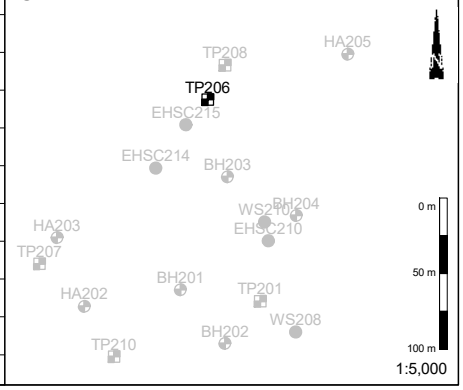
Samples + Lab Testing:
- 0.5m: Grading
- 1.0m: Not tested

Field Testing Results:
- No. 1: 1, 3, 4, 3, 4, 3, 3, 2, 2, 1, 1, 2, 1, 1, 1, 2, 2, 2, 2, 2 — P= 102, R= 28, P= 123, R= 32
- No. 2: 2, 2, 2, 1, 1, 2, 3, 4, 4, 3, 2, 5, 4, 4, 3, 4, 7, 10, 20

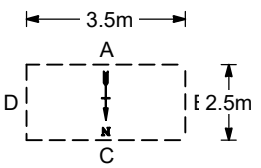
Instrument/ Backfill

SKETCH

SITE MAP



Shoring/Support:
Stability: Stable



SAMPLES AND TESTING
- Grab Sample (Disturbed)
- Bulk Sample (Disturbed)
- Scala Penetrometer (blows/50mm)
- Insitu Vane Shear Strength (kPa): P: Peak; R: Residual; UTP: Unable to penetrate
- Lab Testing: PSD: particle size dist. OMC: optimum moisture cont.; MDD: max dry density; Disp: dispersivity

GROUNDWATER
- [X] None
- [ ] Slow Seep
- [ ] Rapid Inflow
- Water Strike
- Water Rise
- Time (minutes)

TERMINATION DUE TO
- [X] Target depth
- [ ] Refusal
- [ ] Collapse
- [ ] Machine limit

Remarks
1. Coordinates based on handheld GPS and subject to survey confirmation. Elevation based on data from Graham Surveying (27/02/2020).
2. Strength terms for cohesive soils based on Scala test results, indicated in quotation marks.

All dimensions in metres Scale 1:50	Contractor: Taggart Earthmoving Ltd	Rig/Plant Used: Machine Excavator (13 tonne)	Logged by: DDH	Checked by: AVD

RILEY CONSULTANTS Engineers and Geologists

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TEST PIT LOG

Project: Geotech Assessment Resource Consent	Location: 578-606 Springs Road, Prebbleton	Hole position: Refer to Site Plan	No.: TP207
Job No.: 190417	Start Date: 16-06-20 Finish Date: 16-06-20	Ground Level (NZVD2016): 23.4m Coordinates (NZTM2000): E 1,560,140.8 N 5,174,343.5	
Client: Summerset Group Holdings Ltd		Hole Depth: 5.00 m	Sheet: 1 of 1

Elevation (m NZVD2016)	Depth (m)	Geological Description (refer to separate Geotechnical and Geological Information sheet for further information)	Groundwater	Samples + Lab Testing	Field Testing Results
+23.40	0	SILT with some gravel minor cobbles and trace organics; medium brown; dry. Gravel, medium to coarse; subrounded to rounded. (NON-ENGINEERED FILL).			
+21.40	2.00	SILT with trace organics; "firm"; moist; dark brown. Organics, rootlets [BURIED TOPSOIL]. (BURIED TOPSOIL)		2.2m: Not tested	No. 1 1, 2, 2, 3, 2, 3, 2, 2, 4, 4, 5, 4, 4, 3, 4, 3, 2, 2, 3, 3 P= 182 R= 43 P= 134 R= 25
+21.25	2.15	SILT with some sand; light orangish brown with grey mottling; very stiff; moist; low plasticity. (SPRINGSTON FORMATION)			
+20.40	3.00	Silty fine SAND; medium dense; moist.			No. 2 2, 2, 2, 2, 2, 1, 2, 2, 2, 2, 3, 2, 2, 3, 3, 2, 1, 2, 2, 2
+19.40	4.00	Sandy medium to coarse GRAVEL with some cobbles; brownish grey; moist. Sand, fine to coarse. Gravel, subrounded to rounded. Cobbles max intermediate/long axis 150mm/200mm.			
+18.40	5.00	END OF HOLE @ 5.00m			

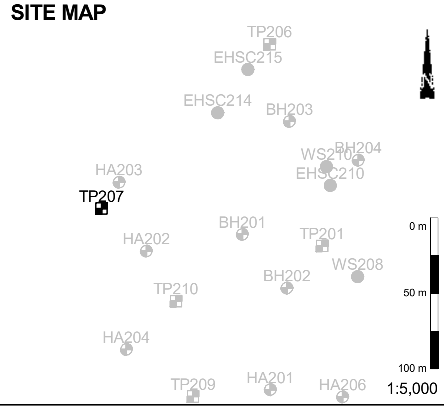
Field Strength: Soil | Rock — VS/VL, S/L, F/MD, St/D, VSt/VD, H/EW, VW, W, MS, S, VS, ES

Scala Penetrometer (blows / 50 mm): 0 3 6 9 12 15 18

Instrument/ Backfill

SKETCH

SITE MAP



1:5,000

Shoring/Support:
Stability: Stable

3.0m; 5.0m; A; C; D; E; N

SAMPLES AND TESTING
- Grab Sample (Disturbed)
- Bulk Sample (Disturbed)
- Scala Penetrometer (blows/50mm)
- Insitu Vane Shear Strength (kPa): P: Peak; R: Residual; UTP: Unable to penetrate

Lab Testing: PSD: particle size dist. OMC: optimum moisture cont.; MDD: max dry density; Disp: dispersivity

GROUNDWATER
- [X] None
- [ ] Slow Seep
- [ ] Rapid Inflow

Water Strike; Water Rise; Time (minutes)

TERMINATION DUE TO
- [X] Target depth
- [ ] Collapse
- [ ] Refusal
- [ ] Machine limit

Remarks
1. Coordinates based on handheld GPS and subject to survey confirmation. Elevation based on data from Graham Surveying (27/02/2020).
2. Strength terms for cohesive soils based on Scala test results, indicated in quotation marks.
3. Test pit starts within bund 2.0m above natural ground level.

All dimensions in metres Scale 1:50	Contractor: Taggart Earthmoving Ltd	Rig/Plant Used: Machine Excavator (13 tonne)	Logged by: DDH	Checked by: AVD

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TEST PIT LOG

Project:	Geotech Assessment Resource Consent
Location:	578-606 Springs Road, Prebbleton
Hole position:	Refer to Site Plan
No.:	TP208
Job No.:	190417
Start Date:	16-06-20
Finish Date:	16-06-20
Ground Level (NZVD2016):	22.9m
Co-Ordinates (NZTM2000):	E 1,560,263.5 N 5,174,474.8
Client:	Summerset Group Holdings Ltd
Hole Depth:	5.00 m
Sheet:	1 of 1

Elevation (m NZVD2016)	Depth (m)	Geological Description (refer to separate Geotechnical and Geological Information sheet for further information)	Field Testing Results
+22.90	0.00	Gravelly SILT with minor organics; brown; medium brown; moist; low plasticity index. (NON-ENGINEERED FILL).	
+20.40	2.50		
+20.25	2.65	SILT with trace organics; dark brown; "firm"; moist. (BURIED TOPSOIL)	No. 1 1, 1, 1, 2, 1, 1, 2, 1, 1, 1, 2, 1, 2, 4, 4, 4, 4, 6, 5, 5
+19.90	3.00	SILT with some sand; light orangish brown with grey mottling; "firm"; moist. (SPRINGSTON FORMATION)	UTP
		Fine SAND; grey; dense to very dense; moist. Becoming silty towards base.	No. 2 6, 8, 11, 10, 9, 9, 9, 5, 6, 9, 7, 9, 10, 16, 18
+18.80	4.10	Sandy medium to coarse GRAVEL with some cobbles; brownish grey; moist. Sand, fine to coarse. Gravel, subrounded to rounded. Cobbles max intermediate/long axis 150mm/200mm.	
+17.90	5.00	END OF HOLE @ 5.00m	

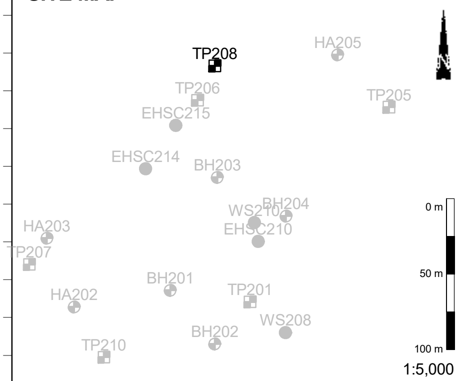
Field Strength: Soil VS/VL, S/L, F/MD, St/D, VSt/VD, H/EW, VW, W, MS, S, VS, ES | Rock

Scala Penetrometer (blows / 50 mm): 0 3 6 9 12 15 18

Groundwater | Samples + Lab Testing | Instrument/ Backfill

SKETCH/PHOTO

SITE MAP



Shoring/Support:
Stability: Stable

4.0m × 3.0m; A, B, C, D

SAMPLES AND TESTING
- Grab Sample (Disturbed)
- Bulk Sample (Disturbed)
- Scala Penetrometer (blows/50mm)
- Insitu Vane Shear Strength (kPa): P: Peak; R: Residual; UTP: Unable to penetrate

Lab Testing: PSD: particle size dist. OMC: optimum moisture cont.; MDD: max dry density; Disp: dispersivity

GROUNDWATER
- [X] None
- [ ] Slow Seep
- [ ] Rapid Inflow

Water Strike; Water Rise; Time (minutes)

TERMINATION DUE TO
- [X] Target depth
- [ ] Collapse
- [ ] Refusal
- [ ] Machine limit

Remarks
1. Coordinates based on handheld GPS and subject to survey confirmation. Elevation based on data from Graham Surveying (27/02/2020).
2. Strength terms for cohesive soils based on Scala test results, indicated in quotation marks.
3. Test pit starts within bund 2.5m above natural ground level.

All dimensions in metres Scale 1:50	Contractor: Taggart Earthmoving Ltd	Rig/Plant Used: Machine Excavator (13 tonne)	Logged by: DDH	Checked by: AVD

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TEST PIT LOG

Project:	Location:	Hole position:	No.:
Geotech Assessment Resource Consent	578-606 Springs Road, Prebbleton	Refer to Site Plan	TP209

Job No.:	Start Date: 16-06-20 Finish Date: 16-06-20	Ground Level (NZVD2016):	Co-ordinates (NZTM2000):
190417		23.0m	E 1,560,201.4 N 5,174,219.1

Client:	Hole Depth:	Sheet:
Summerset Group Holdings Ltd	5.60 m	1 of 1

Elevation (m NZVD2016)	Depth (m)	Geological Description (refer to separate Geotechnical and Geological Information sheet for further information)
+23.00	0	
	1	SILT with minor organics and gravel; medium brown; dry. Organics, rootletes. Gravel, fine to mediuml; subrounded to rounded. (NON-ENGINEERED FILL).
+21.00	2.00	
+20.80	2.20	SILT with minor organics; dark brown; "firm to stiff"; dry. Organics, rootlets. (BURIED TOPSOIL)
	3	SILT; mottled greyish brown; very stiff; dry to moist; low plasticity index. (SPRINGSTON FORMATION)
+20.00	3.00	
	4	SILT with some sand; brownish grey; "very stiff" to hard; moist. Sand, fine.
+18.40	4.60	
	5	Sandy medium to coarse GRAVEL with some cobbles; brownish grey; moist. Sand, fine to coarse. Gravel, subrounded to rounded. Cobbles max intermediate/long axis 150mm/200mm.
+17.40	5.60	END OF HOLE @ 5.60m

Legend; Field Strength (Soil | Rock): VS/VL, S/L, F/MD, St/VD, VSt/VD, H/EW, VH/EW, W, Ms, Vs, ES

Groundwater

Scala Penetrometer (blows / 50 mm): 0 3 6 9 12 15 18

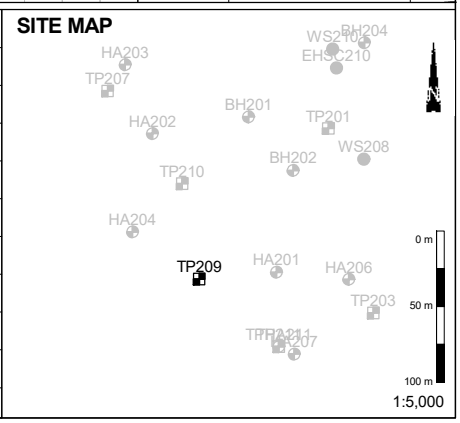
Samples + Lab Testing:
- 2.5m: Not tested
- 3.0m: Grading and compaction

Field Testing Results:
- No. 1: 1, 1, 2, 3, 3, 3, 5, 5, 5, 4, 5, 6, 6, 4, 4, 5, 3, 5, 4, 4
- No. 2: 8, 7, 12, 15, 15
- P= 169 R= 40
- P= >216

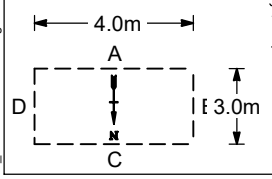
Instrument/ Backfill

SKETCH/PHOTO

SITE MAP



Shoring/Support:
Stability: Stable



SAMPLES AND TESTING
- Grab Sample (Disturbed)
- Bulk Sample (Disturbed)
- Scala Penetrometer (blows/50mm)
- Insitu Vane Shear Strength (kPa): P: Peak; R: Residual; UTP: Unable to penetrate
- Lab Testing: PSD: particle size dist. OMC: optimum moisture cont.; MDD: max dry density; Disp: dispersivity

GROUNDWATER
- [ ] None
- [ ] Slow Seep
- [ ] Rapid Inflow
- Water Strike 1
- Water Rise 2
- Time (minutes)

TERMINATION DUE TO
- [X] Target depth
- [ ] Refusal
- [ ] Collapse
- [ ] Machine limit

Remarks
1. Coordinates based on handheld GPS and subject to survey confirmation. Elevation based on data from Graham Surveying (27/02/2020).
2. Strength terms for cohesive soils based on Scala test results, indicated in quotation marks.
3. Test pit starts within bund 2.0m above natural ground level.

All dimensions in metres Scale 1:50	Contractor: Taggart Earthmoving Ltd	Rig/Plant Used: Machine Excavator (13 tonne)	Logged by: DDH	Checked by: AVD

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TEST PIT LOG

Project: Geotech Assessment Resource Consent
Location: 578-606 Springs Road, Prebbleton
Hole position: Refer to Site Plan
No.: **TP210**

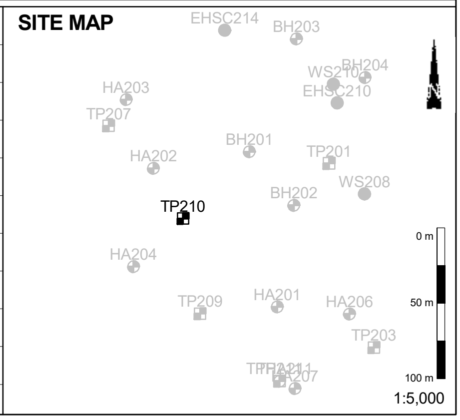
Job No.: 190417
Start Date: 16-06-20
Finish Date: 16-06-20
Ground Level (NZVD2016): 23.4m
Co-Ordinates (NZTM2000): E 1,560,190.1 N 5,174,282.2

Client: Summerset Group Holdings Ltd
Hole Depth: 5.00 m
Sheet: 1 of 1

Elevation (m NZVD2016)	Depth (m)	Geological Description (refer to separate Geotechnical and Geological Information sheet for further information)	Scala Penetrometer (blows / 50 mm)	Field Testing Results
+23.40		SILT with some organics; medium brown; dry. (NON-ENGINEERED FILL).		
+21.90	1.50	Clayey SILT with trace organics; dark brown; "firm becoming very stiff" with depth; moist. Organics, rootlets. FILL		No. 1 1, 1, 1, 3, 3, 4, 5, 6, 6, 6, 6, 3, 3, 2, 2, 3, 3, 3, 2, 3
+21.30	2.10	SILT with some sand; light orangish brown with grey mottling; very stiff; dry to moist. (SPRINGSTON FORMATION)		P= 200 R= 52; No. 2 4, 8, 4, 5, 12, 19, 19, 20
+19.40	4.00	Sandy medium to coarse GRAVEL with some cobbles; brownish grey; moist. Sand, fine to coarse. Gravel, subrounded to rounded.		
+18.40	5.00	END OF HOLE @ 5.00m		

SKETCH/PHOTO

SITE MAP



Shoring/Support:
Stability: Stable

4.0m, 3.0m, A, B, C, D

SAMPLES AND TESTING
- Grab Sample (Disturbed)
- Bulk Sample (Disturbed)
- Scala Penetrometer (blows/50mm)
- Insitu Vane Shear Strength (kPa): P: Peak; R: Residual; UTP: Unable to penetrate
- Lab Testing: PSD: particle size dist. OMC: optimum moisture cont.; MDD: max dry density; Disp: dispersivity

GROUNDWATER
- [X] None
- [ ] Slow Seep
- [ ] Rapid Inflow
- Water Strike
- Water Rise
- Time (minutes)

TERMINATION DUE TO
- [X] Target depth
- [ ] Collapse
- [ ] Refusal
- [ ] Machine limit

Remarks
1. Coordinates based on handheld GPS and subject to survey confirmation. Elevation based on data from Graham Surveying (27/02/2020).
2. Strength terms for cohesive soils based on Scala test results, indicated in quotation marks.
3. Test pit starts within bund 2.1m above natural ground level.

All dimensions in metres
Scale 1:50

Contractor: Taggart Earthmoving Ltd
Rig/Plant Used: Machine Excavator (13 tonne)
Logged by: DDH
Checked by: AVD

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TEST PIT LOG

Project: Geotech Assessment Resource Consent	Location: 578-606 Springs Road, Prebbleton	Hole position: Refer to Site Plan	No.: TP211
Job No.: 190417	Start Date: 16-06-20 Finish Date: 16-06-20	Ground Level (NZVD2016): 23.0m; Co-Ordinates (NZTM2000): E 1,560,254.0 N 5,174,174.5	
Client: Summerset Group Holdings Ltd	Hole Depth: 2.60 m		Sheet: 1 of 1

Elevation (m NZVD2016)	Depth (m)	Geological Description (refer to separate Geotechnical and Geological Information sheet for further information)	Legend	Field Strength (Soil / Rock)	Groundwater	Scala Penetrometer (blows / 50 mm)	Samples + Lab Testing	Field Testing Results	Instrument/ Backfill
+23.00	0.00	SILT with some gravel and minor organics; brown; dry. Gravel, fine to coarse; subangular to rounded. Organics, rootlets. (NON-ENGINEERED FILL).							
+21.60	1.40	SILT with some organics; dark brown; moist. Organics, small tree roots. (FILL)							
+20.40	2.60	END OF HOLE @ 2.60m							

SKETCH

SITE MAP

1:5,000

Shoring/Support:
Stability: Stable

3.0m × 2.0m (A, C, D)

SAMPLES AND TESTING
- Grab Sample (Disturbed)
- Bulk Sample (Disturbed)
- Scala Penetrometer (blows/50mm)
- Insitu Vane Shear Strength (kPa): P: Peak; R: Residual; UTP: Unable to penetrate
- Lab Testing: PSD: particle size dist. OMC: optimum moisture cont.; MDD: max dry density; Disp: dispersivity

GROUNDWATER
- [X] None
- [ ] Slow Seep
- [ ] Rapid Inflow

Water Strike / Water Rise / Time (minutes)

TERMINATION DUE TO
- [ ] Target depth
- [ ] Collapse
- [ ] Refusal
- [X] Machine limit

Remarks
1. Coordinates based on handheld GPS and subject to survey confirmation. Elevation based on data from Graham Surveying (27/02/2020).
2. Test pit starts within bund 1.4m above natural ground level.
3. Excavator broke down at 2.6m depth.
4. Hand auger TPHA211 undertaken from ground level beside bund due to excavator breakdown.

All dimensions in metres Scale 1:50	Contractor: Taggart Earthmoving Ltd	Rig/Plant Used: Machine Excavator (13 tonne)	Logged by: DDH	Checked by: AVD

RILEY AGS 3_1 NZ LIB 13.GLB Log RILEY CHCH TP - SOIL 190417 - SUMMERSET PREBBLETON SPRINGS ROAD - 2020.GPJ <<DrawingFile>> 17/07/2020 14:21 Produced by gINT Professional

RILEY CONSULTANTS

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HAND AUGER LOG

Project:	Location:	Hole position:	No.:
Geotech Assessment Resource Consent	578-606 Springs Road, Prebbleton	Refer to Site Plan	HA201

Job No.:	Start Date: 08-06-20 Finish Date: 08-06-20	Ground Level (m NZVD2016):	Co-Ordinates (NZTM2000):
190417		21.00	E 1,560,252.5 N 5,174,223.7

Client:	Hole Depth:	Sheet:
Summerset Group Holdings Ltd	0.25 m	1 of 1

Elevation (m NZVD2016)	Depth (m)	Geological Unit	Geological Description (refer to separate Geotechnical and Geological Information sheet for further information)	Legend
+21.00				
+20.85	0.15		SILT with minor gravel and organics; dark brown; "firm"; moist. Gravel, medium; rounded. Organics, rootlets. (TOPSOIL)	
+20.75	0.25		Sandy SILT with trace gravel; dark brown; "very stiff"; dry to moist. Gravel, medium; rounded. (SPRINGSTON FORMATION)	
			EOH @ 0.25 m	

Soil Shear Strength (kPa): 50 100 150 200

Scala Penetrometer (blows / 50 mm): 3 6 9 12 15

1.00m

2.00m

Groundwater | Soil Moisture | Samples

Tests

No. 1
1, 2, 3,
4, 4, 4,
3, 4, 5,
6, 7, 7,
8, 8, 7,
7, 9, 6,
7, 7

No. 2
8, 6, 6,
5, 4, 4,
4, 4, 4,
4, 4, 4,
5, 6, 5,
4, 4, 4,
4, 4

Instrument/ Backfill

Explanations:

- Scala Penetrometer - blows/50mm
- Permeability Test
- Schmidt Hammer
- Insitu Vane Shear Strength (kPa) V=Peak, R=Residual, UTP=Unable to penetrate
- Small Disturbed Sample
- Large Disturbed Sample
- U100 Undisturbed Sample
- Water Strike (1st, 2nd ...)
- Water Rise (1st, 2nd ...) and Rise Time (minutes)

Soil Moisture:
D = dry; M = moist; W = wet; S = saturated

GROUNDWATER

- [X] Not Encountered
- [ ] Slow Seep (depth)
- [ ] Rapid Inflow (depth)

HOLE TERMINATED DUE TO:
[ ] Target depth [X] Refusal [ ] Collapse

Remarks

1. Coordinates based on handheld GPS and subject to survey confirmation. Elevation based on data from Graham Surveying (27/02/2020).
2. Strength terms for cohesive soils based on Scala test results indicated in quotation marks.

All dimensions in metres Scale 1:20	Contractor:	Rig/Plant Used: Hand Auger 70 mm	Logged by: DDH	Checked by: AVD

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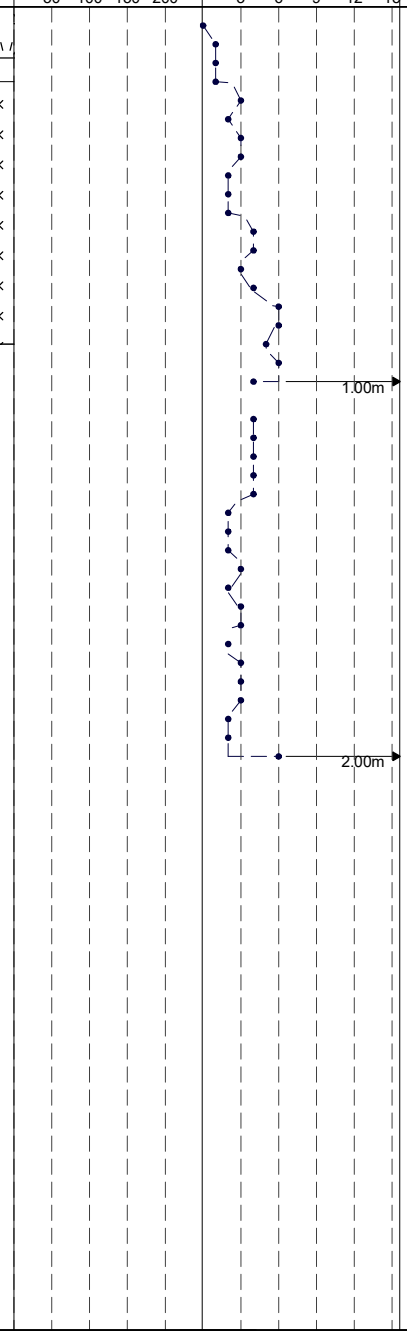
HAND AUGER LOG

Project:	Location:	Hole position:	No.:
Geotech Assessment Resource Consent	578-606 Springs Road, Prebbleton	Refer to Site Plan	HA202

Job No.:	Start Date: 08-06-20 Finish Date: 08-06-20	Ground Level (m NZVD2016):	Co-Ordinates (NZTM2000):
190417		21.60	E 1,560,170.4 N 5,174,315.4

Client:	Hole Depth:	Sheet:
Summerset Group Holdings Ltd	0.90 m	1 of 1

Elevation (m NZVD2016)	Depth (m)	Geological Unit	Geological Description (refer to separate Geotechnical and Geological Information sheet for further information)	Legend
+21.60	0			
+21.40	0.20	(TOPSOIL)	SILT with minor organics; dark brown; "soft"; dry to moist. Organics, rootlets. (TOPSOIL)	
+20.70	0.90	(SPRINGSTON FORMATION)	SILT; light yellowish brown; "stiff to very stiff"; dry. (SPRINGSTON FORMATION)	
	1		EOH @ 0.90 m	
	2			
	3			



Groundwater | Soil Moisture | Samples

Tests

No. 1
0, 1, 1,
1, 3, 2,
3, 3, 2,
2, 2, 4,
4, 3, 4,
6, 6, 5,
6, 4

UTP

No. 2
3, 4, 4,
4, 4, 4,
2, 2, 2,
3, 2, 3,
3, 2, 3,
3, 3, 2,
2, 6

Instrument/ Backfill

Explanations:

- Scala Penetrometer - blows/50mm
- Permeability Test
- Schmidt Hammer
- Insitu Vane Shear Strength (kPa) V=Peak, R=Residual, UTP=Unable to penetrate
- Small Disturbed Sample
- Large Disturbed Sample
- U100 Undisturbed Sample
- Water Strike (1st, 2nd ...)
- Water Rise (1st, 2nd ...) and Rise Time (minutes)

Soil Moisture:
D = dry; M = moist; W = wet; S = saturated

GROUNDWATER

- [X] Not Encountered
- [ ] Slow Seep (depth)
- [ ] Rapid Inflow (depth)

HOLE TERMINATED DUE TO:
[ ] Target depth [X] Refusal [ ] Collapse

Remarks

1. Coordinates based on handheld GPS and subject to survey confirmation. Elevation based on data from Graham Surveying (27/02/2020).
2. Strength terms for cohesive soils based on Scala test results indicated in quotation marks.

All dimensions in metres Scale 1:20	Contractor:	Rig/Plant Used: Hand Auger 70 mm	Logged by: DDH	Checked by: AVD

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Fax:

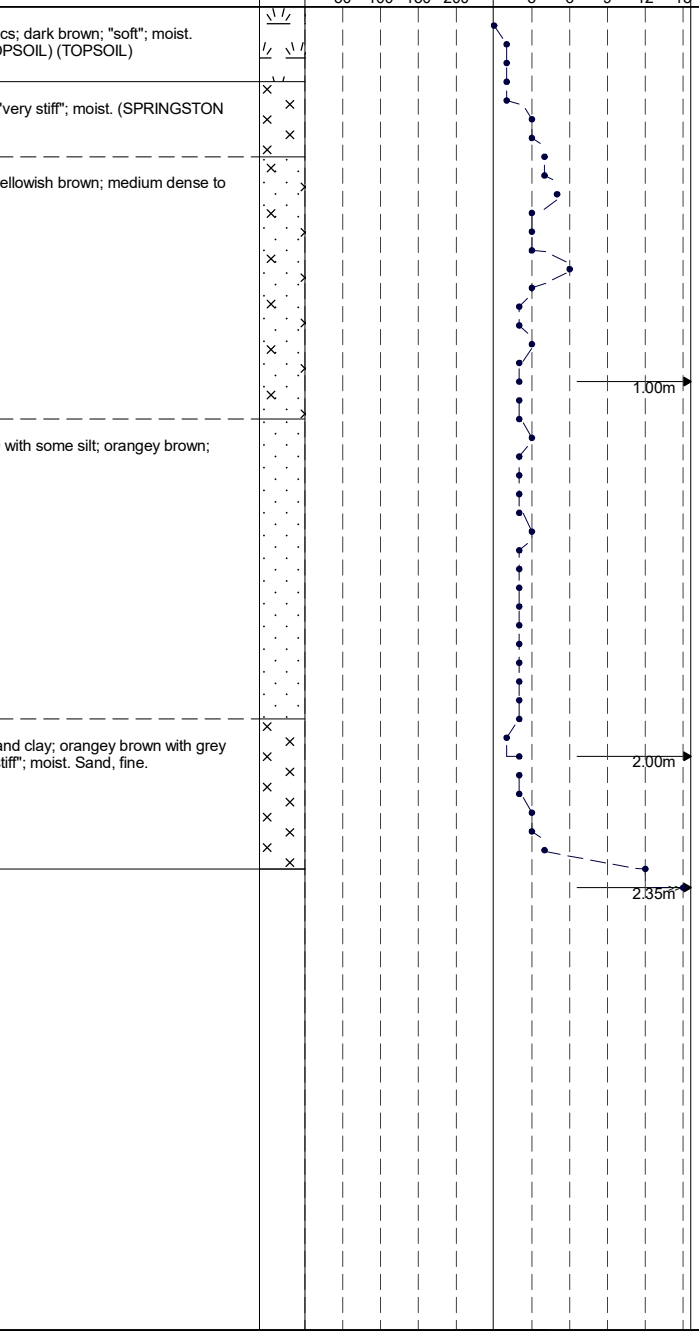
HAND AUGER LOG

Project:	Location:	Hole position:	No.:
Geotech Assessment Resource Consent	578-606 Springs Road, Prebbleton	Refer to Site Plan	HA203

Job No.:	Start Date: 09-06-20 Finish Date: 09-06-20	Ground Level (m NZVD2016)	Co-Ordinates (NZTM2000):
190417		21.90	E 1,560,152.4 N 5,174,360.9

Client:	Hole Depth:	Sheet:
Summerset Group Holdings Ltd	2.30 m	1 of 1

Elevation (m NZVD2016)	Depth (m)	Geological Unit	Geological Description (refer to separate Geotechnical and Geological Information sheet for further information)
+21.70	0.20	(TOPSOIL)	SILT with minor organics; dark brown; "soft"; moist. Organics, rootlets. (TOPSOIL) (TOPSOIL)
+21.50	0.40		SILT; medium brown; "very stiff"; moist. (SPRINGSTON FORMATION)
+20.80	1.10		Silty fine SAND; light yellowish brown; medium dense to dense; moist.
+20.00	1.90		Fine to medium SAND with some silt; orangey brown; medium dense; moist.
+19.60	2.30		SILT with some sand and clay; orangey brown with grey mottling; "stiff to very stiff"; moist. Sand, fine.
			EOH @ 2.30 m



Explanations:

- Scala Penetrometer - blows/50mm
- Permeability Test
- Schmidt Hammer
- Insitu Vane Shear Strength (kPa) V=Peak, R=Residual, UTP=Unable to penetrate
- Small Disturbed Sample
- Large Disturbed Sample
- U100 Undisturbed Sample
- Water Strike (1st, 2nd ...)
- Water Rise (1st, 2nd ...) and Rise Time (minutes)

Soil Moisture:
D = dry; M = moist; W = wet; S = saturated

GROUNDWATER

- [X] Not Encountered
- [ ] Slow Seep (depth)
- [ ] Rapid Inflow (depth)

HOLE TERMINATED DUE TO:
[X] Target depth [ ] Refusal [ ] Collapse

Remarks

1. Coordinates based on handheld GPS and subject to survey confirmation. Elevation based on data from Graham Surveying (27/02/2020).
2. Strength terms for cohesive soils based on Scala test results indicated in quotation marks.
3. Test refused on gravel at 2.3m depth.

All dimensions in metres Scale 1:20	Contractor:	Rig/Plant Used: Hand Auger 70 mm	Logged by: DDH	Checked by: AVD

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Fax:

HAND AUGER LOG

Project:	Location:	Hole position:	No.:
Geotech Assessment Resource Consent	578-606 Springs Road, Prebbleton	Refer to Site Plan	HA204

Job No.:	Start Date: 09-06-20 Finish Date: 09-06-20	Ground Level (m NZVD2016):	Co-Ordinates (NZTM2000):
190417		21.60	E 1,560,157.3 N 5,174,250.3

Client:	Hole Depth:	Sheet:
Summerset Group Holdings Ltd	0.55 m	1 of 1

Elevation (m NZVD2016)	Depth (m)	Geological Unit	Geological Description (refer to separate Geotechnical and Geological Information sheet for further information)	Legend
+21.60	0			
+21.35	0.25		SILT with minor organics; dark brown; "soft"; moist. Organics, rootlets. (TOPSOIL)	
+21.05	0.55		SILT; medium yellowish brown; "stiff to very stiff"; moist. (SPRINGSTON FORMATION)	
	1		EOH @ 0.55 m	
	2			
	3			

Soil Shear Strength (kPa): 50 100 150 200

Scala Penetrometer (blows / 50 mm): 3 6 9 12 15

Groundwater: 1.00m; 2.00m

Soil Moisture

Samples

Tests:
No. 1
0, 1, 1,
1, 3, 3,
2, 2, 3,
3, 2, 4,
6, 5, 5,
3, 2, 3,
3, 3

No. 2
3, 3, 4,
2, 2, 2,
2, 2, 2,
3, 2, 2,
3, 3, 3,
2, 3, 2,
2, 3

Instrument/ Backfill

Explanations:

- Scala Penetrometer - blows/50mm
- Permeability Test
- Schmidt Hammer
- Insitu Vane Shear Strength (kPa) V=Peak, R=Residual, UTP=Unable to penetrate
- Small Disturbed Sample
- Large Disturbed Sample
- U100 Undisturbed Sample
- Water Strike (1st, 2nd ...)
- Water Rise (1st, 2nd ...) and Rise Time (minutes)

Soil Moisture:
D = dry; M = moist; W = wet; S = saturated

GROUNDWATER

- [X] Not Encountered
- [ ] Slow Seep (depth)
- [ ] Rapid Inflow (depth)

HOLE TERMINATED DUE TO:
[ ] Target depth [X] Refusal [ ] Collapse

Remarks

1. Coordinates based on handheld GPS and subject to survey confirmation. Elevation based on data from Graham Surveying (27/02/2020).
2. Strength terms for cohesive soils based on Scala test results indicated in quotation marks.

All dimensions in metres Scale 1:20	Contractor:	Rig/Plant Used: Hand Auger 70 mm	Logged by: DDH	Checked by: AVD

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HAND AUGER LOG

Project:	Location:	Hole position:	No.:
Geotech Assessment Resource Consent	578-606 Springs Road, Prebbleton	Refer to Site Plan	HA205

Job No.:	Start Date: 12-06-20 Finish Date: 12-06-20	Ground Level (m NZVD2016)	Co-Ordinates (NZTM2000):
190417		21.30	E 1,560,344.7 N 5,174,482.2

Client:	Hole Depth:	Sheet:
Summerset Group Holdings Ltd	1.20 m	1 of 1

Elevation (m NZVD2016)	Depth (m)	Geological Unit	Geological Description (refer to separate Geotechnical and Geological Information sheet for further information)
+21.30	0.00		
+21.15	0.15		SILT with minor organics; dark brown; "soft"; dry. Organics, rootlets. (TOPSOIL)
+20.90	0.40		SILT; dark brown; "very stiff"; dry. (SPRINGSTON FORMATION)
+20.10	1.20		SILT with some sand; light orangey brown; "very stiff"; dry.
			EOH @ 1.20 m

Legend

Soil Shear Strength (kPa): 50 100 150 200

Scala Penetrometer (blows / 50 mm): 3 6 9 12 15

1.00m

2.25m

Groundwater

Soil Moisture

Samples

Tests

No. 1
1, 1, 1,
4, 5, 5,
5, 5, 5,
4, 5, 4,
4, 3, 4,
3, 3, 4,
3, 4

No. 2
4, 4, 4,
5, 25

Instrument/ Backfill

Explanations:

- Scala Penetrometer - blows/50mm
- Permeability Test
- Schmidt Hammer
- Insitu Vane Shear Strength (kPa) V=Peak, R=Residual, UTP=Unable to penetrate
- Small Disturbed Sample
- Large Disturbed Sample
- U100 Undisturbed Sample
- Water Strike (1st, 2nd ...)
- Water Rise (1st, 2nd ...) and Rise Time (minutes)

Soil Moisture:
D = dry; M = moist; W = wet; S = saturated

GROUNDWATER

- [X] Not Encountered
- [ ] Slow Seep (depth)
- [ ] Rapid Inflow (depth)

HOLE TERMINATED DUE TO:
[X] Target depth [ ] Refusal [ ] Collapse

Remarks

1. Coordinates based on handheld GPS and subject to survey confirmation. Elevation based on data from Graham Surveying (27/02/2020).
2. Strength terms for cohesive soils based on Scala test results indicated in quotation marks.
3. Test refused on gravel at 1.2m depth.

All dimensions in metres Scale 1:20	Contractor:	Rig/Plant Used: Hand Auger 70 mm	Logged by: DDH	Checked by: AVD

RILEY CONSULTANTS

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HAND AUGER LOG

Project:	Location:	Hole position:	No.:
Geotech Assessment Resource Consent	578-606 Springs Road, Prebbleton	Refer to Site Plan	HA206

Job No.:	Start Date: 16-06-20 Finish Date: 16-06-20	Ground Level (m NZVD2016)	Co-Ordinates (NZTM2000):
190417		21.20	E 1,560,300.3 N 5,174,219.0

Client:	Hole Depth:	Sheet:
Summerset Group Holdings Ltd	3.00 m	1 of 1

Elevation (m NZVD2016)	Depth (m)	Geological Unit	Geological Description (refer to separate Geotechnical and Geological Information sheet for further information)
+21.20			
+20.90	0.30	(TOPSOIL)	SILT with some organics, some to minor sand; "stiff"; dry. Organics, roots and rootlets. Sand, fine to medium. (TOPSOIL)
+20.30	0.90	(SPRINGSTON FORMATION)	Sandy SILT; yellowish brown with orange mottling; "stiff"; dry. Sand, fine to medium. (SPRINGSTON FORMATION)
+19.60	1.60		SILT with some sand; greyish brown with orange mottling; "stiff"; dry. Sand, fine to medium.
+18.20	3.00		Fine to medium SAND with some silt; brown with grey staining and orange mottling; medium dense; moist to dry. 2.40m - 3.00m Grades to minor silt. Medium dense; moist. EOH @ 3.00 m

Legend

Soil Shear Strength (kPa): 50 100 150 200

Scala Penetrometer (blows / 50 mm): 3 6 9 12 15

Groundwater: 1.00m; 2.00m; 3.00m; 3.04m

Soil Moisture

Samples

Tests

- No. 1: 2, 2, 3, 3, 2, 1, 2, 2, 1, 2, 2, 2, 2, 3, 4, 5, 3, 2, 2, 2
- No. 2: 3, 2, 2, 3, 2, 2, 2, 2, 2, 3, 2, 2, 3, 2, 2, 3, 2, 3
- No. 3: 2, 1, 1, 1, 1, 1, 2, 2, 4, 4, 3, 4, 4, 4, 4, 5, 5, 4, 5, 10
- No. 4: 20

Instrument/ Backfill

Explanations:

- Scala Penetrometer - blows/50mm
- Permeability Test
- Schmidt Hammer
- Insitu Vane Shear Strength (kPa) V=Peak, R=Residual, UTP=Unable to penetrate
- Small Disturbed Sample
- Large Disturbed Sample
- U100 Undisturbed Sample
- Water Strike (1st, 2nd ...)
- Water Rise (1st, 2nd ...) and Rise Time (minutes)

Soil Moisture:
D = dry; M = moist; W = wet; S = saturated

GROUNDWATER

- [X] Not Encountered
- [ ] Slow Seep (depth)
- [ ] Rapid Inflow (depth)

HOLE TERMINATED DUE TO:
[X] Target depth [ ] Refusal [ ] Collapse

Remarks

1. Coordinates based on handheld GPS and subject to survey confirmation. Elevation based on data from Graham Surveying (27/02/2020).
2. Strength terms for cohesive soils based on Scala test results indicated in quotation marks.

All dimensions in metres Scale 1:20	Contractor:	Rig/Plant Used: Hand Auger 70 mm	Logged by: DL	Checked by: AVD

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HAND AUGER LOG

Project:	Location:	Hole position:	No.:
Geotech Assessment Resource Consent	578-606 Springs Road, Prebbleton	Refer to Site Plan	HA207

Job No.:	Start Date: 16-06-20 Finish Date: 16-06-20	Ground Level (m NZVD2016):	Co-Ordinates (NZTM2000):
190417		21.00	E 1,560,264.2 N 5,174,169.5

Client:	Hole Depth:	Sheet:
Summerset Group Holdings Ltd	3.00 m	1 of 1

Elevation (m NZVD2016)	Depth (m)	Geological Unit	Geological Description (refer to separate Geotechnical and Geological Information sheet for further information)
+21.00	0		
+20.85	0.15		Gravelly fine to medium SAND with some cobbles; greyish brown; very dense; dry. Gravel, fine to coarse, subrounded and subangular; maximum intermediate 30mm. (FILL)
+20.50	0.50		SILT with some sand and trace organics; dark brown; "stiff"; dry to moist. Sand, fine to medium. Organics, roots and rootlets. (BURRIED TOPSOIL)
			0.25m Grades to brown with orange mottling.
	1	(SPRINGSTON FORMATION)	Sandy SILT; yellowish brown with orange mottling; "stiff"; moist. Sand, fine to medium. (SPRINGSTON FORMATION)
			1.20m Grades to SILT with some sand; yellowish brown with orange mottling and grey staining. Moist.
+19.10	1.90		
	2		Fine to medium SAND with some silt; brown; loose to dense; moist.
			2.20m Grades to medium dense.
+18.00	3.00		
	3		EOH @ 3.00 m

Soil Shear Strength (kPa): 50 100 150 200

Scala Penetrometer (blows / 50 mm): 3 6 9 12 15

Groundwater | Soil Moisture | Samples

Tests

- No. 1: 5, 15, 6, 3, 3, 2, 2, 2, 3, 2, 2, 2, 3, 2, 2, 2, 2, 2, 2
- 1.00m
- No. 2: 0, 2, 2, 2, 2, 2, 2, 3, 2, 2, 2, 3, 3, 3, 3, 2, 2, 2, 4
- 2.00m
- No. 3: 2, 3, 3, 2, 4, 4, 3, 4, 3, 4, 5, 5, 4, 4, 5, 4, 4, 5, 5, 13
- 3.00m
- No. 4: 6, 11, 12, 10
- 3.20m

Instrument/ Backfill

Explanations:

- Scala Penetrometer - blows/50mm
- Permeability Test
- Schmidt Hammer
- Insitu Vane Shear Strength (kPa) V=Peak, R=Residual, UTP=Unable to penetrate
- Small Disturbed Sample
- Large Disturbed Sample
- U100 Undisturbed Sample
- Water Strike (1st, 2nd ...)
- Water Rise (1st, 2nd ...) and Rise Time (minutes)

Soil Moisture:
D = dry; M = moist; W = wet; S = saturated

GROUNDWATER

- [X] Not Encountered
- [ ] Slow Seep (depth)
- [ ] Rapid Inflow (depth)

HOLE TERMINATED DUE TO:
[X] Target depth [ ] Refusal [ ] Collapse

Remarks

1. Coordinates based on handheld GPS and subject to survey confirmation. Elevation based on data from Graham Surveying (27/02/2020).
2. Strength terms for cohesive soils based on Scala test results indicated in quotation marks.

All dimensions in metres Scale 1:20	Contractor:	Rig/Plant Used: Hand Auger 70 mm	Logged by: DL	Checked by: AVD

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HAND AUGER LOG

Project:	Location:	Hole position:	No.:
Geotech Assessment Resource Consent	578-606 Springs Road, Prebbleton	Refer to Site Plan	TPHA211

Job No.:	Start Date: 17-06-20 Finish Date: 17-06-20	Ground Level (m NZVD2016):	Co-Ordinates (NZTM2000):
190417		22.00	E 1,560,254.0 N 5,174,174.5

Client:	Hole Depth:	Sheet:
Summerset Group Holdings Ltd	0.30 m	1 of 1

Elevation (m NZVD2016)	Depth (m)	Geological Unit	Geological Description (refer to separate Geotechnical and Geological Information sheet for further information)	Legend
+22.00				
+21.70	0.30	(TOPSOIL)	SILT with some organics and minor sand; blackish brown. "Stiff" to "very stiff"; moist. Organics, fiborous, rootlets and roots; sand, fine to medium. Rubbish found within hole. (TOPSOIL)	
			EOH @ 0.30 m	

Soil Shear Strength (kPa): 50 100 150 200

Scala Penetrometer (blows / 50 mm): 3 6 9 12 15

1.00m

1.35m

Groundwater | Soil Moisture | Samples

Tests

No. 1
0, 1, 1,
1, 1, 2,
6, 18,
2, 2, 2,
2, 2, 3,
4, 3, 4,
3, 3, 5

No. 2
6, 6, 6,
10, 8,
13, 15

Instrument/ Backfill

Explanations:

- Scala Penetrometer - blows/50mm
- Permeability Test
- Schmidt Hammer
- Insitu Vane Shear Strength (kPa) V=Peak, R=Residual, UTP=Unable to penetrate
- Small Disturbed Sample
- Large Disturbed Sample
- U100 Undisturbed Sample
- Water Strike (1st, 2nd ...)
- Water Rise (1st, 2nd ...) and Rise Time (minutes)

Soil Moisture:
D = dry; M = moist; W = wet; S = saturated

GROUNDWATER

- [X] Not Encountered
- [ ] Slow Seep (depth)
- [ ] Rapid Inflow (depth)

HOLE TERMINATED DUE TO:
[ ] Target depth [X] Refusal [ ] Collapse

Remarks

1. Coordinates based on handheld GPS and subject to survey confirmation. Elevation based on data from Graham Surveying (27/02/2020).
2. Strength terms for cohesive soils based on Scala test results, indicated in quotation marks.
3. Hand auger undertaken from ground level beside bund due to machine breakdown for TP211.
4. Refusal potentially on tree roots.

All dimensions in metres Scale 1:34	Contractor:	Rig/Plant Used: Hand Auger 70 mm	Logged by: DL	Checked by: AVD

RILEY AGS 3_1 NZ LIB 13.GLB Log RILEY CHCH HA 190417 - SUMMERSET PREBBLETON SPRINGS ROAD - 2020.GPJ <<DrawingFile>> 17/07/2020 14:32 Produced by gINT Professional

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HAND AUGER LOG

Project:	Location:	Hole position:	No.:
Geotech Assessment Resource Consent	578-606 Springs Road, Prebbleton	Refer to Site Plan	WS208

Job No.:	Start Date: 16-06-20 Finish Date: 16-06-20	Ground Level (m NZVD2016)	Co-Ordinates (NZTM2000):
190417		21.30	E 1,560,310.2 N 5,174,298.4

Client:	Hole Depth:	Sheet:
Summerset Group Holdings Ltd	2.40 m	1 of 1

Elevation (m NZVD2016)	Depth (m)	Geological Unit	Geological Description (refer to separate Geotechnical and Geological Information sheet for further information)
+21.30	0.00	(FILL)	Gravelly SILT with some sand; dark greyish brown. Dense to very dense; moist; gravel, subrounded to angular, fine to coarse sandstone; sand, fine to medium. (FILL)
			0.30m - 0.50m Grades to SILT with some gravel, minor sand; brown. Gravel, fine to medium.
+20.80	0.50	(SPRINGSTON FORMATION)	SILT with minor to trace sand; greyish brown with orange mottling. Moist to wet; slightly plastic; sand, fine to medium. (SPRINGSTON FORMATION)
+20.10	1.20		Silty SAND/Sandy SILT with some gravels; brown with orange mottling. Moist; loose to medium dense; slightly plastic; sand, fine to medium; gravel, fine to medium, subrounded to subangular.
			1.50m - 1.70m Grades to gravelly sandy SILT.
			1.70m - 2.40m Grades back to sandy SILT and minor to trace gravels.
+18.90	2.40		EOH @ 2.40 m

Soil Shear Strength (kPa): 50 100 150 200

Scala Penetrometer (blows / 50 mm): 3 6 9 12 15

0.15m
1.95m
2.45m

Groundwater | Soil Moisture | Samples

Tests:
No. 1
8, 10, 13
No. 1
2, 2, 2, 2, 2, 2, 2, 2, 2, 2, 2, 2, 2
No. 1
4, 4, 3, 2, 2, 2, 2, 4, 7, 31

Instrument/ Backfill

Explanations:

- Scala Penetrometer - blows/50mm
- Permeability Test
- Schmidt Hammer
- Insitu Vane Shear Strength (kPa) V=Peak, R=Residual, UTP=Unable to penetrate
- Small Disturbed Sample
- Large Disturbed Sample
- U100 Undisturbed Sample
- Water Strike (1st, 2nd ...)
- Water Rise (1st, 2nd ...) and Rise Time (minutes)

Soil Moisture:
D = dry; M = moist; W = wet; S = saturated

GROUNDWATER

- [X] Not Encountered
- [ ] Slow Seep (depth)
- [ ] Rapid Inflow (depth)

HOLE TERMINATED DUE TO:
[ ] Target depth [X] Refusal [ ] Collapse

Remarks

1. Coordinates based on handheld GPS and subject to survey confirmation. Elevation based on data from Graham Surveying (27/02/2020).
2. Strength terms for cohesive soils based on Scala test results, indicated in quotation marks.
3. Window sampling to 1.2m depth with percussion drill rig. Hand auger extended to practical refusal beyong drill depth.

All dimensions in metres Scale 1:20	Contractor: McMillan Drilling Ltd.	Rig/Plant Used: Direct Push Sampler	Logged by: DL	Checked by: AVD

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Fax:

HAND AUGER LOG

Project:	Location:	Hole position:	No.:
Geotech Assessment Resource Consent	578-606 Springs Road, Prebbleton	Refer to Site Plan	WS209

Job No.:	Start Date: 16-06-20 Finish Date: 16-06-20	Ground Level (m NZVD2016)	Co-Ordinates (NZTM2000):
190417		20.80	E 1,560,394.1 N 5,174,392.2

Client:	Hole Depth:	Sheet:
Summerset Group Holdings Ltd	1.70 m	1 of 1

Elevation (m NZVD2016)	Depth (m)	Geological Unit	Geological Description (refer to separate Geotechnical and Geological Information sheet for further information)	Legend
+20.80	0			
+20.65	0.15		CONCRETE. (CONCRETE SLAB)	
+20.40	0.40	(FILL)	Fine to coarse GRAVEL with some sand; blackish brown. Loose; sand, fine to medium. Shiny surface (hydrocarbon smell). (FILL)	
+19.90	0.90	(SPRINGSTON FORMATION)	SILT with some to minor sand; blackish greyish brown. "Stiff"; sand, fine to medium. Hydrocarbon smell. (SPRINGSTON FORMATION) 0.50m Grades to brown with orange mottling 0.70m - 0.95m Grades to "soft".	
	1		Sandy SILT; greyish brown. "Firm"; sand, fine to medium.	
+19.40	1.40		1.05m - 1.40m Grades back to some to minor sand, minor gravel; greyish brown with orange mottling. "Very soft"; gravel, fine to medium, subangular to subrounded; sandstone. 1.25m - 1.55m Grades to "very stiff".	
+19.10	1.70		Fine to medium SAND with some silt; greyish brown with orange mottling. Dense.	
			EOH @ 1.70 m	
	2			
	3			

Soil Shear Strength (kPa): 50 100 150 200

Scala Penetrometer (blows / 50 mm): 3 6 9 12 15

0.95m

1.55m

Groundwater | Soil Moisture | Samples

Tests:
No. 1
2, 2, 2,
4, 5, 4,
4, 3, 4,
4, 2, 1,
0, 1, 2

No. 2
Undertaken at 1m with 1m extension rod.
3, 3, 2,
2, 2, 8,
6, 7,
12, 10,
12

Instrument/ Backfill

Explanations:

- Scala Penetrometer - blows/50mm
- Permeability Test
- Schmidt Hammer
- Insitu Vane Shear Strength (kPa) V=Peak, R=Residual, UTP=Unable to penetrate
- Small Disturbed Sample
- Large Disturbed Sample
- U100 Undisturbed Sample
- Water Strike (1st, 2nd ...)
- Water Rise (1st, 2nd ...) and Rise Time (minutes)

Soil Moisture:
D = dry; M = moist; W = wet; S = saturated

GROUNDWATER

- [X] Not Encountered
- [ ] Slow Seep (depth)
- [ ] Rapid Inflow (depth)

HOLE TERMINATED DUE TO:
[ ] Target depth [X] Refusal [ ] Collapse

Remarks

1. Coordinates based on handheld GPS and subject to survey confirmation. Elevation based on data from Graham Surveying (27/02/2020).
2. Strength terms for cohesive soils based on Scala test results, indicated in quotation marks.
3. Window sampling to 1.7m depth with percussion drill rig. Unable to hand auger beyond 1.7m due to refusal at granular residual at bottom of hole.
4. Moisture content not recorded as water is used during concrete coring.

All dimensions in metres Scale 1:20	Contractor: McMillan Drilling Ltd.	Rig/Plant Used: Direct Push Sampler	Logged by: DL	Checked by: AVD

RILEY CONSULTANTS

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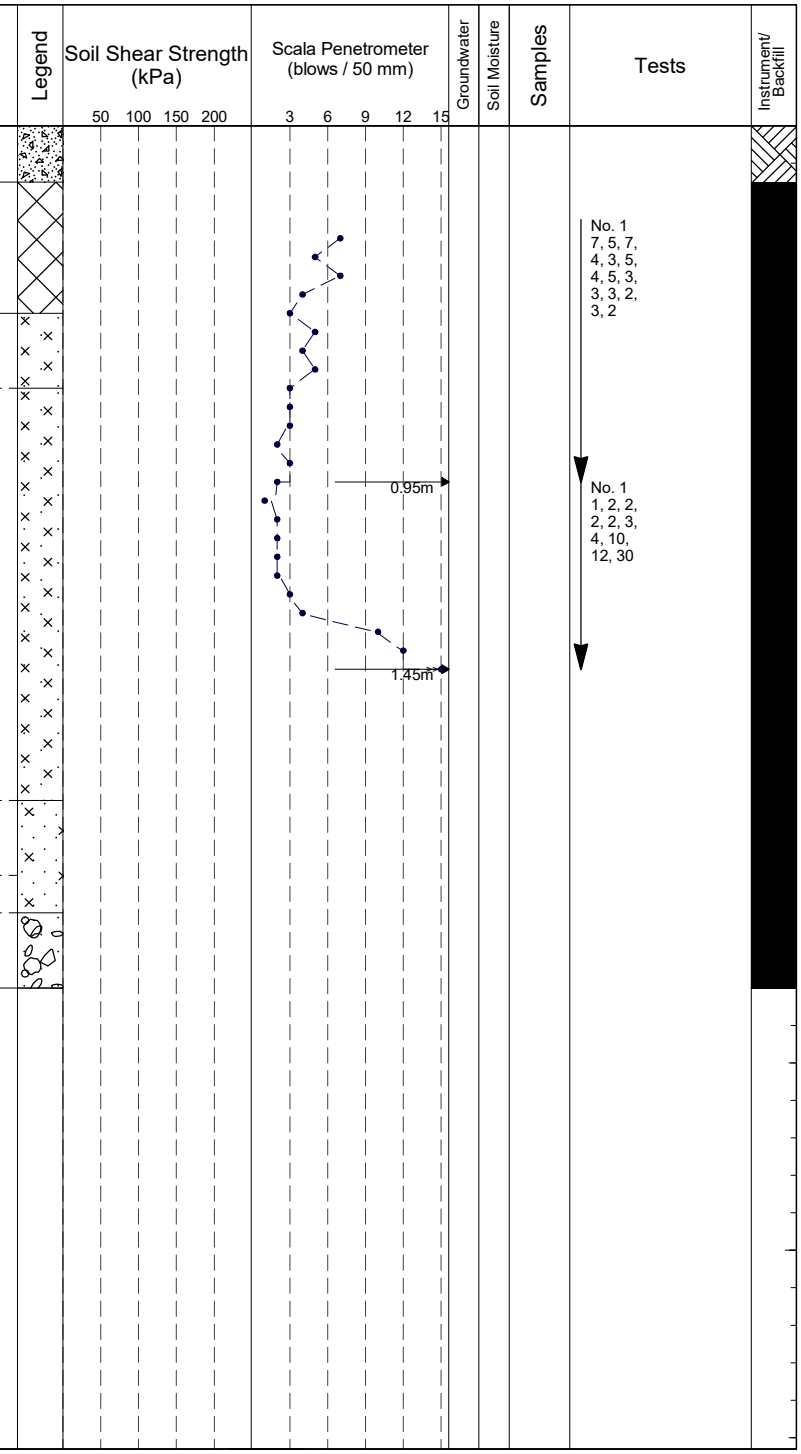
HAND AUGER LOG

Project:	Location:	Hole position:	No.:
Geotech Assessment Resource Consent	578-606 Springs Road, Prebbleton	Refer to Site Plan	WS210

Job No.:	Start Date: 18-06-20 Finish Date: 18-06-20	Ground Level (m NZVD2016)	Co-Ordinates (NZTM2000):
190417		21.00	E 1,560,289.6 N 5,174,371.2

Client:	Hole Depth:	Sheet:
Summerset Group Holdings Ltd	2.30 m	1 of 1

Elevation (m NZVD2016)	Depth (m)	Geological Unit	Geological Description (refer to separate Geotechnical and Geological Information sheet for further information)
+21.00			
+20.85	0.15	(CONCRETE SLAB)	CONCRETE. (CONCRETE SLAB)
+20.50	0.50	(FILL)	Sandy fine to coarse GRAVEL with minor silt; greyish brown. Medium dense; sand, fine to medium; gravel, subrounded to angular. (FILL)
+20.30	0.70		SILT with some sand; brown with orange mottling. "Stiff"; sand, fine to medium. (SPRINGSTON FORMATION)
	1		Sandy SILT; brown. "Firm"; sand, fine to medium
			1.35m Grades to "very stiff".
+19.20	1.80		
	2		Fine to medium SAND with some silt; greyish brown with orange mottling.
			2.00m Grades to include some gravels.
+18.90	2.10		
			Sandy fine to coarse GRAVEL with some cobbles; dark brown. Sand, fine to medium; cobbles, fine, max 30mm.
+18.70	2.30		
	3		EOH @ 2.30 m



Explanations:

- Scala Penetrometer - blows/50mm
- Permeability Test
- Schmidt Hammer
- Insitu Vane Shear Strength (kPa) V=Peak, R=Residual, UTP=Unable to penetrate
- Small Disturbed Sample
- Large Disturbed Sample
- U100 Undisturbed Sample
- Water Strike (1st, 2nd ...)
- Water Rise (1st, 2nd ...) and Rise Time (minutes)

Soil Moisture:
D = dry; M = moist; W = wet; S = saturated

GROUNDWATER

- [X] Not Encountered
- [ ] Slow Seep (depth)
- [ ] Rapid Inflow (depth)

HOLE TERMINATED DUE TO:
[ ] Target depth [X] Refusal [ ] Collapse

Remarks

1. Coordinates based on handheld GPS and subject to survey confirmation. Elevation based on data from Graham Surveying (27/02/2020).
2. Strength terms for cohesive soils based on Scala test results, indicated in quotation marks.
3. Strength terms for soil layers are based on Scala test results undertaken at EHSC210. Approximately 5m away from machine auger.
4. Moisture content not recorded as water is used during concrete coring.
5. Diameter of plastic tube for coring is 45mm.

All dimensions in metres Scale 1:20	Contractor: McMillan Drilling Ltd.	Rig/Plant Used: Direct Push Sampler	Logged by: DL	Checked by: AVD

RILEY CONSULTANTS
Engineers and Geologists

RILEY Consultants Ltd
Level 2, 22 Moorhouse Ave
Addington, Christchurch, 8024
Tel: +64 3 379 4402
Fax:

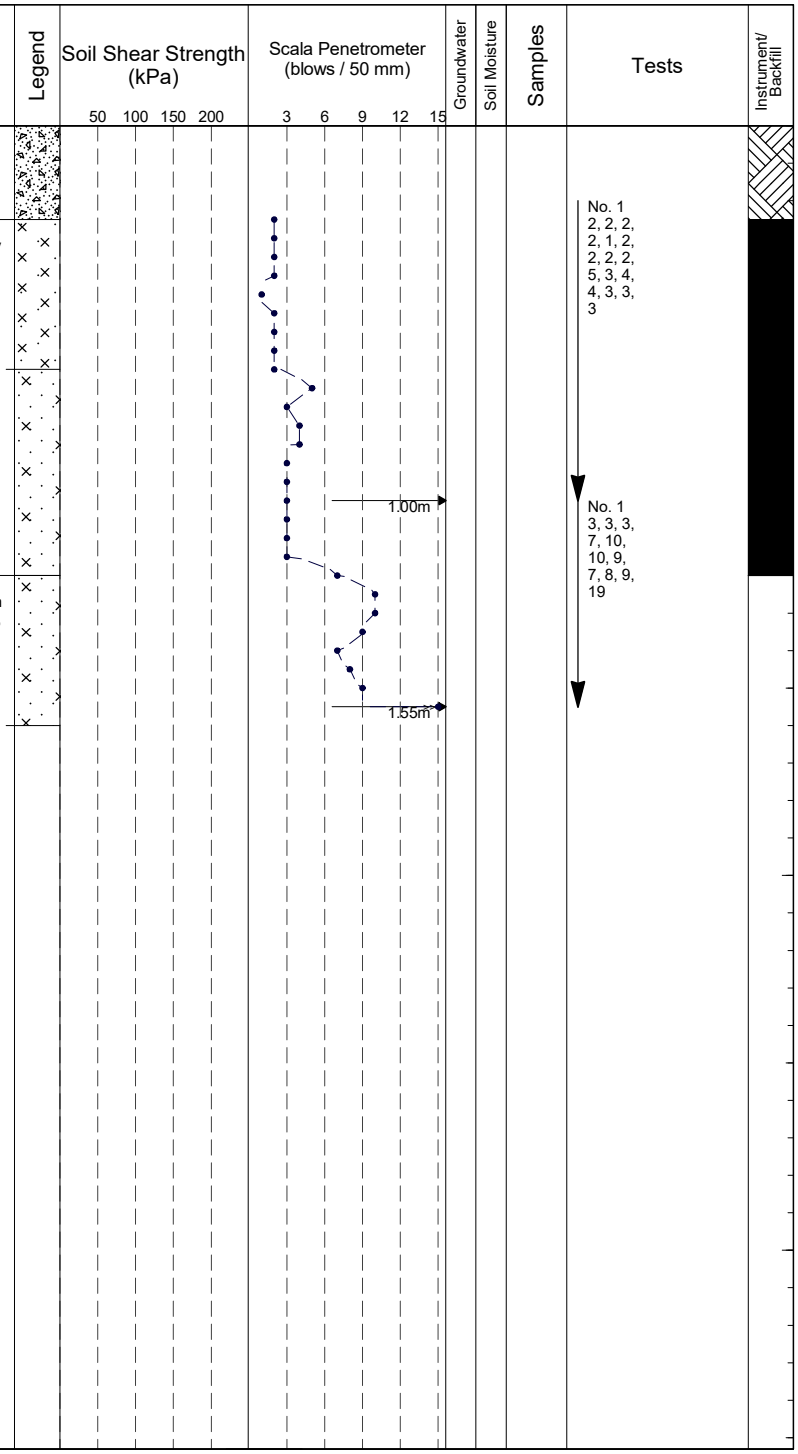
HAND AUGER LOG

Project:	Location:	Hole position:	No.:
Geotech Assessment Resource Consent	578-606 Springs Road, Prebbleton	Refer to Site Plan	WS211

Job No.:	Start Date: 17-06-20 Finish Date: 17-06-20	Ground Level (m NZVD2016):	Co-Ordinates (NZTM2000):
190417		20.60	E 1,560,413.9 N 5,174,303.1

Client:	Hole Depth:	Sheet:
Summerset Group Holdings Ltd	1.20 m	1 of 1

Elevation (m NZVD2016)	Depth (m)	Geological Unit	Geological Description (refer to separate Geotechnical and Geological Information sheet for further information)	Legend
+20.60	0			
+20.35	0.25	(CONCRETE SLAB)	CONCRETE (CONCRETE SLAB)	
+19.95	0.65	(SPRINGSTON FORMATION)	SILT with some sand; brown with orange mottling with grey staining. "Firm"; dry; sand, fine to medium (SPRINGSTON FORMATION)	
+19.40	1.20		Fine to medium SAND with some silt; greyish brown with orange mottling. Medium dense; moist.	
+19.00	1.60		Sitly fine to medium SAND with trace gravel; greyish brown iwht orange mottling. Dense; moist; gravel, fine to medium, subrounded to subangular sandstone.	
			EOH @ 1.20 m	



Explanations:

- Scala Penetrometer - blows/50mm
- Permeability Test
- Schmidt Hammer
- Insitu Vane Shear Strength (kPa) V=Peak, R=Residual, UTP=Unable to penetrate
- Small Disturbed Sample
- Large Disturbed Sample
- U100 Undisturbed Sample
- Water Strike (1st, 2nd ...)
- Water Rise (1st, 2nd ...) and Rise Time (minutes)

Soil Moisture:
D = dry; M = moist; W = wet; S = saturated

GROUNDWATER

- [X] Not Encountered
- [ ] Slow Seep (depth)
- [ ] Rapid Inflow (depth)

HOLE TERMINATED DUE TO:
[ ] Target depth [X] Refusal [ ] Collapse

Remarks

1. Coordinates based on handheld GPS and subject to survey confirmation. Elevation based on data from Graham Surveying (27/02/2020).
2. Strength terms for cohesive soils based on Scala test results, indicated in quotation marks.
3. Window sampling to 1.2m depth with percussion drill rig. Unable to hand auger beyond 1.7m due to refusal at granular residual at bottom of hole.
4. Moisture content not recorded as water is used during concrete coring.

All dimensions in metres Scale 1:20	Contractor: McMillan Drilling Ltd.	Rig/Plant Used: Hand Auger 70 mm	Logged by: DL	Checked by: AVD

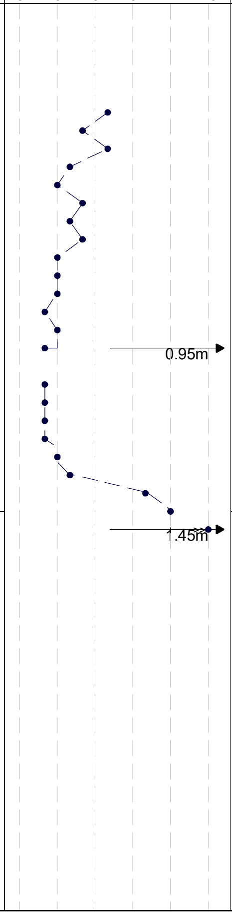
RILEY AGS 3_1 NZ LIB 13.GLB Log RILEY CHCH HA 190417 - SUMMERSET PREBBLETON SPRINGS ROAD - 2020.GPJ <<DrawingFile>> 17/07/2020 14:33 Produced by gINT Professional

RILEY Consultants Ltd
Level 2, 22 Moorhouse Ave
Addington, Christchurch, 8024
Tel: +64 3 379 4402
Fax:

SCALA LOG

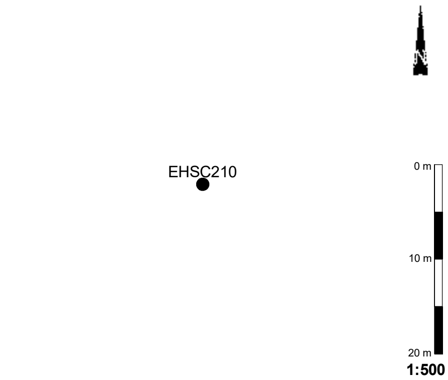
Project: Geotech Assessment Resource Consent	Location: 578-606 Springs Road, Prebbleton	Hole position: Refer to Site Plan	No.: **EHSC210**
Job No.: 190417	Start Date: 18-06-20 Finish Date: 18-06-20	Ground Level (m NZVD2016): 21.00	Co-Ordinates (NZTM2000): E 1,560,292.1 N 5,174,358.7
Client: Summerset Group Holdings Ltd	Termination Depth (below ground level): 1.40 m		Sheet: 1 of 1

Elevation (m NZVD2016)	Depth (m)	Descriptive Strength Term (inferred from in-situ penetration test)	Legend	Weathering (RS CW HW MW SW UW)	Field Strength Soil / Rock (VS/VL S/L F/MD St/D VSt/VD H/EW VW W MS S VS ES)	Scala Penetrometer (blows / 50 mm) 0 3 6 9 12 15	Fluid & Water	Samples	Tests	Instrument/ Backfill
+21.00									No. 1: 7, 5, 7, 4, 3, 5, 4, 5, 3, 3, 3, 2, 3, 2	
	1					0.95m			No. 2: 1, 2, 2, 2, 2, 3, 4, 10, 12, 30	
						1.45m				
	2									



SKETCH:

MAP



Explanations:
Rock Mass Weathering - unweathered, slightly weathered, moderately weathered, highly weathered, completely weathered, residually weathered
Relative soil Strength - very soft/very loose, soft/loose, firm/medium dense, stiff/dense, very stiff/very dense

- Small Disturbed Sample
- Large Disturbed Sample
- U100 Undisturbed Sample

- Scala Penetrometer: blows/50mm
- Permeability Test
- Clegg Hammer: impact value (test repetitions)
- Insitu Vane Shear Strength (kPa) P=Peak, R=Residual, UTP=Unable to penetrate
- Water Strike (1st, 2nd ...)
- Water Rise (1st, 2nd ..) & Rise Time (min's.)

Groundwater:
[X] None
[ ] Rods wet below

HOLE TERMINATED DUE TO:
[ ] Target depth [X] Refusal

Remarks
1. Coordinates based on handheld GPS and subject to survey confirmation. Elevation based on data from Graham Surveying (27/02/2020).
2. Strength terms for cohesive soils based on Scala test results indicated in quotation marks. Strength testing undertaken for WS210 approximately 5m away from WS210 hole due to method of drilling.

All dimensions in metres Scale 1:21	Contractor:	Rig/Plant Used: Scala Penetrometer	Logged by: DL	Checked by: AVD

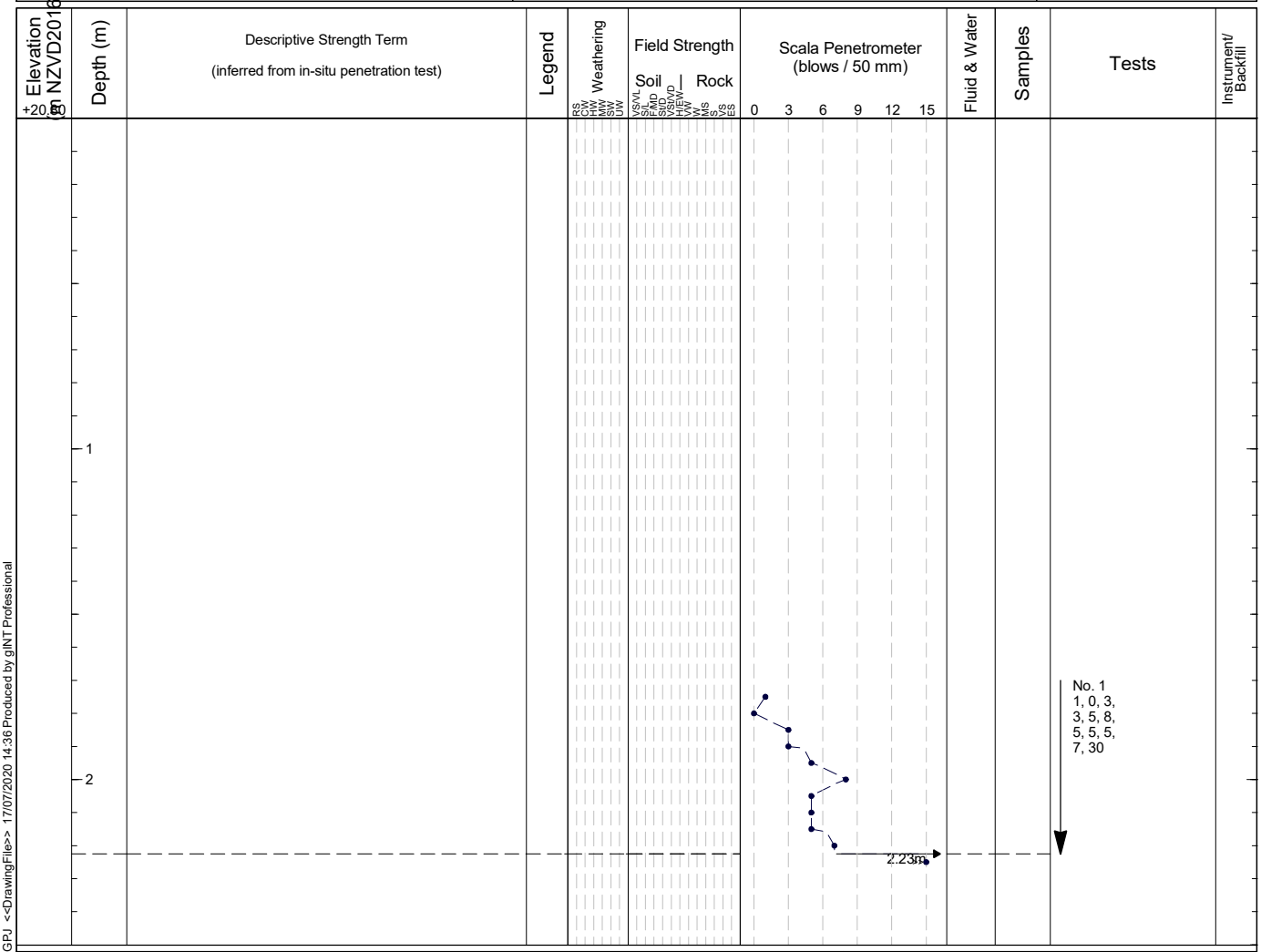
RILEY CONSULTANTS
RILEY Consultants Ltd
Level 2, 22 Moorhouse Ave
Addington, Christchurch, 8024
Tel: +64 3 379 4402
Fax:

SCALA LOG

Project:	Location:	Hole position:	No.:
Geotech Assessment Resource Consent	578-606 Springs Road, Prebbleton	Refer to Site Plan	EHSC214

Job No.:	Start Date: 17-06-20 Finish Date: 17-06-20	Ground Level (m NZVD2016)	Co-Ordinates (NZTM2000):
190417		20.80	E 1,560,217.7 N 5,174,406.8

Client:	Termination Depth (below ground level):	Sheet:
Summerset Group Holdings Ltd	2.23 m	1 of 1



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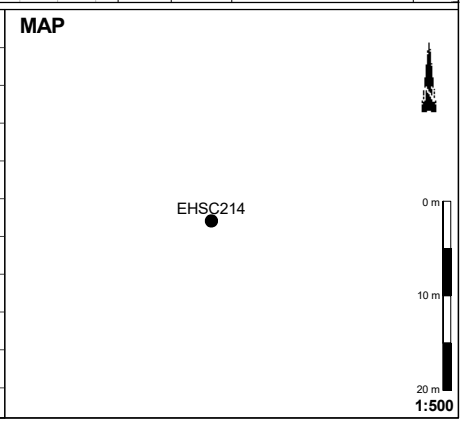


Explanations:

Rock Mass Weathering - unweathered, slightly weathered, moderately weathered, highly weathered, completely weathered, residually weathered

Relative soil Strength - very soft/very loose, soft/loose, firm/medium dense, stiff/dense, very stiff/very dense

- Small Disturbed Sample
- Large Disturbed Sample
- U100 Undisturbed Sample

- Scala Penetrometer: blows/50mm
- Permeability Test
- Clegg Hammer: impact value (test repetitions)
- Insitu Vane Shear Strength (kPa) P=Peak, R=Residual, UTP=Unable to penetrate
- Water Strike (1st, 2nd ...)
- Water Rise (1st, 2nd ..) & Rise Time (min's.)

Groundwater:

- [X] None
- [ ] Rods wet below

HOLE TERMINATED DUE TO:

- [ ] Target depth
- [X] Refusal

Remarks

1. Coordinates based on handheld GPS and subject to survey confirmation. Elevation based on data from Graham Surveying (27/02/2020).
2. Strength terms for cohesive soils based on Scala test results indicated in quotation marks.
3. Scala undertaken at the bottom of environmental borehole, 1.7m below ground surface.

All dimensions in metres Scale 1:21	Contractor:	Rig/Plant Used: Scala Penetrometer	Logged by: DL	Checked by: AVD

RILEY AGS 3_1 NZ LIB 13.GLB Log RILEY CHCH SC_190417 - SUMMERSET PREBBLETON SPRINGS ROAD - 2020.GPJ <<DrawingFile>> 17/07/2020 14:36 Produced by gINT Professional

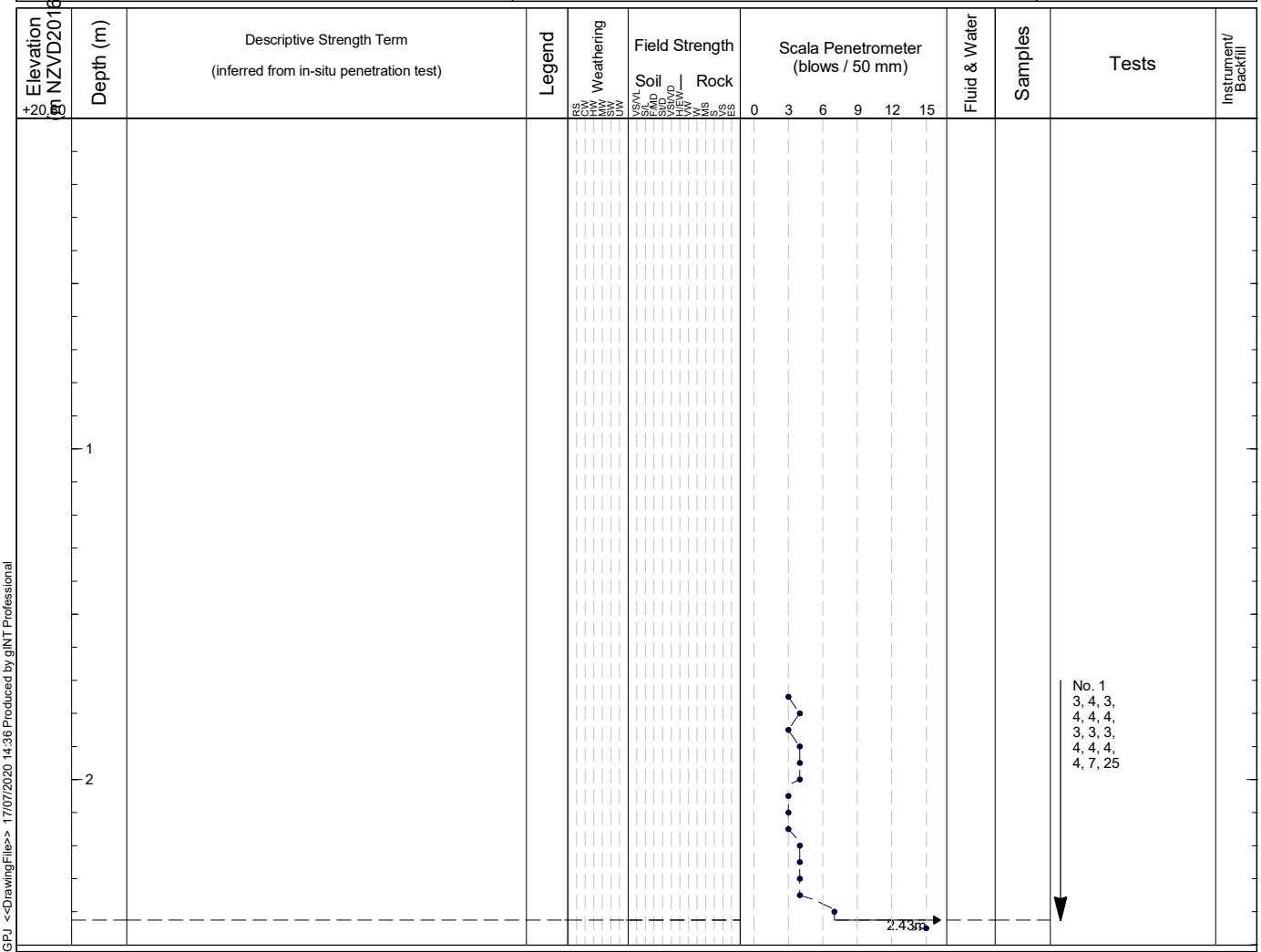
RILEY CONSULTANTS
RILEY Consultants Ltd
Level 2, 22 Moorhouse Ave
Addington, Christchurch, 8024
Tel: +64 3 379 4402
Fax:

SCALA LOG

Project:	Location:	Hole position:	No.:
Geotech Assessment Resource Consent	578-606 Springs Road, Prebbleton	Refer to Site Plan	EHSC215

Job No.:	Start Date: 17-06-20 Finish Date: 17-06-20	Ground Level (m NZVD2016)	Co-Ordinates (NZTM2000):
190417		20.80	E 1,560,237.6 N 5,174,435.5

Client:	Termination Depth (below ground level):	Sheet:
Summerset Group Holdings Ltd	2.43 m	1 of 1



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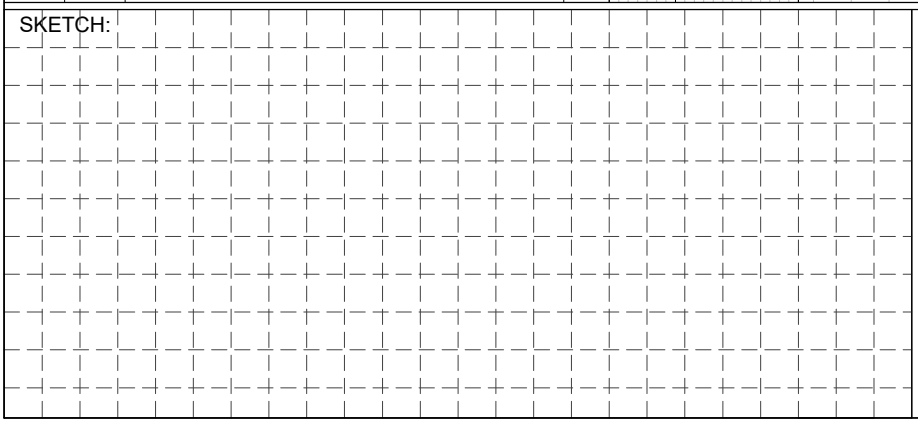
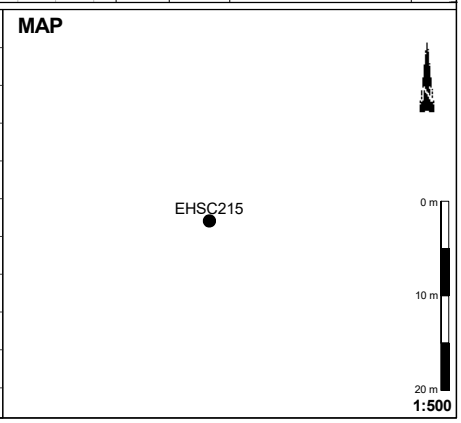


MAP



Explanations:

Rock Mass Weathering - unweathered, slightly weathered, moderately weathered, highly weathered, completely weathered, residually weathered

Relative soil Strength - very soft/very loose, soft/loose, firm/medium dense, stiff/dense, very stiff/very dense

- Small Disturbed Sample
- Large Disturbed Sample
- U100 Undisturbed Sample
- Scala Penetrometer: blows/50mm
- Permeability Test
- Clegg Hammer: impact value (test repetitions)
- Insitu Vane Shear Strength (kPa) P=Peak, R=Residual, UTP=Unable to penetrate
- Water Strike (1st, 2nd ...)
- Water Rise (1st, 2nd ..) & Rise Time (min's.)

Groundwater:

- [X] None
- [ ] Rods wet below

HOLE TERMINATED DUE TO:

- [ ] Target depth
- [X] Refusal

Remarks

1. Coordinates based on handheld GPS and subject to survey confirmation. Elevation based on data from Graham Surveying (27/02/2020).
2. Strength terms for cohesive soils based on Scala test results indicated in quotation marks.
3. Scala undertaken at the bottom of environmental borehole, 1.7m below ground surface.

All dimensions in metres Scale 1:21	Contractor:	Rig/Plant Used: Scala Penetrometer	Logged by: DL	Checked by: AVD

APPENDIX B

Borehole Core Photography

Box No 1 **From** 0.00m **To** 1.50m

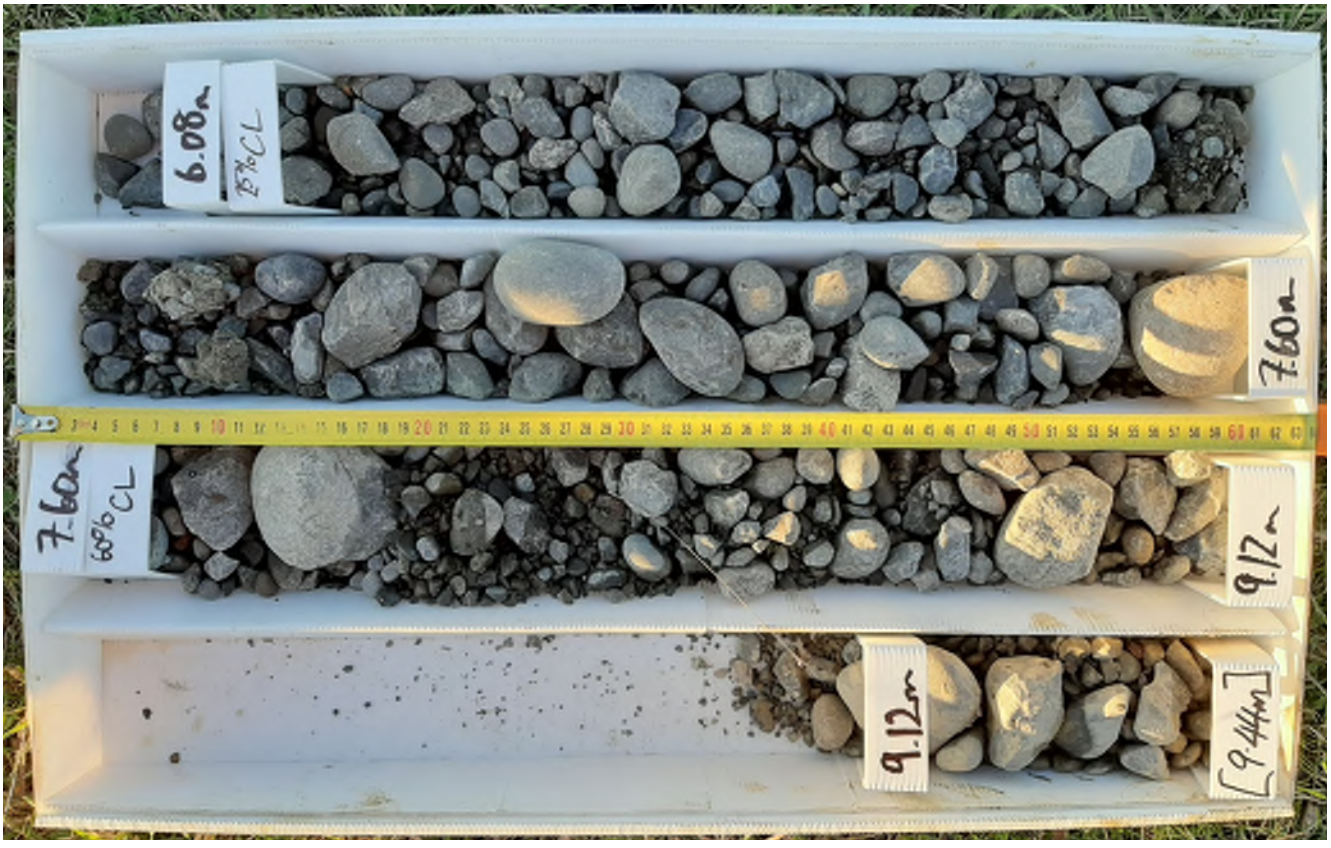
Box No 2 **From** 1.50m **To** 3.36m

Client	Summerset Villages Ltd	**Location**	Refer to Site Plan	**Notes**
Project	Prebbleton, Springs Rd	**Total depth**	15.0m	
Project No	190417	**Date drilled**	8 June 2020	
Borehole	**BH201**	**Core size**	76mm DT45 Sonic	

RILEY CONSULTANTS Engineers and Geologists

Summerset RETIREMENT VILLAGES

Box No 3 **From** 3.36m **To** 6.08m



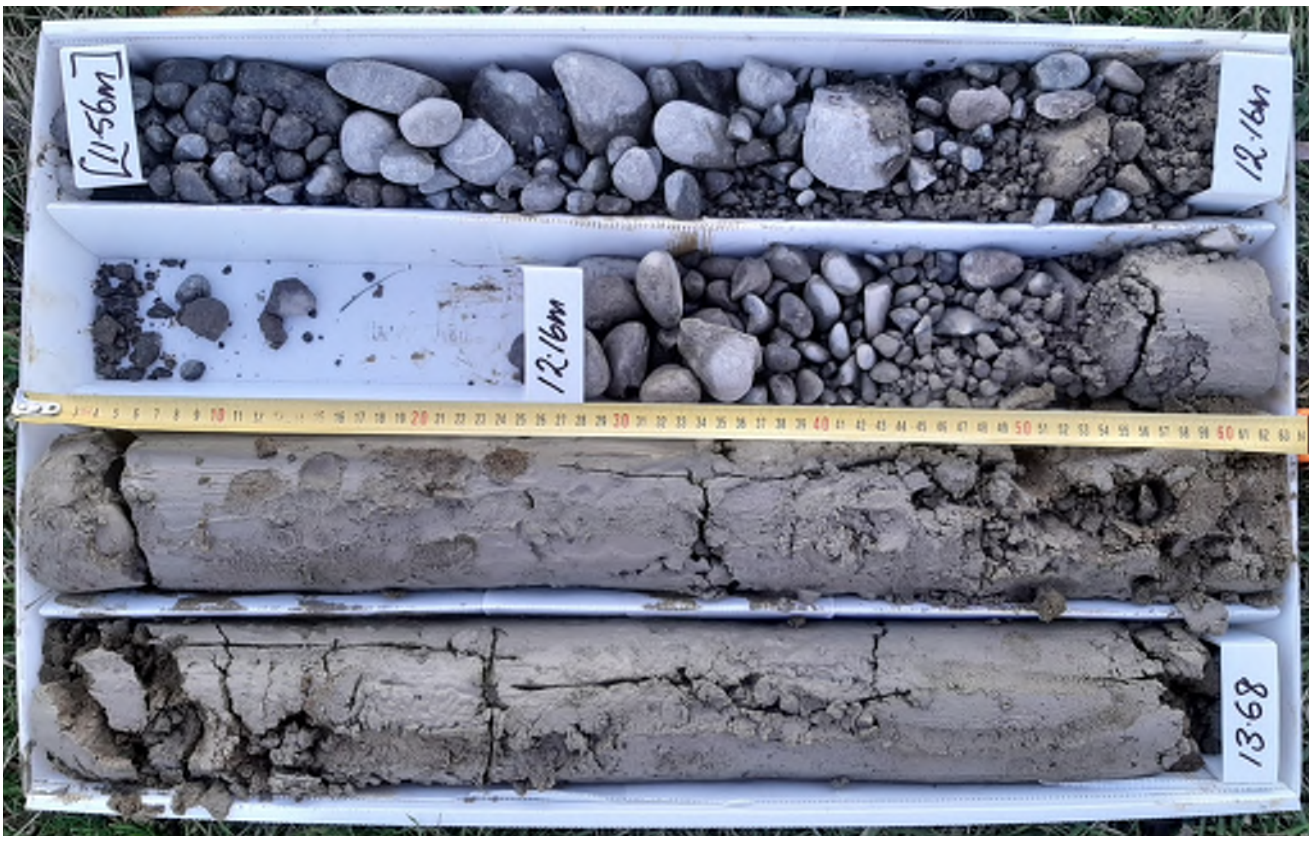
Box No 4 **From** 6.08m **To** 9.44m

Client	Summerset Villages Ltd	**Location**	Refer to Site Plan	**Notes**
Project	Prebbleton, Springs Rd	**Total depth**	15.0m	
Project No	190417	**Date drilled**	8 June 2020	
Borehole	**BH201**	**Core size**	76mm DT45 Sonic	

RILEY CONSULTANTS Engineers and Geologists

Summerset RETIREMENT VILLAGES

Box No 5 **From** 9.44m **To** 11.56m

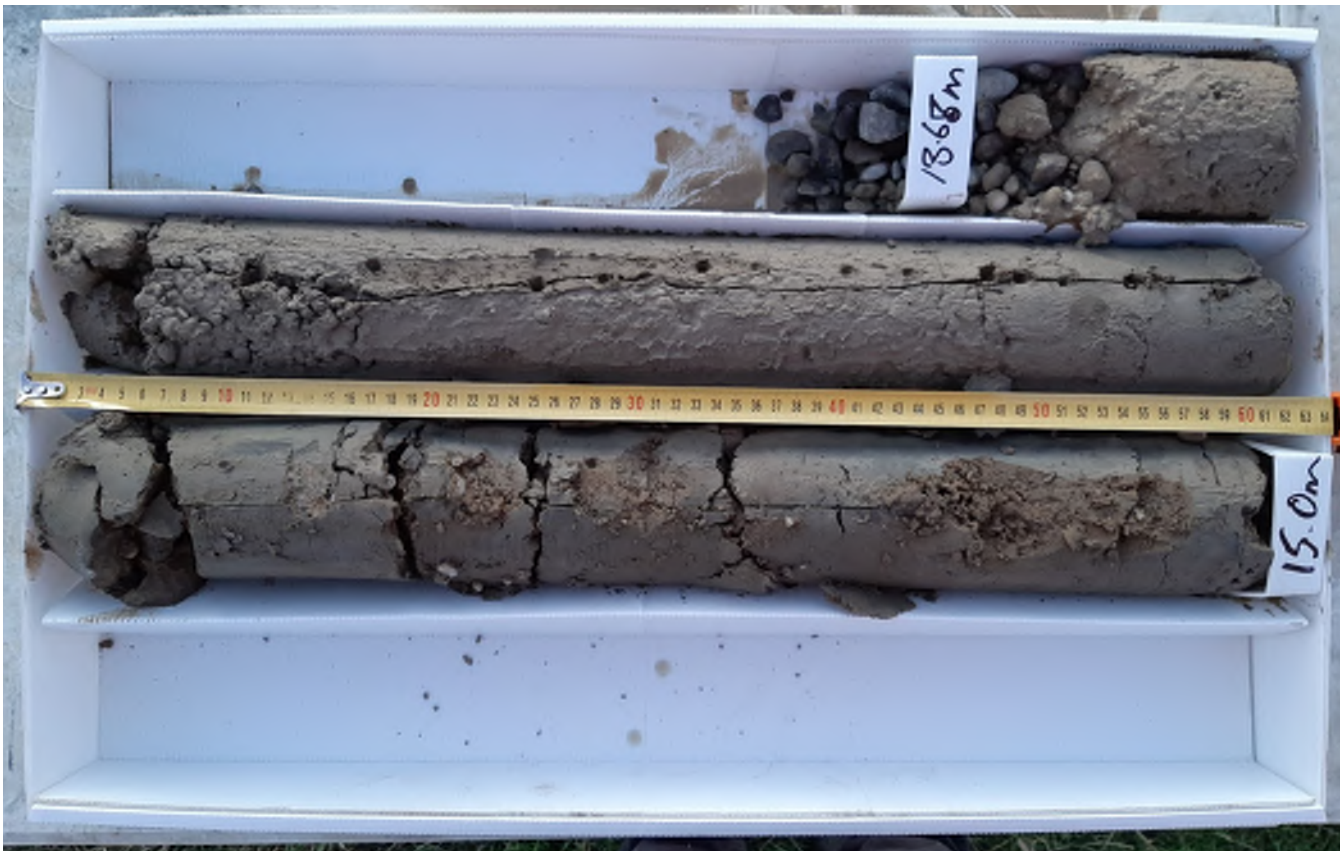


Box No 6 **From** 11.56m **To** 13.68m

Client	Summerset Villages Ltd	**Location**	Refer to Site Plan	**Notes**
Project	Prebbleton, Springs Rd	**Total depth**	15.0m	
Project No	190417	**Date drilled**	8 June 2020	
Borehole	**BH201**	**Core size**	76mm DT45 Sonic	

RILEY CONSULTANTS Engineers and Geologists

Summerset RETIREMENT VILLAGES



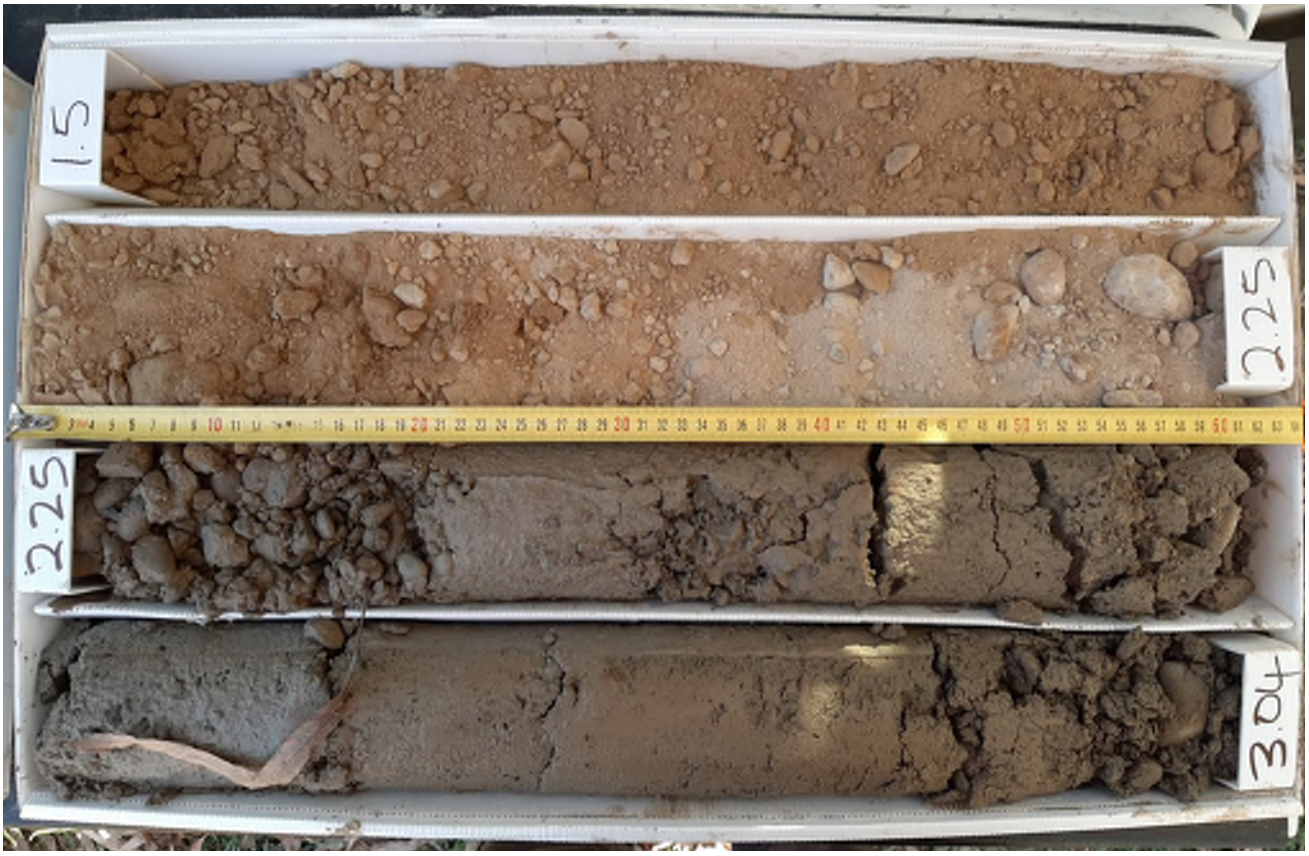
Box No 5 **From** 13.68m **To** 15.00m

Client	Summerset Villages Ltd	**Location**	Refer to Site Plan	**Notes**
Project	Prebbleton, Springs Rd	**Total depth**	15.0m	
Project No	190417	**Date drilled**	8 June 2020	
Borehole	**BH201**	**Core size**	76mm DT45 Sonic	

RILEY CONSULTANTS Engineers and Geologists

Summerset RETIREMENT VILLAGES

Box No 1 **From** 0.00m **To** 1.50m



Box No 2 **From** 1.50m **To** 3.04m

Client	Summerset Villages Ltd	**Location**	Refer to Site Plan	**Notes**
Project	Prebbleton, Springs Rd	**Total depth**	15.20m	
Project No	190417	**Date drilled**	9 to 10 June 2020	
Borehole	**BH202**	**Core size**	76mm DT45 Sonic	

RILEY CONSULTANTS Engineers and Geologists

Summerset RETIREMENT VILLAGES

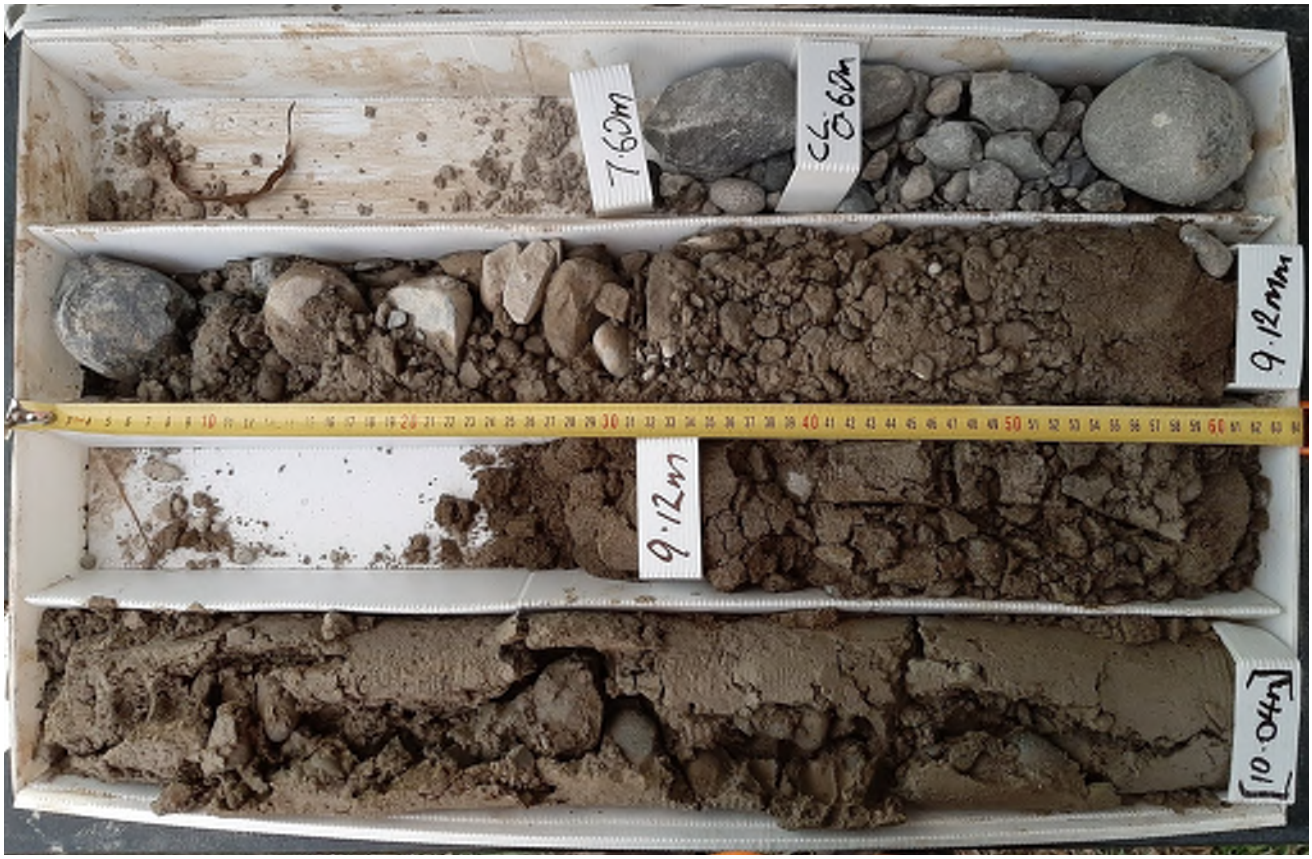
Box No 3 **From** 3.04m **To** 4.86m

Box No 4 **From** 4.86m **To** 7.60m

Client	Summerset Villages Ltd	**Location**	Refer to Site Plan	**Notes**
Project	Prebbleton, Springs Rd	**Total depth**	15.20m	
Project No	190417	**Date drilled**	9 to 10 June 2020	
Borehole	**BH202**	**Core size**	76mm DT45 Sonic	

RILEY CONSULTANTS Engineers and Geologists

Summerset RETIREMENT VILLAGES



Box No 5 **From** 7.60m **To** 10.04m

Box No 6 **From** 10.04m **To** 12.16m

Client	Summerset Villages Ltd	**Location**	Refer to Site Plan	**Notes**
Project	Prebbleton, Springs Rd	**Total depth**	15.20m	
Project No	190417	**Date drilled**	9 to 10 June 2020	
Borehole	**BH202**	**Core size**	76mm DT45 Sonic	

RILEY CONSULTANTS Engineers and Geologists

Summerset RETIREMENT VILLAGES

Box No 7 **From** 12.16m **To** 14.00m

Box No 8 **From** 14.00m **To** 15.20m

Client	Summerset Villages Ltd	**Location**	Refer to Site Plan	**Notes**
Project	Prebbleton, Springs Rd	**Total depth**	15.20m	
Project No	190417	**Date drilled**	9 to 10 June 2020	
Borehole	**BH202**	**Core size**	76mm DT45 Sonic	

RILEY CONSULTANTS Engineers and Geologists

Summerset RETIREMENT VILLAGES

Box No 1 **From** 0.00m **To** 1.84m

Box No 2 **From** 1.84m **To** 3.96m

Client	Summerset Villages Ltd	**Location**	Refer to Site Plan	**Notes**
Project	Prebbleton, Springs Rd	**Total depth**	15.20m	
Project No	190417	**Date drilled**	10 to 11 June 2020	
Borehole	**BH203**	**Core size**	76mm DT45 Sonic	

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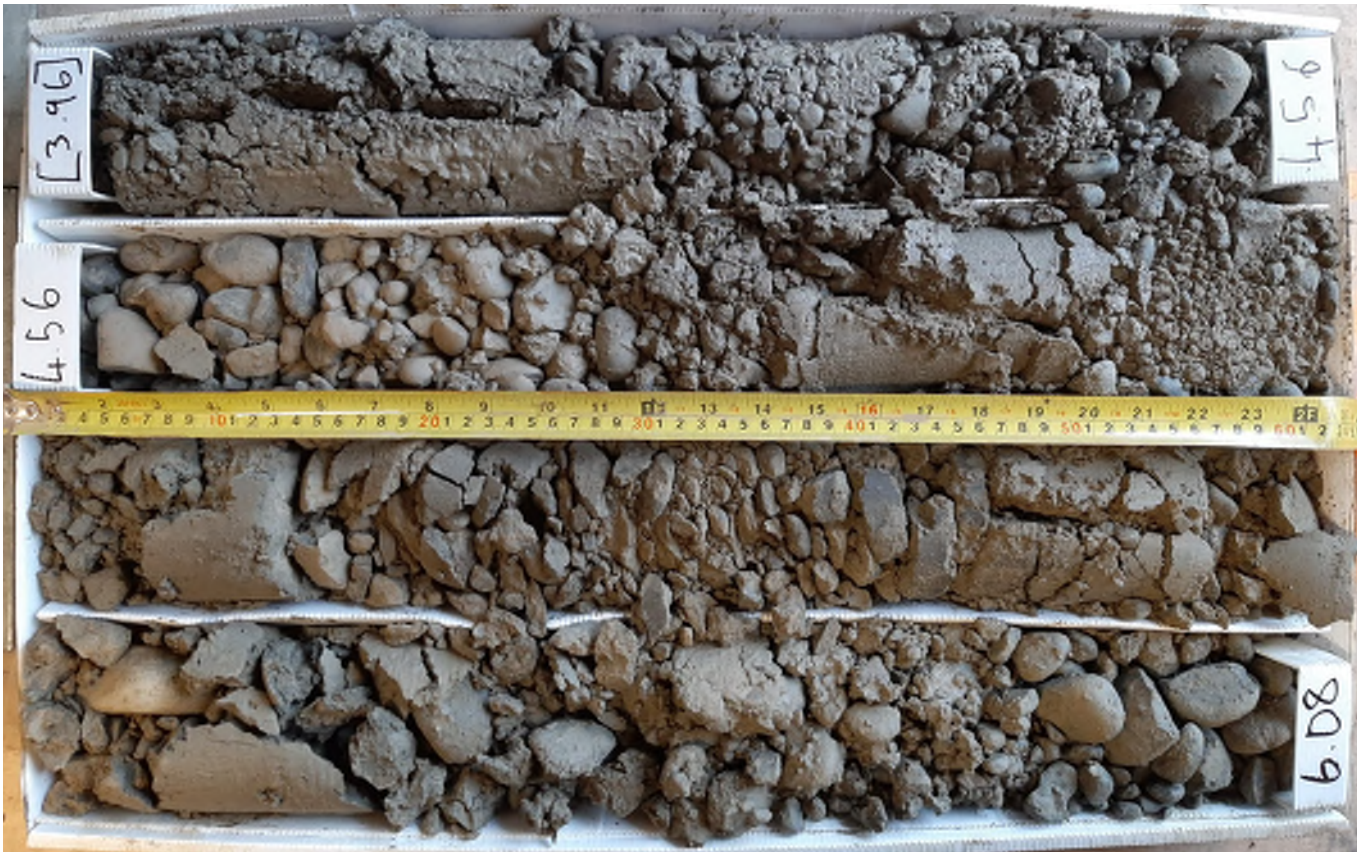
Summerset RETIREMENT VILLAGES



Box No 3 **From** 3.96m **To** 6.08m

Box No 4 **From** 6.08m **To** 9.12m

Client	Summerset Villages Ltd	**Location**	Refer to Site Plan	**Notes**
Project	Prebbleton, Springs Rd	**Total depth**	15.20m	
Project No	190417	**Date drilled**	10 to 11 June 2020	
Borehole	**BH203**	**Core size**	76mm DT45 Sonic	

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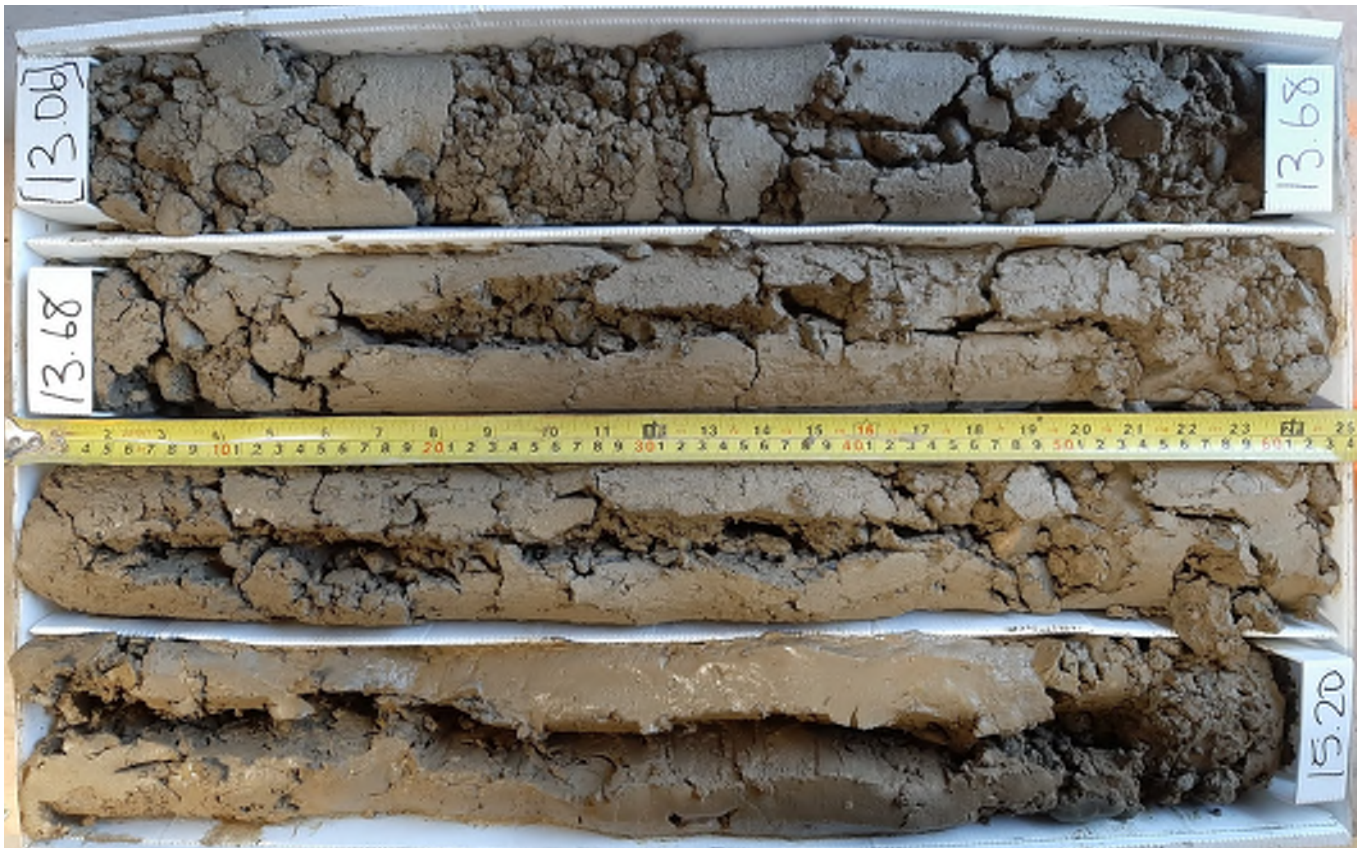
Summerset RETIREMENT VILLAGES

Box No 5 **From** 9.12m **To** 10.94m

Box No 6 **From** 10.94m **To** 13.06m

Client	Summerset Villages Ltd	**Location**	Refer to Site Plan	**Notes**
Project	Prebbleton, Springs Rd	**Total depth**	15.20m	
Project No	190417	**Date drilled**	10 to 11 June 2020	
Borehole	**BH203**	**Core size**	76mm DT45 Sonic	

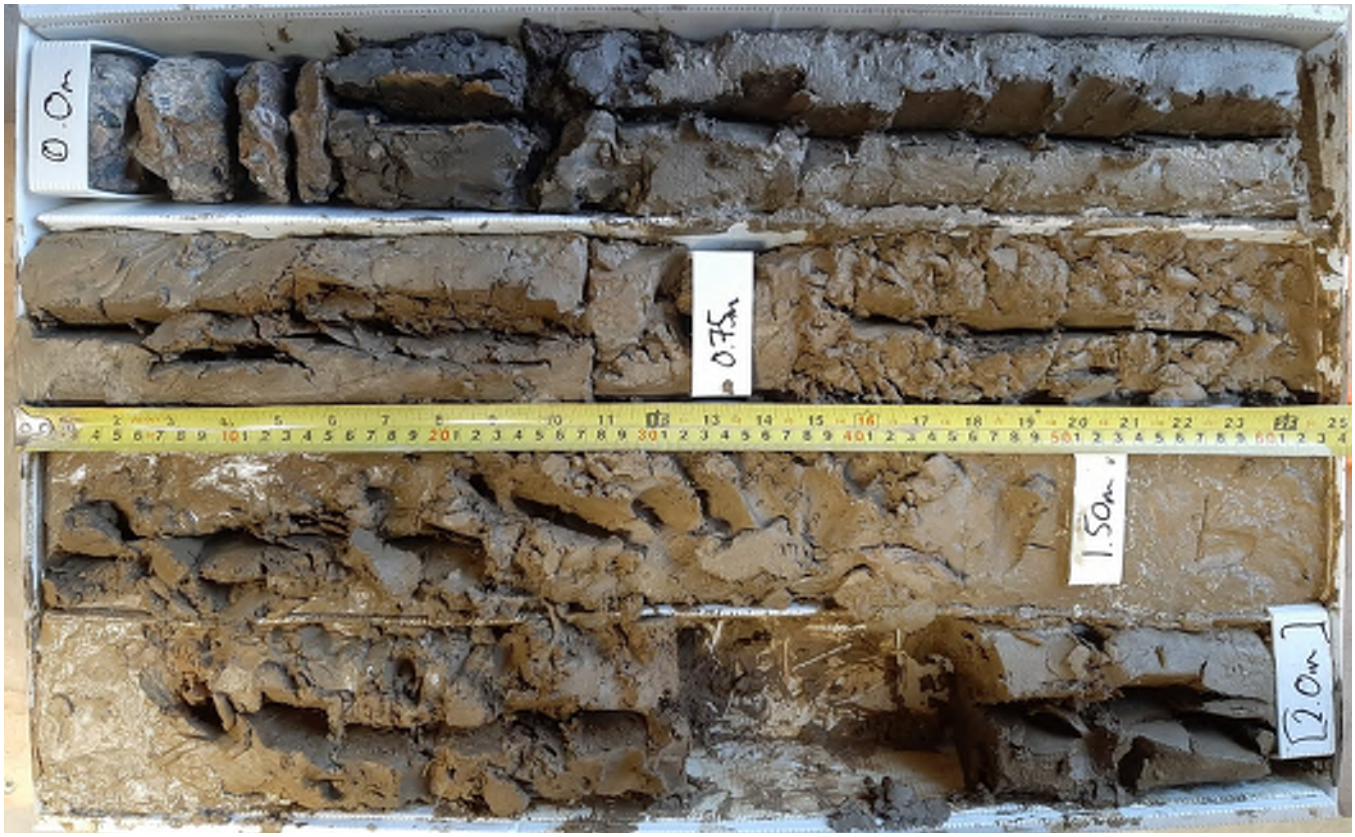


Box No 7 **From** 13.06m **To** 15.20m

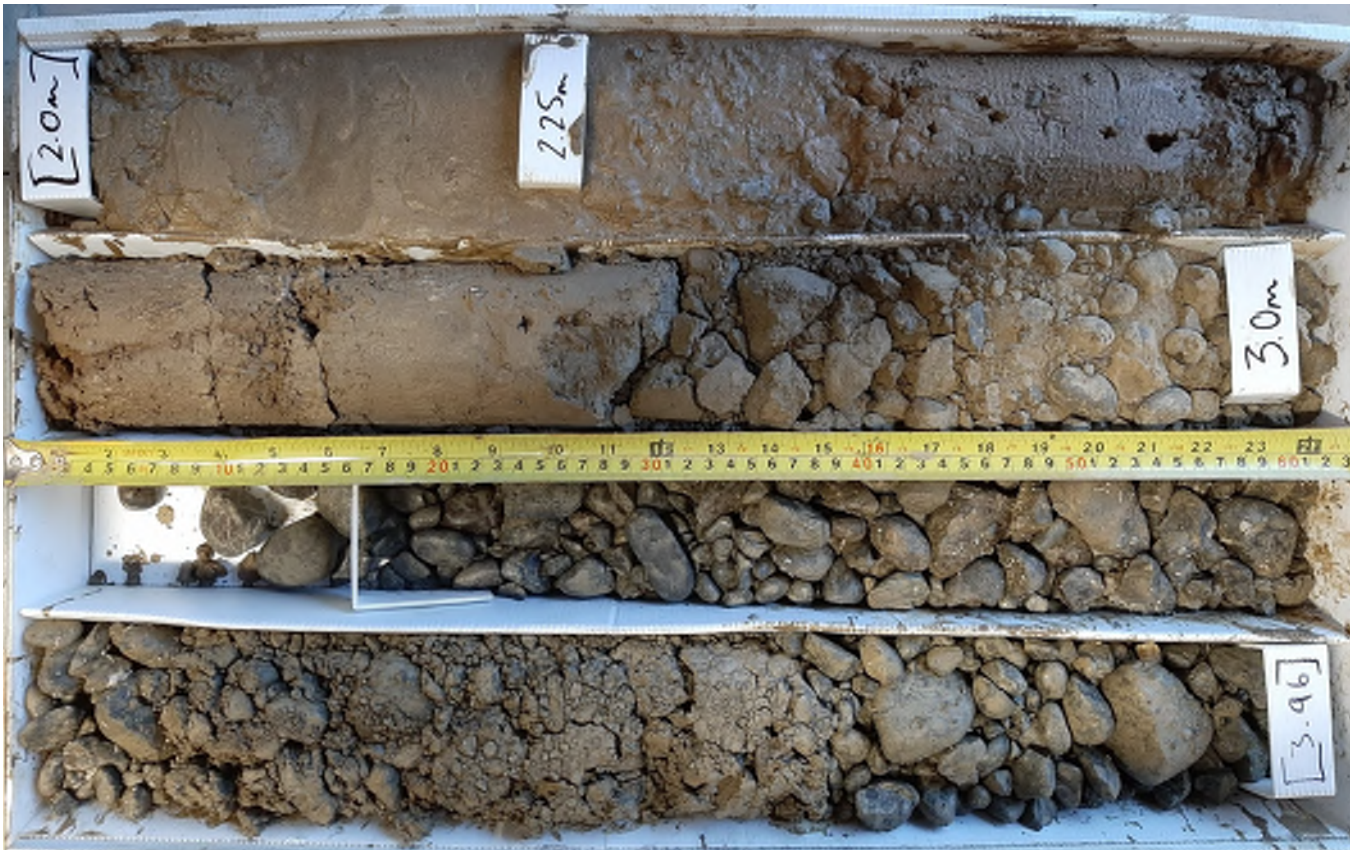
Client	Summerset Villages Ltd	**Location**	Refer to Site Plan	**Notes**
Project	Prebbleton, Springs Rd	**Total depth**	15.20m	
Project No	190417	**Date drilled**	10 to 11 June 2020	
Borehole	**BH203**	**Core size**	76mm DT45 Sonic	

RILEY CONSULTANTS Engineers and Geologists

Summerset RETIREMENT VILLAGES



Box No 1 **From** 0.00m **To** 2.00m



Box No 2 **From** 2.00m **To** 3.96m

Client	Summerset Villages Ltd	**Location**	Refer to Site Plan	**Notes**
Project	Prebbleton, Springs Rd	**Total depth**	15.20m	
Project No	190417	**Date drilled**	15 to 15 June 2020	
Borehole	**BH204**	**Core size**	76mm DT45 Sonic	

RILEY CONSULTANTS Engineers and Geologists

Summerset RETIREMENT VILLAGES

Box No 3 **From** 3.96m **To** 6.08m

Box No 4 **From** 6.08m **To** 7.92m

Client	Summerset Villages Ltd	**Location**	Refer to Site Plan	**Notes**
Project	Prebbleton, Springs Rd	**Total depth**	15.20m	
Project No	190417	**Date drilled**	15 to 15 June 2020	
Borehole	**BH204**	**Core size**	76mm DT45 Sonic	

RILEY CONSULTANTS Engineers and Geologists

Summerset RETIREMENT VILLAGES

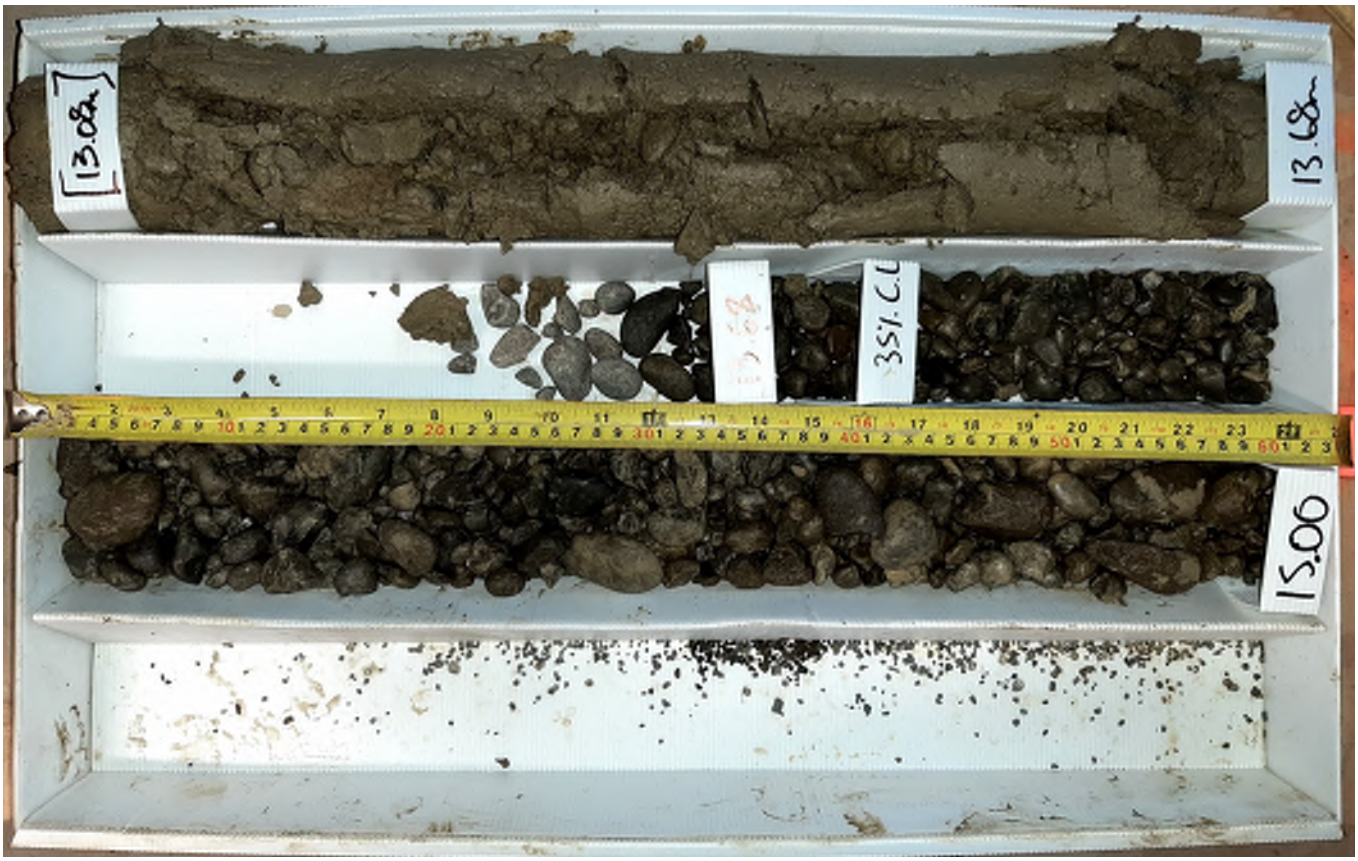
Box No 5 **From** 7.92m **To** 10.64m

Box No 6 **From** 10.64m **To** 13.08m

Client	Summerset Villages Ltd	**Location**	Refer to Site Plan	**Notes**
Project	Prebbleton, Springs Rd	**Total depth**	15.20m	
Project No	190417	**Date drilled**	15 to 15 June 2020	
Borehole	**BH204**	**Core size**	76mm DT45 Sonic	

RILEY CONSULTANTS Engineers and Geologists

Summerset RETIREMENT VILLAGES



Box No 7 **From** 13.08m **To** 15.00m

Client	Summerset Villages Ltd	**Location**	Refer to Site Plan	**Notes**
Project	Prebbleton, Springs Rd	**Total depth**	15.00m	
Project No	190417	**Date drilled**	15 to 15 June 2020	
Borehole	**BH204**	**Core size**	76mm DT45 Sonic	

APPENDIX C

Laboratory Test Reports

Central Testing Services
18 Ngapara St, P.O. Box 397, Alexandra 9340, Central Otago, New Zealand
P: 03 4487644, W: www.centraltesting.co.nz, E: info@centraltesting.co.nz

Reference No: 20/1390

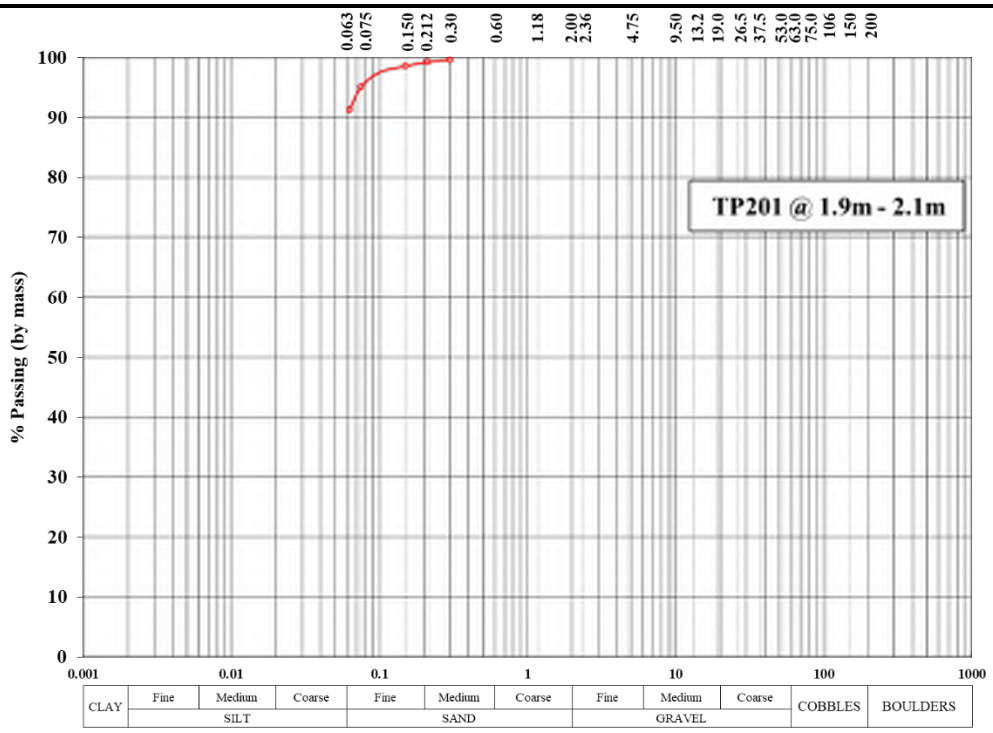
Date: 10 July 2020

TEST REPORT: 578-606 SPRINGS ROAD, PREBBLETON

Client Details:	**Riley Consultants Ltd, P.O. Box 4355, Christchurch**	**Attention:**	**D. Hale**
Job Description:	**578-606 Springs Road, Prebbleton Investigations**		
Sample Description:	**SILT with minor sand**	**Client Ref. No:**	**1904147**
Sample Source:	**TP201**	**Sample Depth:**	**1.9m - 2.1m**
Date & Time Sampled:	**Unknown**	**Sampled By:**	**Riley Consultants Ltd**
Sample Method:	**Test Pit ***	**Date Requested:**	**22-Jun-20**

PARTICLE SIZE ANALYSIS (NZS 4402:1986, Test 2.8.1)

Test Sieve (mm)	% Passing (by mass)
37.5	
26.5	
19.0	
13.2	
9.50	
4.75	
2.36	
2.00	
1.18	
0.60	
0.30	100
0.212	99
0.150	99
0.075	95
0.063	91



The sample was received in a natural state. The percentage passing the 63µm test sieve was obtained by difference.

Notes:

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- *This report may not be reproduced except in full.*

Tested By: B.J. Lippers, J. Norbury & L.T. Smith **Date:** 23-Jun-20 to 10-Jul-20

Checked By:

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Accreditation No: 434

Central Testing Services
18 Ngapara St, P.O. Box 397, Alexandra 9340, Central Otago, New Zealand
P: 03 4487644, W: www.centraltesting.co.nz, E: info@centraltesting.co.nz

Reference No: 20/1390

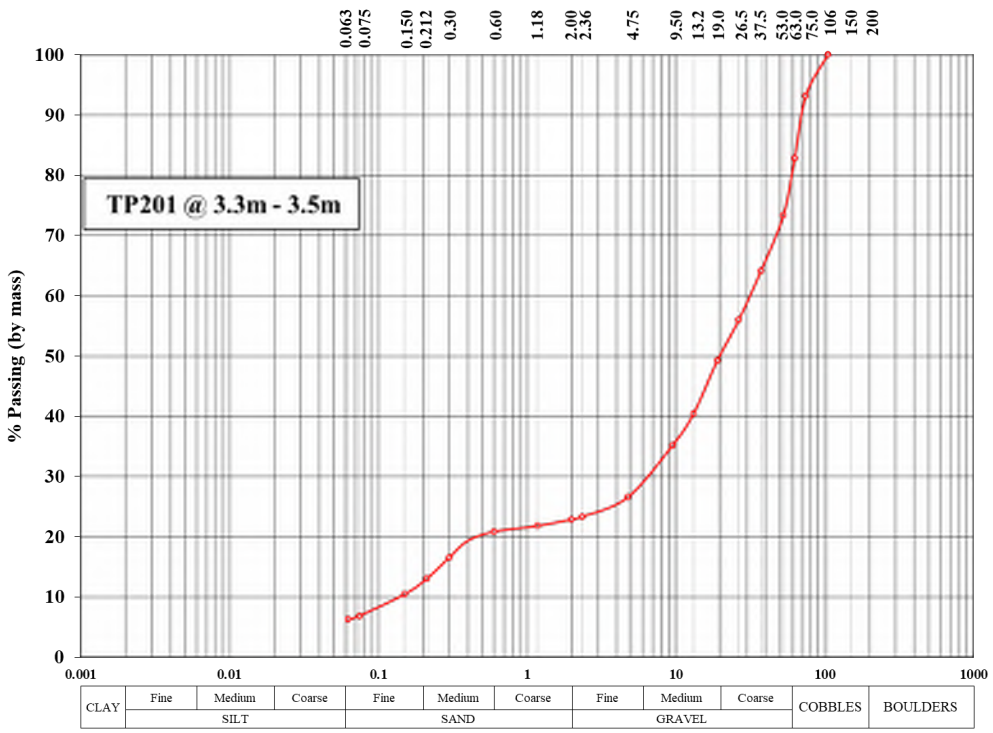
Date: 10 July 2020

TEST REPORT: 578-606 SPRINGS ROAD, PREBBLETON

Client Details:	**Riley Consultants Ltd, P.O. Box 4355, Christchurch**	**Attention:**	**D. Hale**
Job Description:	**578-606 Springs Road, Prebbleton Investigations**		
Sample Description:	**GRAVEL with some cobbles, some sand and minor silt**	**Client Ref. No:**	**1904147**
Sample Source:	**TP201**	**Sample Depth:**	**3.3m - 3.5m**
Date & Time Sampled:	**Unknown**	**Sampled By:**	**Riley Consultants Ltd**
Sample Method:	**Test Pit ***	**Date Requested:**	**22-Jun-20**

PARTICLE SIZE ANALYSIS (NZS 4402:1986, Test 2.8.1)

Test Sieve (mm)	% Passing (by mass)
106.0	100
75.0	93
63.0	83
53.0	73
37.5	64
26.5	56
19.0	49
13.2	40
9.50	35
4.75	27
2.36	23
2.00	23
1.18	22
0.60	21
0.30	17
0.212	13
0.150	10
0.075	7
0.063	6



The sample was received in a natural state. The percentage passing the 63µm test sieve was obtained by difference.

Notes:

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Tested By: **B.J. Lippers, J. Norbury & L.T. Smith** **Date:** **23-Jun-20 to 10-Jul-20**

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Reference No: 20/1390

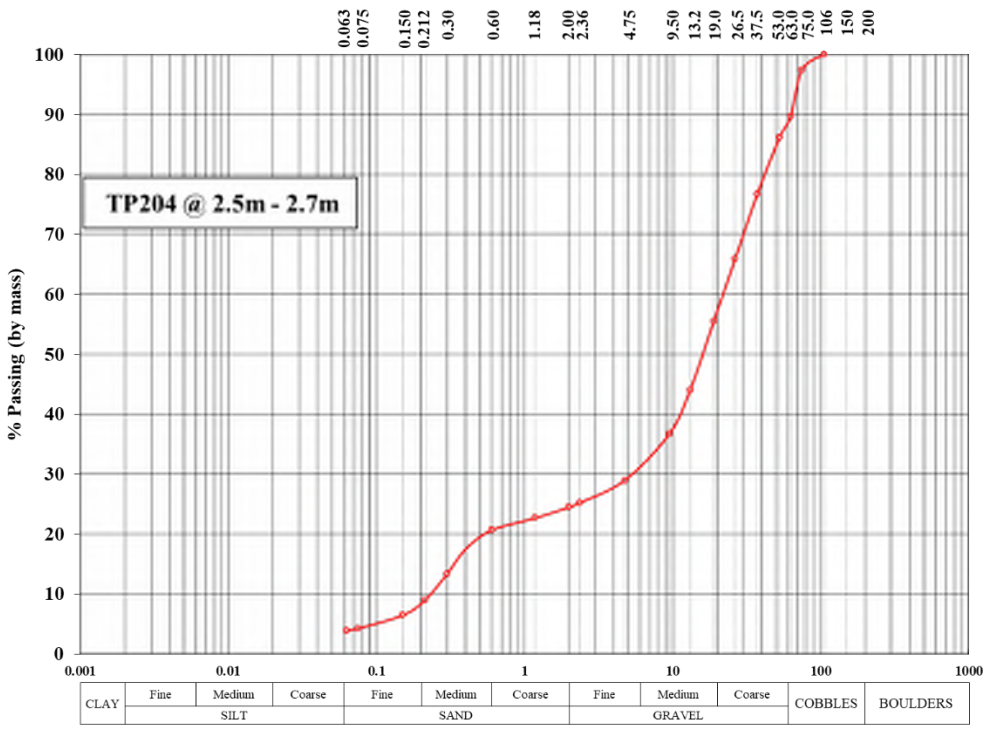
Date: 10 July 2020

TEST REPORT: 578-606 SPRINGS ROAD, PREBBLETON

Client Details:	**Riley Consultants Ltd, P.O. Box 4355, Christchurch**	**Attention:**	**D. Hale**
Job Description:	**578-606 Springs Road, Prebbleton Investigations**		
Sample Description:	**Sandy GRAVEL with minor cobbles and trace of silt**	**Client Ref. No:**	**1904147**
Sample Source:	**TP204**	**Sample Depth:**	**2.5m - 2.7m**
Date & Time Sampled:	**Unknown**	**Sampled By:**	**Riley Consultants Ltd**
Sample Method:	**Test Pit ***	**Date Requested:**	**22-Jun-20**

PARTICLE SIZE ANALYSIS (NZS 4402:1986, Test 2.8.1)

Test Sieve (mm)	% Passing (by mass)
106.0	100
75.0	97
63.0	90
53.0	86
37.5	77
26.5	66
19.0	55
13.2	44
9.50	37
4.75	29
2.36	25
2.00	25
1.18	23
0.60	21
0.30	13
0.212	9
0.150	6
0.075	4
0.063	4



The sample was received in a natural state. The percentage passing the 63µm test sieve was obtained by difference.

Notes:

- ***Information contained in this report which is Not IANZ Accredited relates to the sample descriptions based on NZ Geotechnical Society Guidelines 2005, the sample method* and sampling.***
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Tested By: **B.J. Lippers, J. Norbury & L.T. Smith** **Date:** **23-Jun-20 to 10-Jul-20**

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Reference No: 20/1390

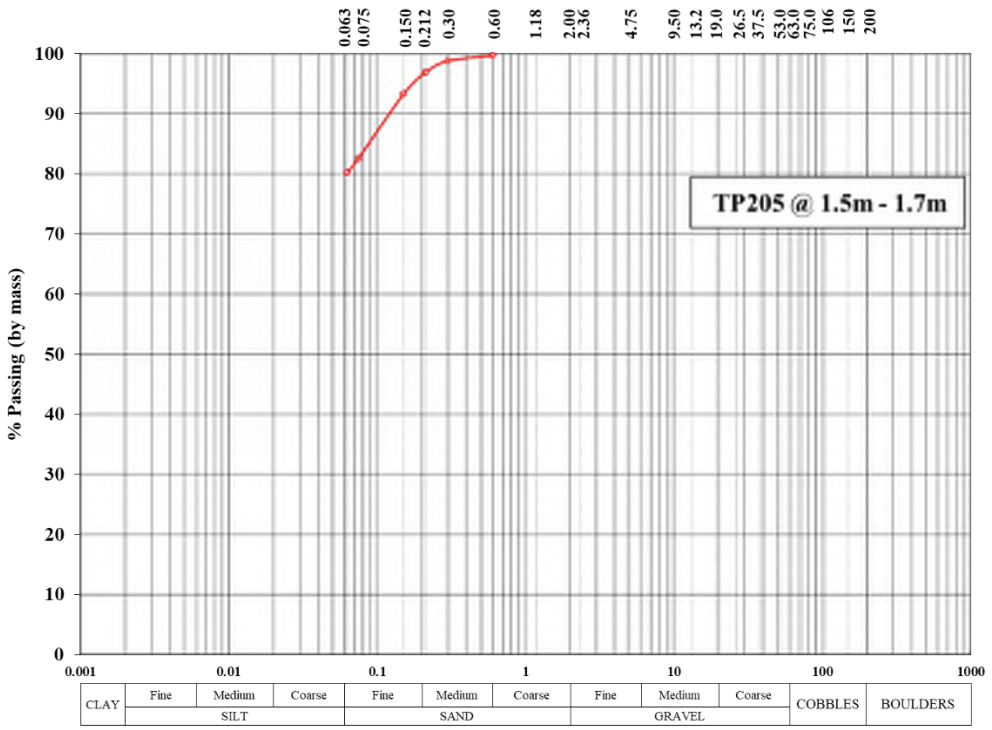
Date: 10 July 2020

TEST REPORT: 578-606 SPRINGS ROAD, PREBBLETON

Client Details:	**Riley Consultants Ltd, P.O. Box 4355, Christchurch**	**Attention:**	**D. Hale**
Job Description:	**578-606 Springs Road, Prebbleton Investigations**		
Sample Description:	**Sandy SILT / SILT with some sand**	**Client Ref. No:**	**1904147**
Sample Source:	**TP205**	**Sample Depth:**	**1.5m - 1.7m**
Date & Time Sampled:	**Unknown**	**Sampled By:**	**Riley Consultants Ltd**
Sample Method:	**Test Pit ***	**Date Requested:**	**22-Jun-20**

PARTICLE SIZE ANALYSIS (NZS 4402:1986, Test 2.8.1)

Test Sieve (mm)	% Passing (by mass)
53.0	
37.5	
26.5	
19.0	
13.2	
9.50	
4.75	
2.36	
2.00	
1.18	
0.60	100
0.30	99
0.212	97
0.150	93
0.075	83
0.063	80



The sample was received in a natural state. The percentage passing the 63µm test sieve was obtained by difference.

WATER CONTENT & PLASTICITY INDEX RESULTS - NZS 4402:1986, Test 2.1, 2.2, 2.3 & 2.4	
Water Content: ("All In" As Received)	**12.2 %**
Liquid Limit: (LL)	**25**
Plastic Limit: (PL)	**19**
Plasticity Index: (PI)	**6**
Note: The sample was received in a natural state. The plasticity index material tested was the fraction passing the 425 µm test sieve.	

Notes:

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Tested By: B.J. Lippers, J. Norbury & L.T. Smith **Date:** 23-Jun-20 to 10-Jul-20

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Reference No: 20/1390

Date: 10 July 2020

TEST REPORT: 578-606 SPRINGS ROAD, PREBBLETON

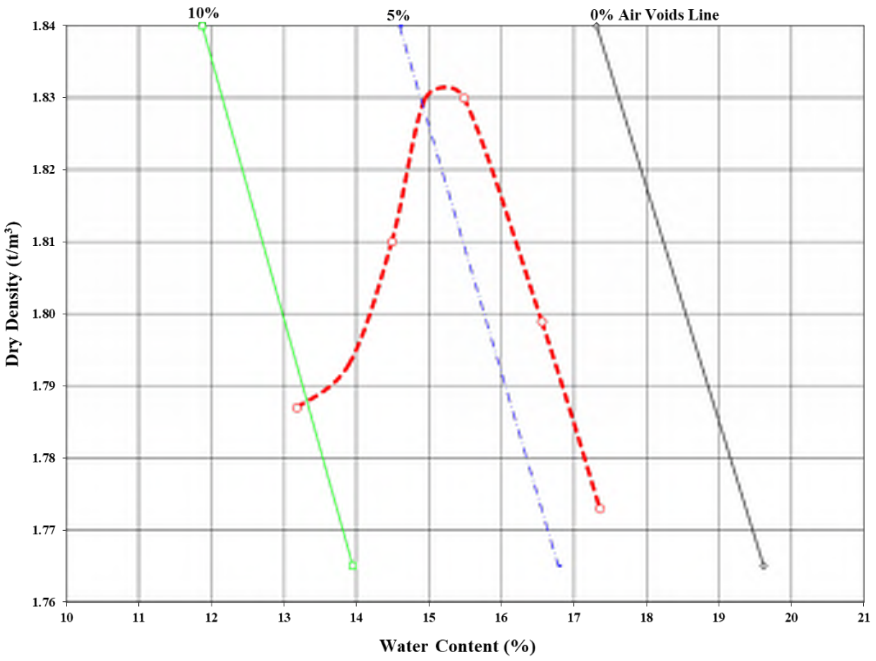
Client Details:	**Riley Consultants Ltd, P.O. Box 4355, Christchurch**	**Attention:**	**D. Hale**
Job Description:	**578-606 Springs Road, Prebbleton Investigations**		
Sample Description:	**Sandy SILT / SILT with some sand**	**Client Ref. No:**	**1904147**
Sample Source:	**TP205**	**Sample Depth:**	**1.5m - 1.7m**
Date & Time Sampled:	**Unknown**	**Sampled By:**	**Riley Consultants Ltd**
Sample Method:	**Test Pit ***	**Date Requested:**	**22-Jun-20**

WATER CONTENT & NZ STANDARD COMPACTION - NZS 4402:1986, Test 2.1 & 4.1.1

% Retained (+19.0mm Fraction)	**0.0 %**
Water Content: ("All In" As Received)	**12.2 %**
Maximum Dry Density:	**1.83 t/m^3**
Optimum Water Content:	**15.0 %**

Notes:

- *The sample was received in a natural state.*
- *The material tested in the NZ Standard Compaction test was whole soil.*
- *The air voids lines were calculated from an assumed solid density of 2.70 t/m^3.*



Notes:

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Tested By: **B.J. Lippers, J. Norbury & L.T. Smith** **Date:** **23-Jun-20 to 10-Jul-20**

Checked By:

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Reference No: 20/1390

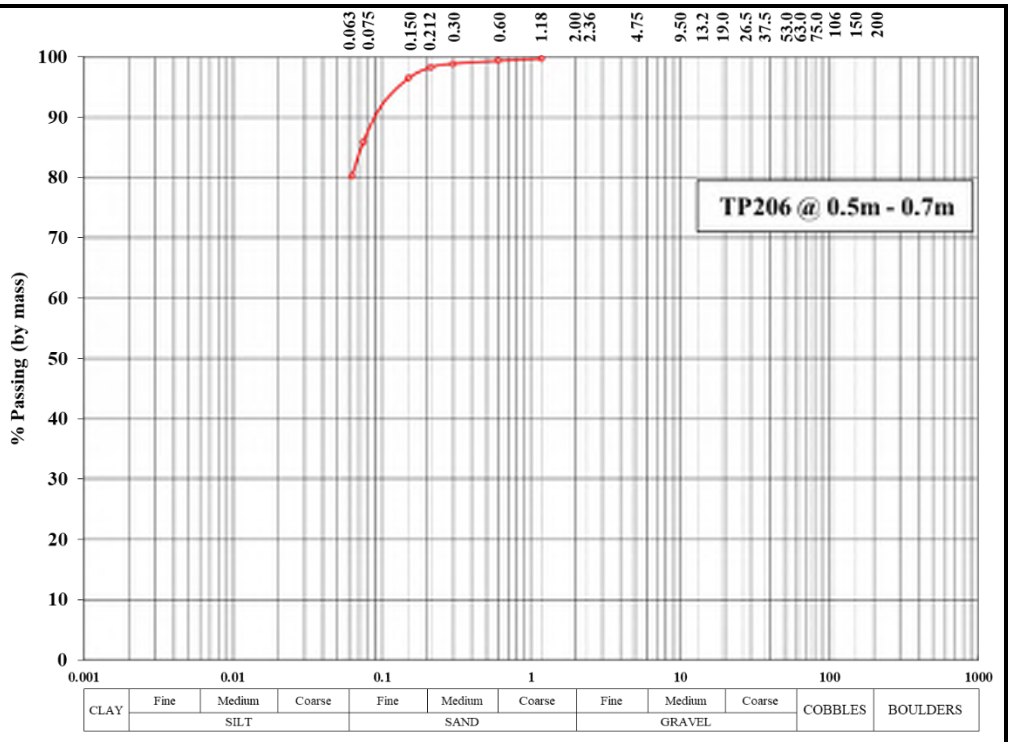
Date: 10 July 2020

TEST REPORT: 578-606 SPRINGS ROAD, PREBBLETON

Client Details:	**Riley Consultants Ltd, P.O. Box 4355, Christchurch**	**Attention:**	**D. Hale**
Job Description:	**578-606 Springs Road, Prebbleton Investigations**		
Sample Description:	**Sandy SILT / SILT with some sand**	**Client Ref. No:**	**1904147**
Sample Source:	**TP206**	**Sample Depth:**	**0.5m - 0.7m**
Date & Time Sampled:	**Unknown**	**Sampled By:**	**Riley Consultants Ltd**
Sample Method:	**Test Pit ***	**Date Requested:**	**22-Jun-20**

PARTICLE SIZE ANALYSIS (NZS 4402:1986, Test 2.8.1)

Test Sieve (mm)	% Passing (by mass)
37.5	
26.5	
19.0	
13.2	
9.50	
4.75	
2.36	
2.00	
1.18	100
0.60	99
0.30	99
0.212	98
0.150	96
0.075	86
0.063	80



The sample was received in a natural state. The percentage passing the 63µm test sieve was obtained by difference.

Notes:

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Tested By: B.J. Lippers, J. Norbury & L.T. Smith **Date:** 23-Jun-20 to 10-Jul-20

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Reference No: 20/1390

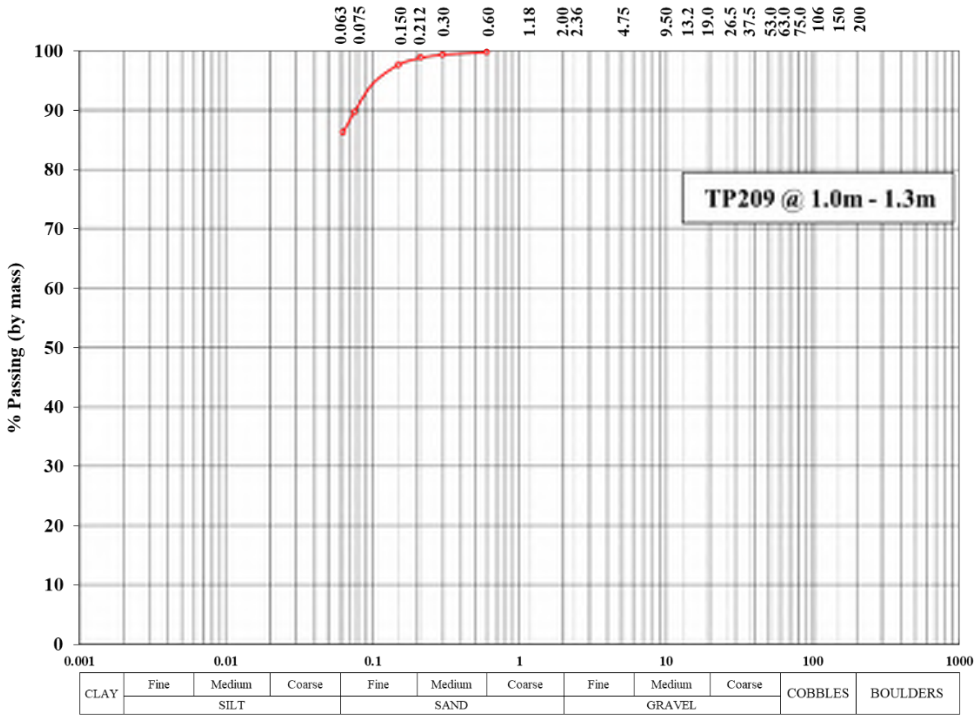
Date: 10 July 2020

TEST REPORT: 578-606 SPRINGS ROAD, PREBBLETON

Client Details:	**Riley Consultants Ltd, P.O. Box 4355, Christchurch**	**Attention:**	**D. Hale**
Job Description:	**578-606 Springs Road, Prebbleton Investigations**		
Sample Description:	**SILT with some sand**	**Client Ref. No:**	**1904147**
Sample Source:	**TP209**	**Sample Depth:**	**1.0m - 1.3m**
Date & Time Sampled:	**Unknown**	**Sampled By:**	**Riley Consultants Ltd**
Sample Method:	**Test Pit ***	**Date Requested:**	**22-Jun-20**

PARTICLE SIZE ANALYSIS (NZS 4402:1986, Test 2.8.1)

Test Sieve (mm)	% Passing (by mass)
37.5	
26.5	
19.0	
13.2	
9.50	
4.75	
2.36	
2.00	
1.18	
0.60	100
0.30	99
0.212	99
0.150	98
0.075	90
0.063	86



The sample was received in a natural state. The percentage passing the 63µm test sieve was obtained by difference.

WATER CONTENT & PLASTICITY INDEX RESULTS - NZS 4402:1986, Test 2.1, 2.2, 2.3 & 2.4	
Water Content: ("All In" As Received)	**12.3 %**
Liquid Limit: (LL)	**Not Applicable ***
Plastic Limit: (PL)	**24**
Plasticity Index: (PI)	**Not Applicable ***
*** Liquid limit test reported as not applicable - unable to cut groove past 12 blows at a water content of 27.4%.**	
Note: The sample was received in a natural state. The plasticity index material tested was whole soil.	

Notes:

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Tested By: B.J. Lippers, J. Norbury & L.T. Smith **Date:** 23-Jun-20 to 10-Jul-20

Checked By:

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Reference No: 20/1390

Date: 10 July 2020

TEST REPORT: 578-606 SPRINGS ROAD, PREBBLETON

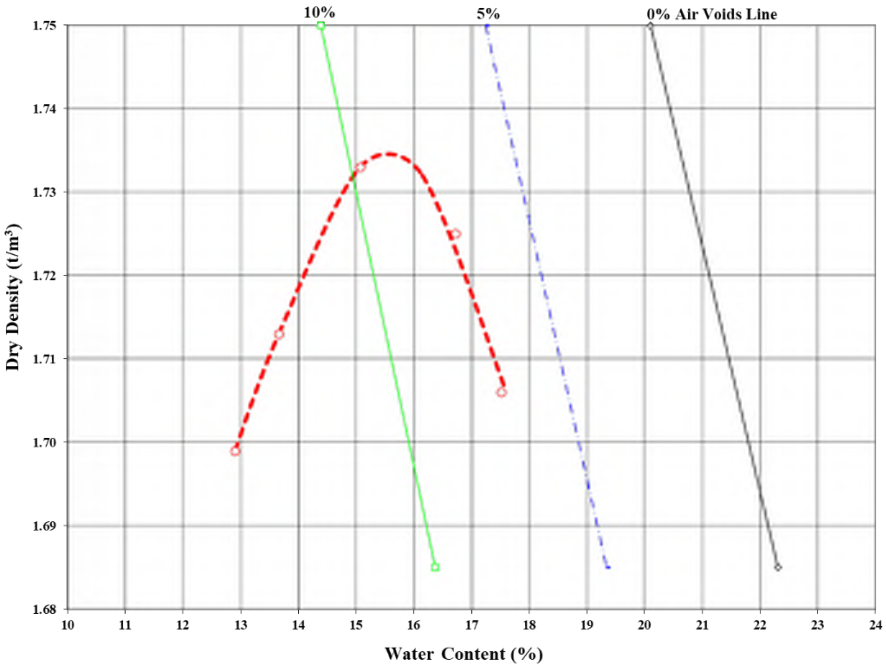
Client Details:	**Riley Consultants Ltd, P.O. Box 4355, Christchurch**	**Attention:**	**D. Hale**
Job Description:	**578-606 Springs Road, Prebbleton Investigations**		
Sample Description:	**SILT with some sand**	**Client Ref. No:**	**1904147**
Sample Source:	**TP209**	**Sample Depth:**	**1.0m - 1.3m**
Date & Time Sampled:	**Unknown**	**Sampled By:**	**Riley Consultants Ltd**
Sample Method:	**Test Pit ***	**Date Requested:**	**22-Jun-20**

WATER CONTENT & NZ STANDARD COMPACTION - NZS 4402:1986, Test 2.1 & 4.1.1

% Retained (+19.0mm Fraction)	**0.0 %**
Water Content: ("All In" As Received)	**12.3 %**
Maximum Dry Density:	**1.73 t/m^3**
Optimum Water Content:	**15.5 %**

Notes:

- *The sample was received in a natural state.*
- *The material tested in the NZ Standard Compaction test was whole soil.*
- *The air voids lines were calculated from an assumed solid density of 2.70 t/m^3.*



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- *This report may not be reproduced except in full.*

Tested By: B.J. Lippers, J. Norbury & L.T. Smith **Date:** 23-Jun-20 to 10-Jul-20

Checked By:

Approved Signatory

A.P. Julius
Laboratory Manager

Tests indicated as Not Accredited are outside the scope of the laboratory's accreditation

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Accreditation No: 434

APPENDIX D

Infiltration Test Reports

GEOTECHNICS

Our Ref: 1014405.0.0.0/REP01
Customer Ref: 190417 - 578-606 Springs Road, Prebbleton
22 June 2020

Riley Consultants
22 Moorhouse Avenue
Addington
Christchurch 8011

Attention: Jenna Crisp

Dear Jenna

578-606 Springs Road Infiltration Testing

Site Report

Customer's Instructions

We were instructed to:

Flush each of the 8 soakage holes with 3-4x the volume of PVC pipe prior to testing, then complete falling head infiltration tests.

Specifications

None issued.

Dates of Procedures

16th & 18th June 2020

Locations

Test locations were determined on site by Riley Consultants and drilled by their subcontractor using a machined auger. PVC pipe was installed in these holes and backfilled by Geotechnics.

The attached plan provides indicative locations only and is not to scale. All other information we provide regarding location should be referenced to the asset owner.

Coordinates			
Locations	Northings	Eastings	RL
FHT001	5171715	1577194	25
FHT002	5174399	1560466	25
FHT003	5174384	1560168	25
FHT004	5174340	1560285	25
FHT005	5174263	1560382	25
FHT006	5174286	1560108	25
FHT007	5174285	1560227	25
FHT008	5174180	1560265	25

a Method used to determine locations: GIS\Web map viewer

b Method used to determine RL: Estimated from contours

c Expected accuracy for location: +/- 5 m

d Expected accuracy for elevation: +/- 5 m

Method

CCC Waterways, Wetlands and Drainage Guide, App 6 – Soakage & Permeability Field Test Methods

Results

The following is attached:

- Water level vs time plot

The raw data used to compile the water level vs time plots can be downloaded here. This hyperlink will expire 31/8/2020, after which the data can be requested from Geotechnics at any time.

The plots contained in this report are for your convenience. We recommend you use the raw data for your calculation and design purposes.

Test Remarks

At 2 locations (FHT004 & FHT008) the rate of soakage was equal or greater than the supplied flowrate from the submersible pump, and therefore the head of water did not reach the top of the PVC pipe.

The calculated flowrate for the submersible pump, including friction loss is 108 l/min.

These two tests are outside the IANZ accreditation for this report.

General Remarks

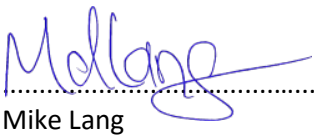
As agreed, we have forwarded a copy of our unlocked spreadsheets. We take no responsibility for manipulation of the data after it has been transmitted.

Please reproduce this report in full when transmitting to others or including in internal reports.

If we can be of any further assistance, feel free to get in touch. Contact details are provided at the bottom of the letterhead page.

GEOTECHNICS LTD

Report prepared by:



.....

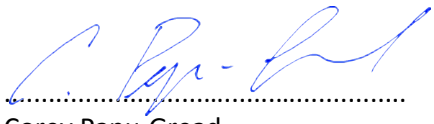
Mike Lang
Geotechnical Project Lead

Authorised for Geotechnics by:

.....

Vic O'Connor
Project Director

Report checked by:



.....

Corey Papu-Gread
Christchurch Manager
Approved Signatory

IANZ ACCREDITED LABORATORY

Tests indicated as not accredited are outside the scope of the laboratory's accreditation

22-Jun-20

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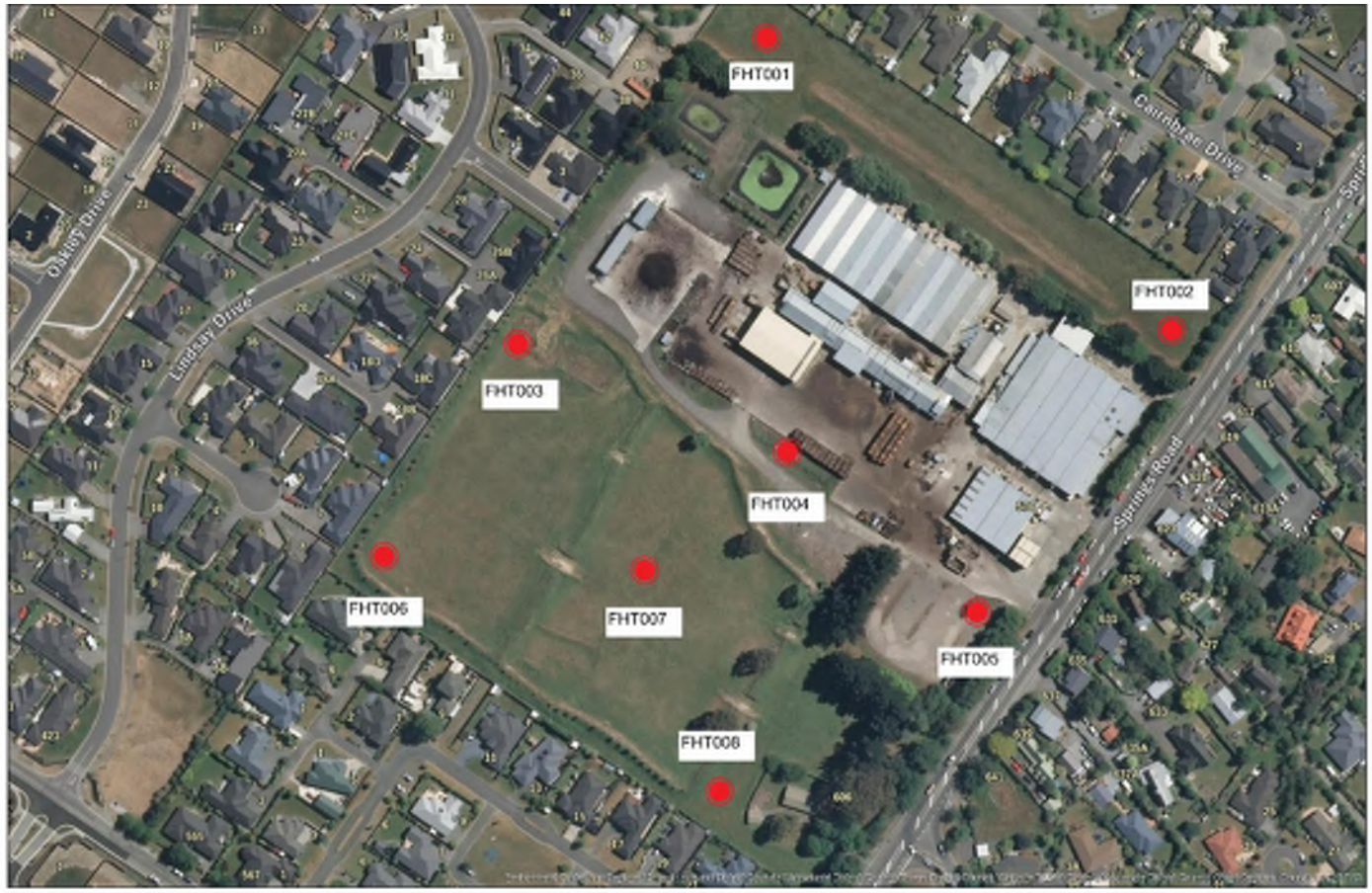
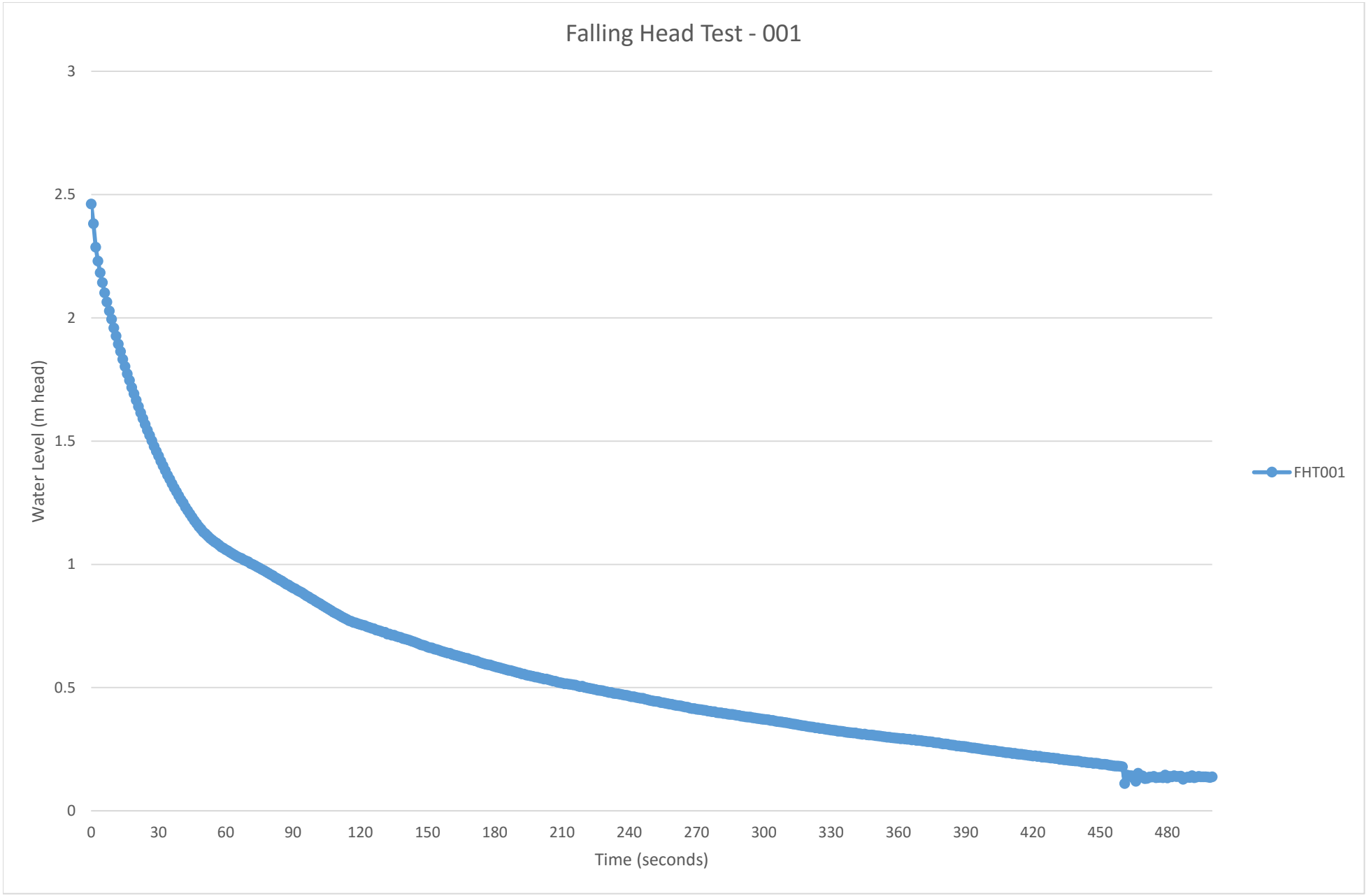


GEOTECHNICS	LOCATION PLAN		Summerset Prebbleton Infiltration Testing 16th & 18th June 2020						Locations are indicative only	
45A Parkhouse Road Wigram Christchurch 8042		Site	Summerset Prebbleton	Our Ref	1014405.0.0.0/REP01	Drawn	MDL	Date	19/06/2020	N
		Location	578-606 Springs Road, Prebbleton	Customer Ref	190417 - 578-606 Springs Road,	Checked	CXPG	Date	22/06/2020	
		Project	G CH Prebbleton Summerset Infil	Lab Ref	N/A	Scale	Not to Scale			

Aerial photograph sourced from Canterbury Maps Copyright 2020)

Depth of BH: 2.4m

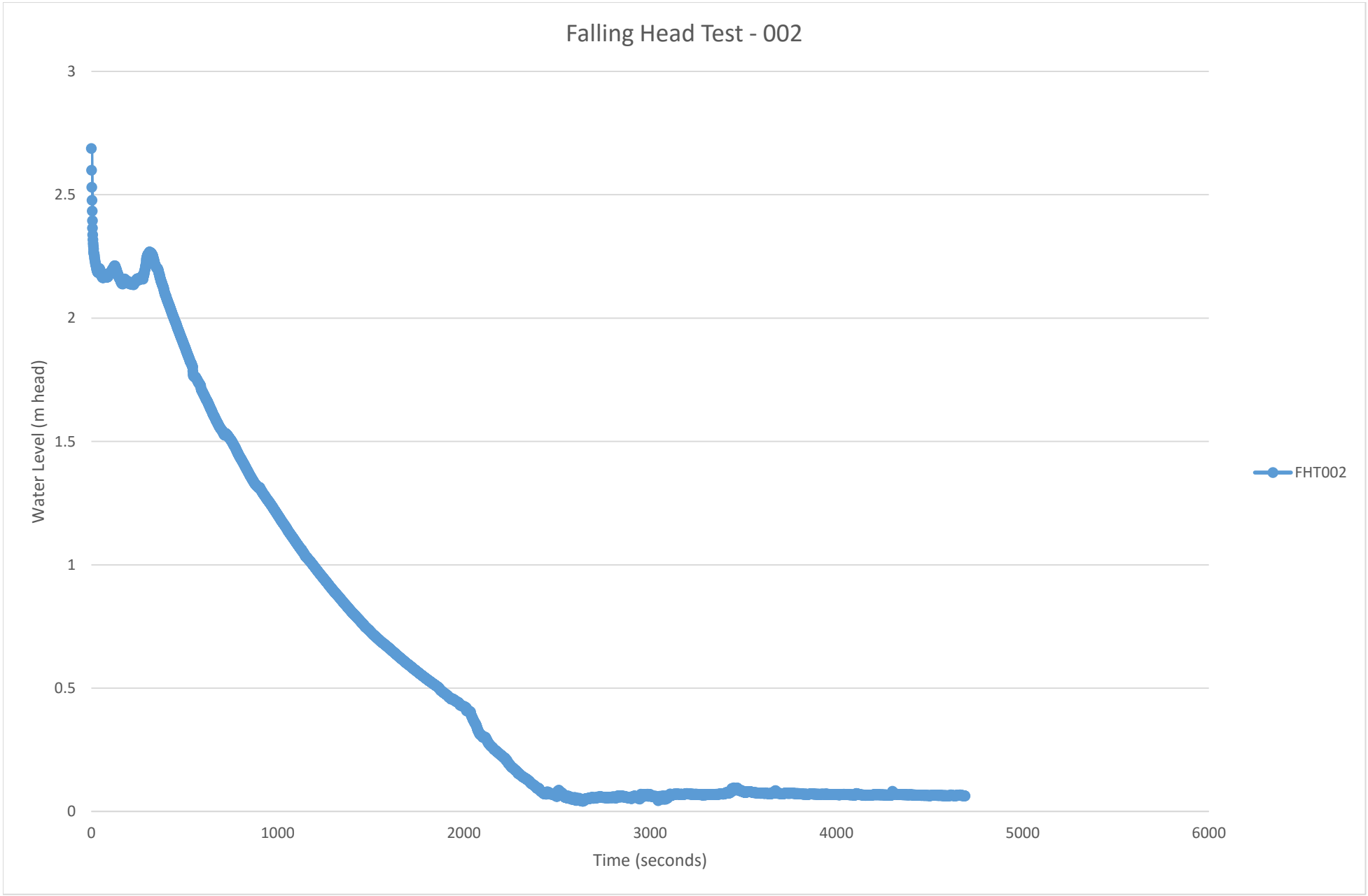


Ref:1014405.0.0.0/REP01

Client Ref: 190417 - 578-606 Springs Road, Prebbleton

Date of testing: 16/06/2020

Depth of BH: 2.65m

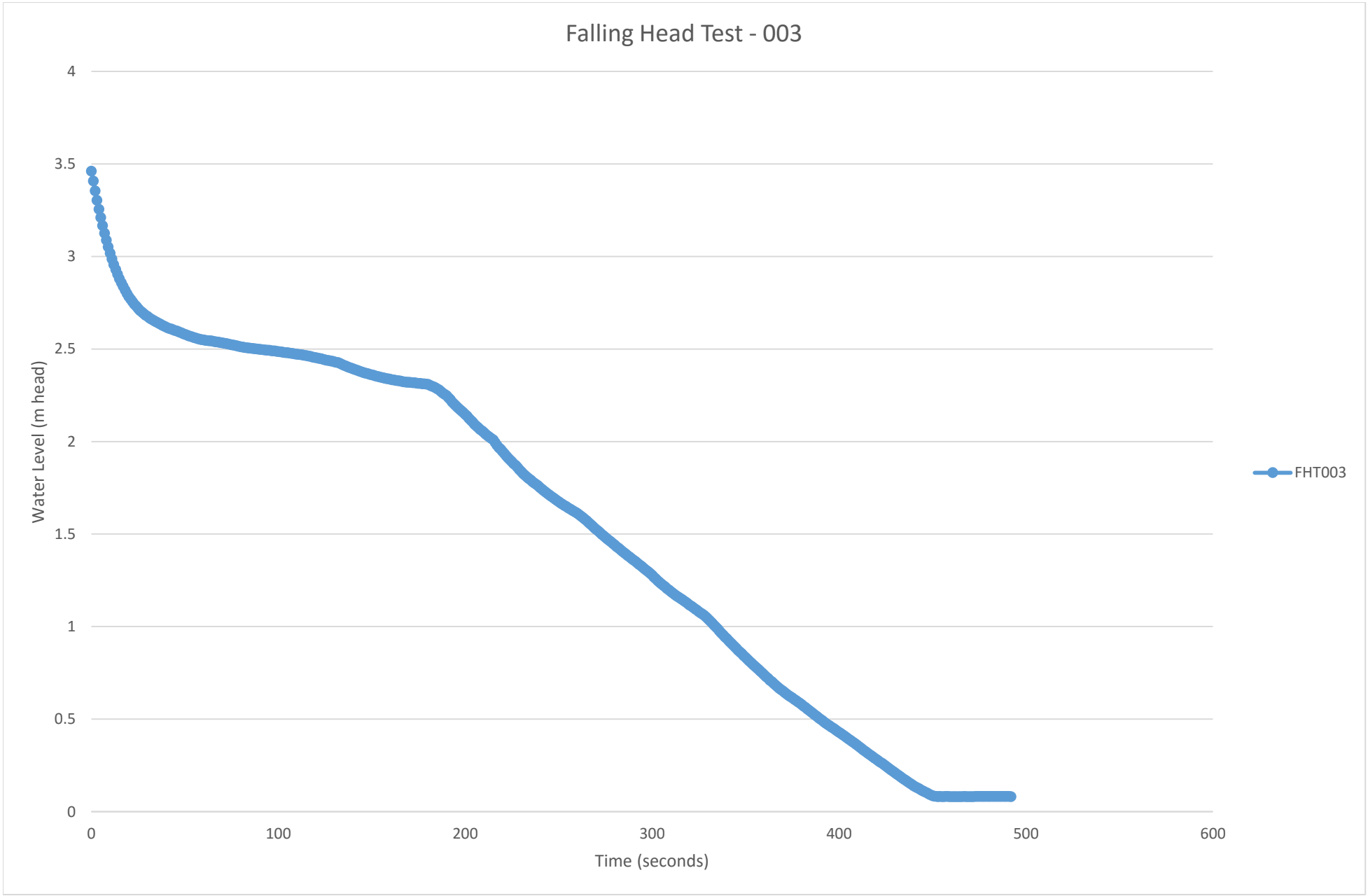


Ref:1014405.0.0.0/REP01

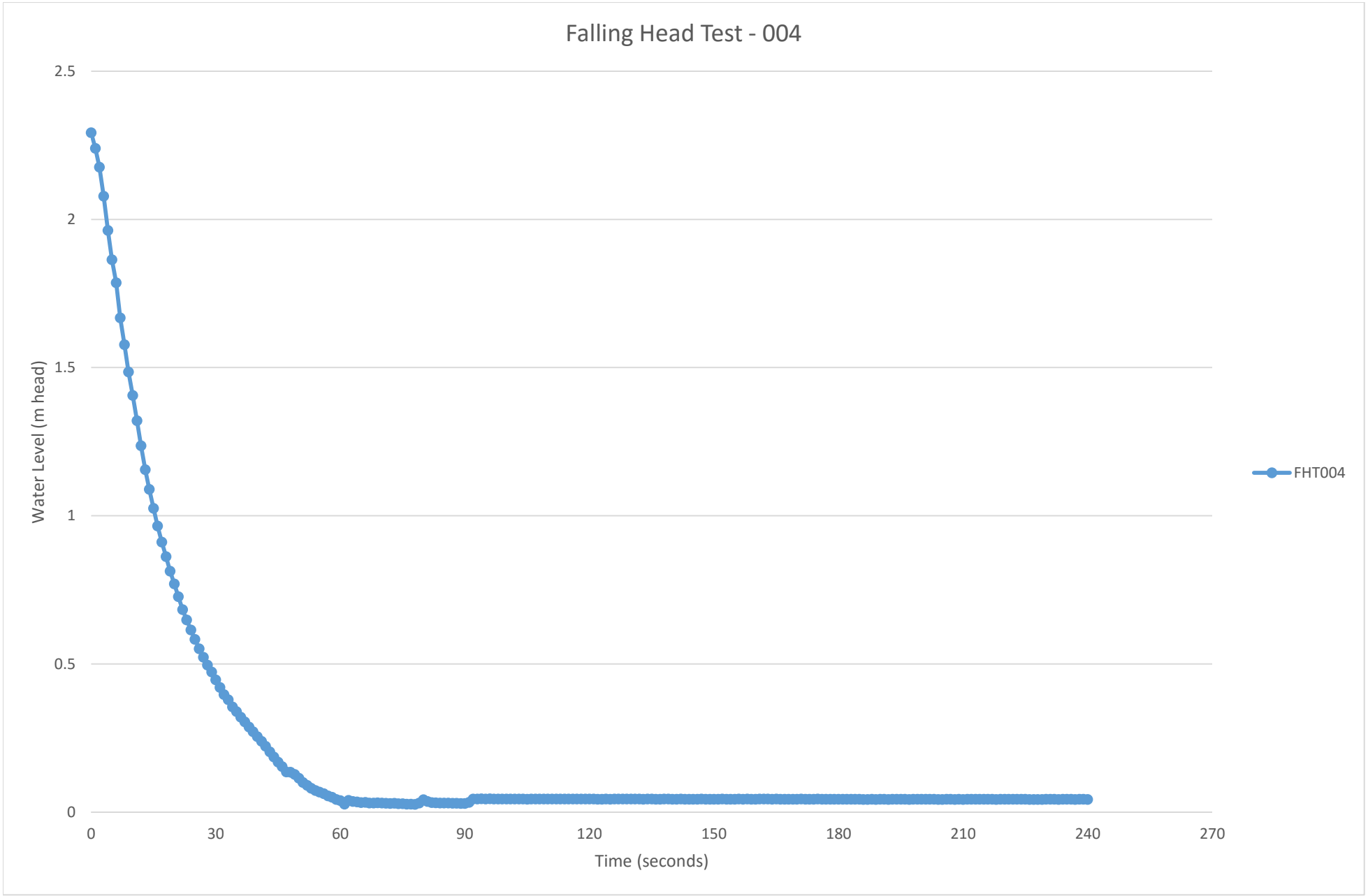
Client Ref: 190417 - 578-606 Springs Road, Prebbleton

Date of testing: 18/06/2020

Depth of BH: 3.40m



Depth of BH: 3.35m

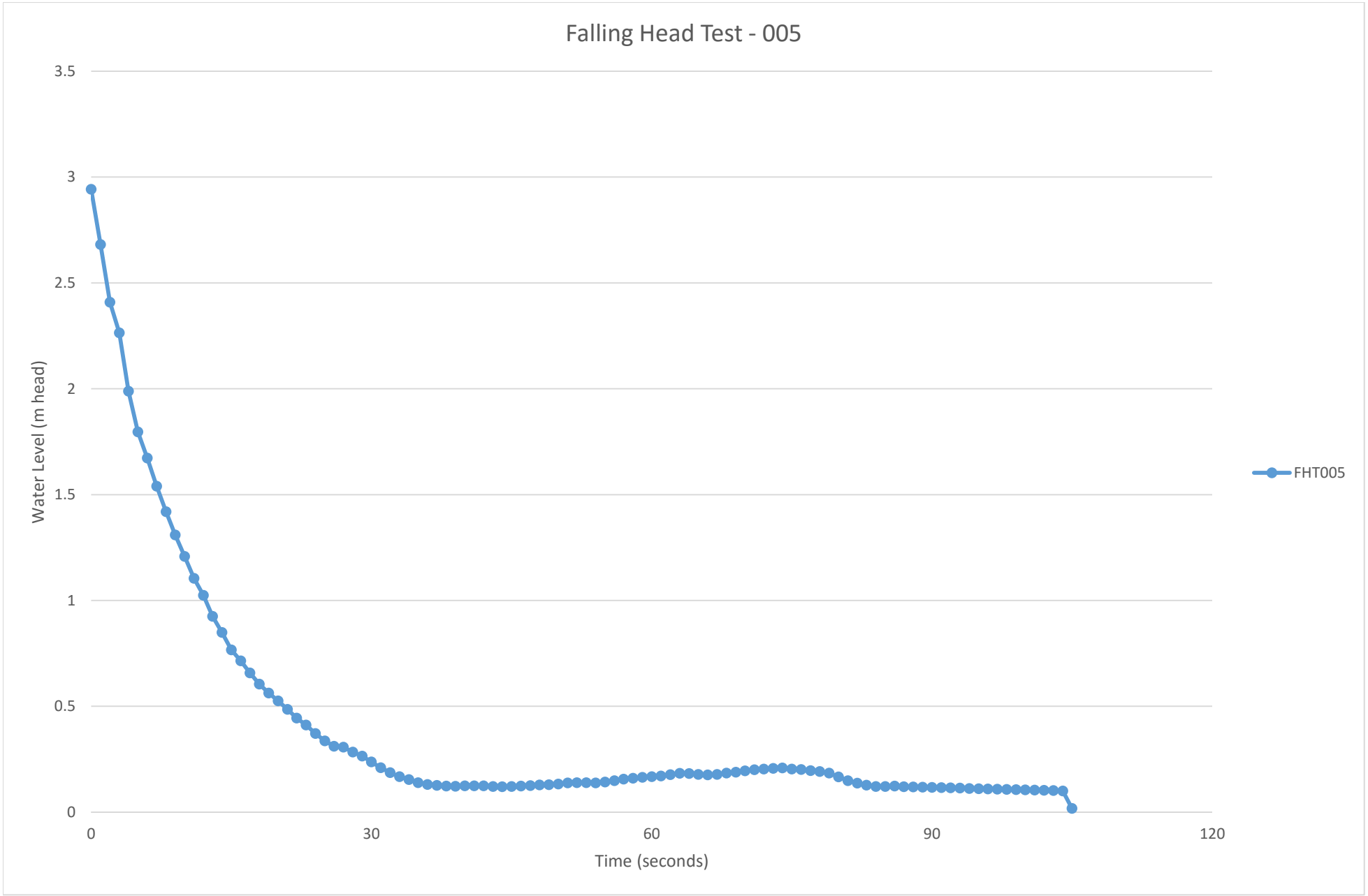


Ref:1014405.0.0.0/REP01

Client Ref: 190417 - 578-606 Springs Road, Prebbleton

Date of testing: 16/06/2020

Depth of BH: 3.00m

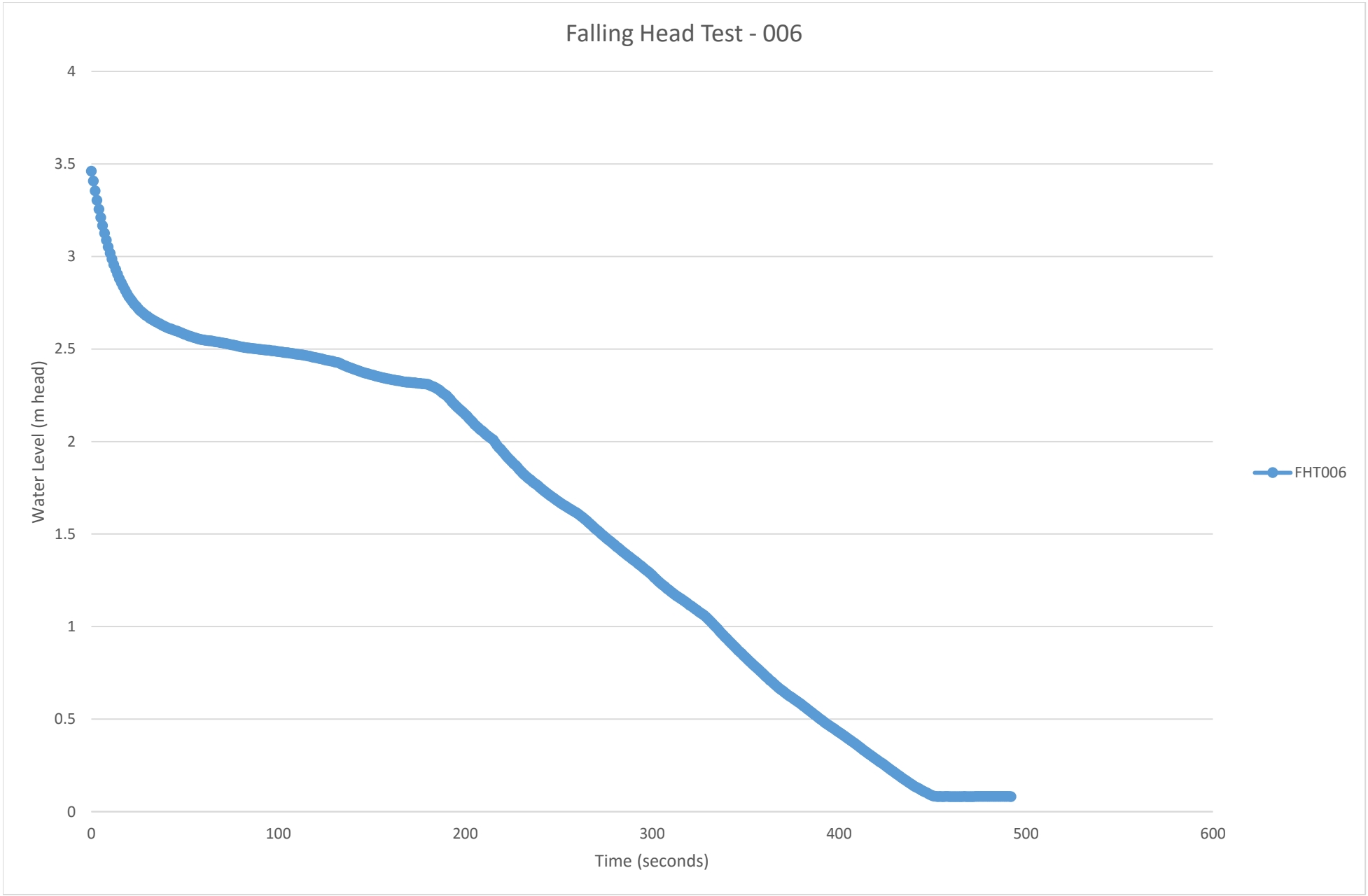


Ref:1014405.0.0.0/REP01

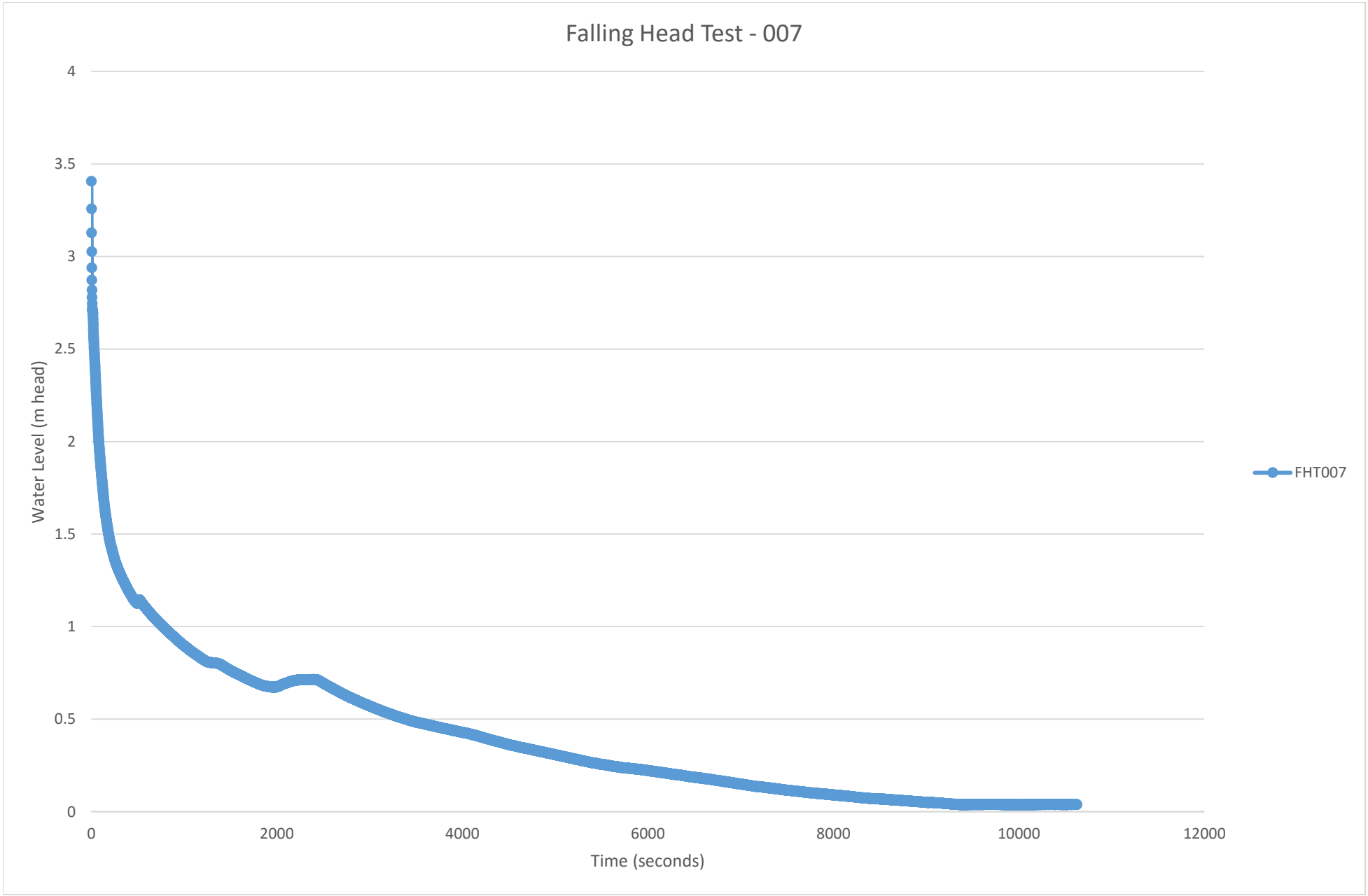
Client Ref: 190417 - 578-606 Springs Road, Prebbleton

Date of testing: 16/06/2020

Depth of BH: 3.50m



Depth of BH: 3.40m

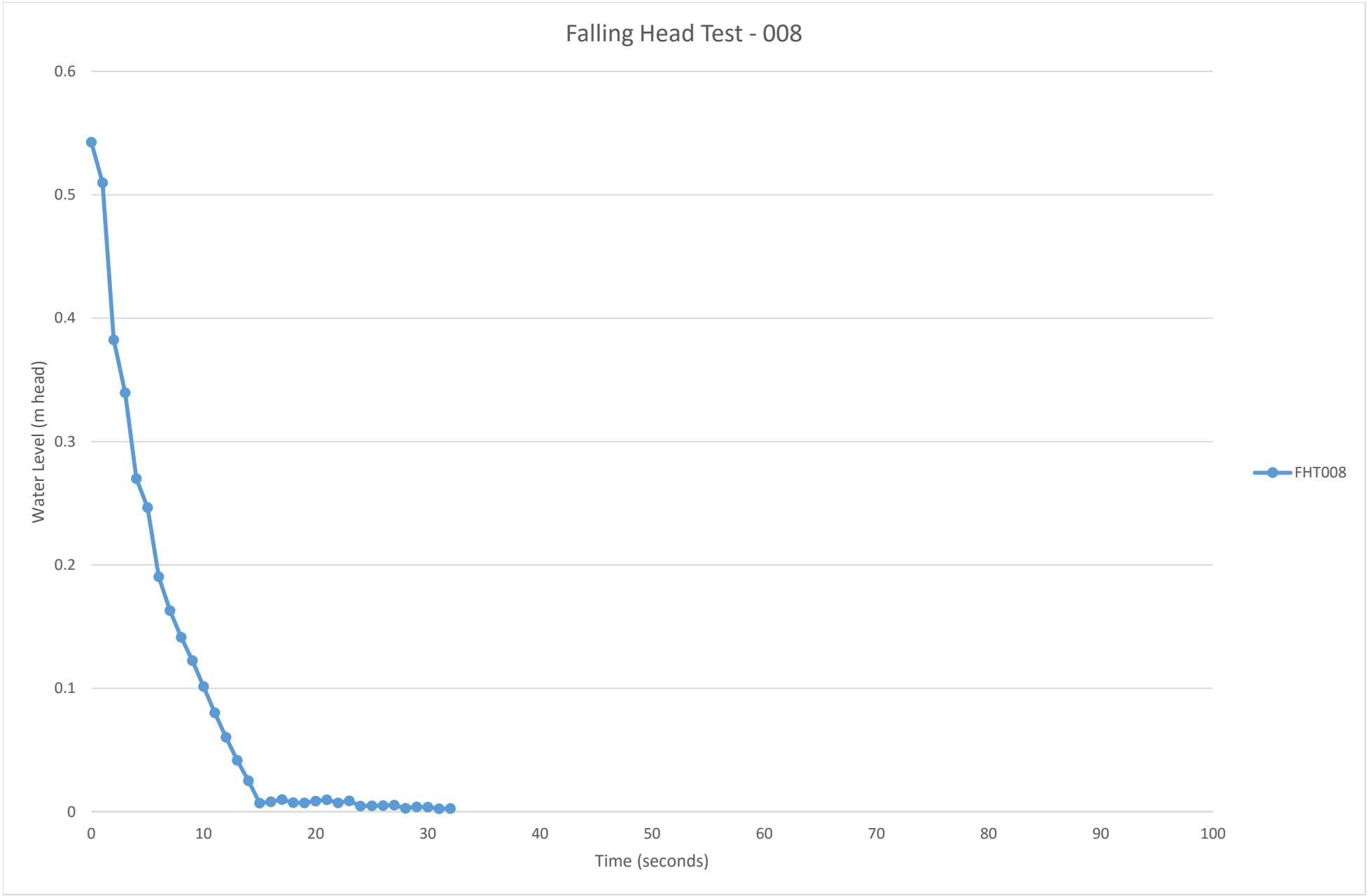


Ref:1014405.0.0.0/REP01

Client Ref: 190417 - 578-606 Springs Road, Prebbleton

Date of testing: 18/06/2020

Depth of BH: 4.10m



Ref:1014405.0.0.0/REP01

Client Ref: 190417 - 578-606 Springs Road, Prebbleton

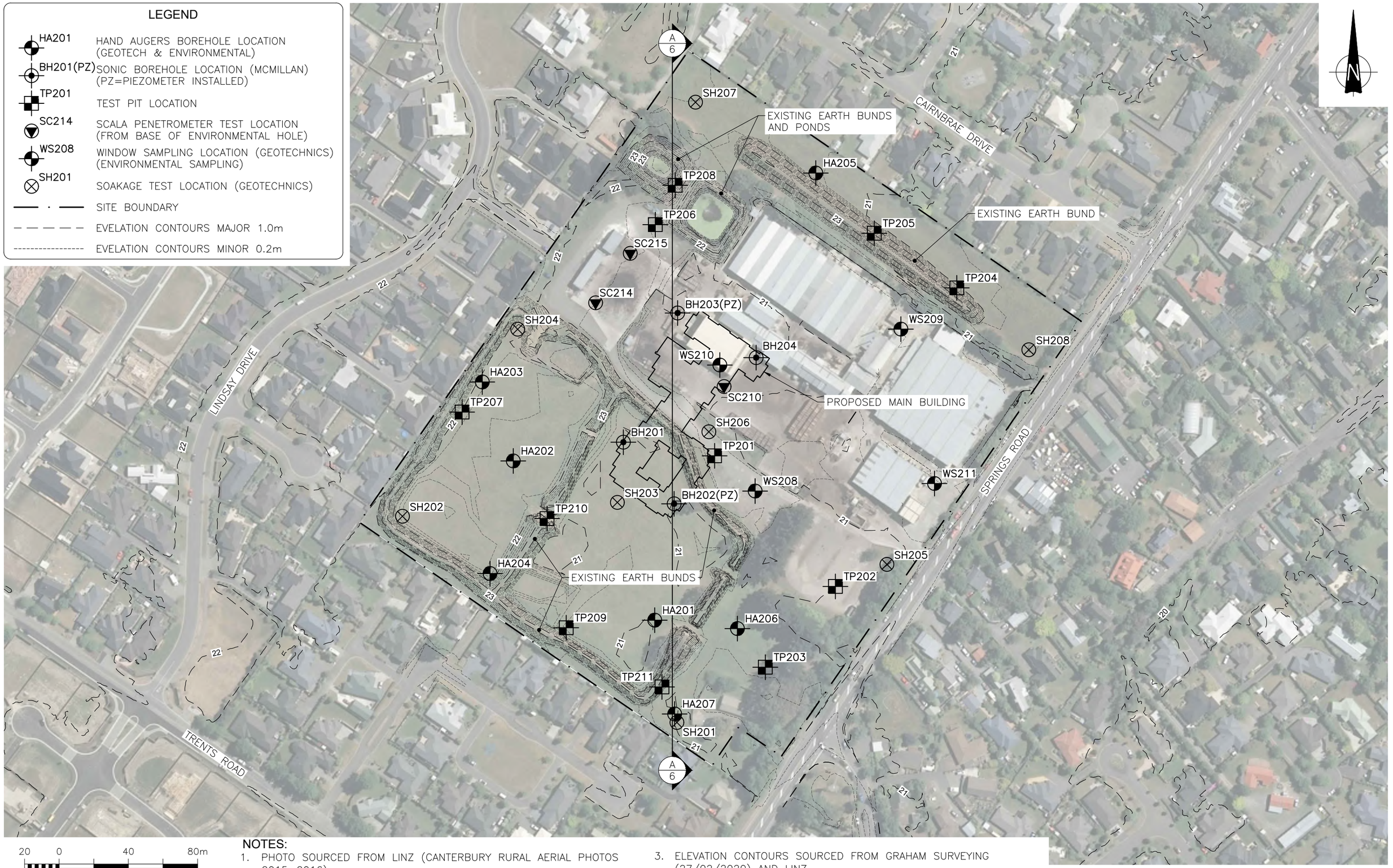
Date of testing: 18/06/2020

APPENDIX E

Drawings

LEGEND

- HA201 — HAND AUGERS BOREHOLE LOCATION (GEOTECH & ENVIRONMENTAL)
- BH201(PZ) — SONIC BOREHOLE LOCATION (MCMILLAN) (PZ=PIEZOMETER INSTALLED)
- TP201 — TEST PIT LOCATION
- SC214 — SCALA PENETROMETER TEST LOCATION (FROM BASE OF ENVIRONMENTAL HOLE)
- WS208 — WINDOW SAMPLING LOCATION (GEOTECHNICS) (ENVIRONMENTAL SAMPLING)
- SH201 — SOAKAGE TEST LOCATION (GEOTECHNICS)
- SITE BOUNDARY
- EVELATION CONTOURS MAJOR 1.0m
- EVELATION CONTOURS MINOR 0.2m



20 0 40 80m
SCALE 1:2000

NOTES:
1. PHOTO SOURCED FROM LINZ (CANTERBURY RURAL AERIAL PHOTOS 2015–2016).
2. SITE BOUNDARY PROVIDED BY GRAHAM SURVEYING.
3. ELEVATION CONTOURS SOURCED FROM GRAHAM SURVEYING (27/02/2020) AND LINZ.
4. TEST LOCATIONS APPROXIMATE AND SUBJECT TO SURVEY CONFIRMATION.

FOR RESOURCE CONSENT

REV	DATE	ISSUE	BY
1	17.07.20	RESOURCE CONSENT ISSUE	FY

DESIGN	DES CHECK	APPROVED FOR ISSUE
DL	AVD	B. BLACK
DRAWN	CAD CHECK	
FY	FY	
DATE DRAWN		ISSUE DATE
22.06.2020		17 / 07 / 20

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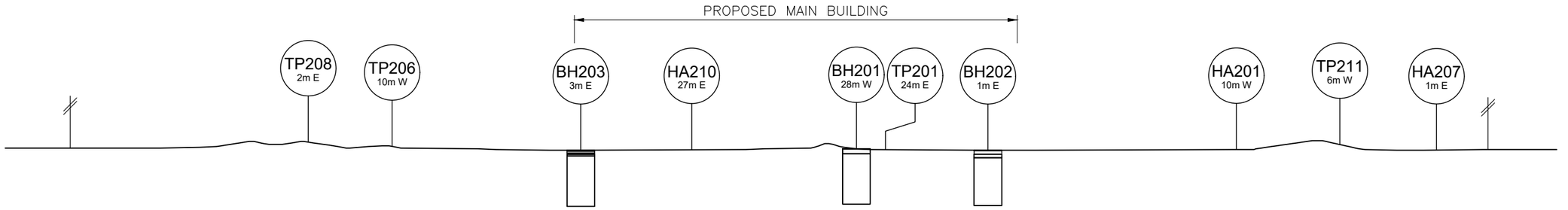
Summerset

CLIENT	SUMMERSET GROUP HOLDINGS LTD
ADDRESS	578-606 SPRINGS ROAD, PREBBLETON
PROJECT	GEOTECHNICAL ASSESSMENT FOR RESOURCE CONSENT
SHEET TITLE	GEOTECHNICAL INVESTIGATION SITE LOCATION PLAN

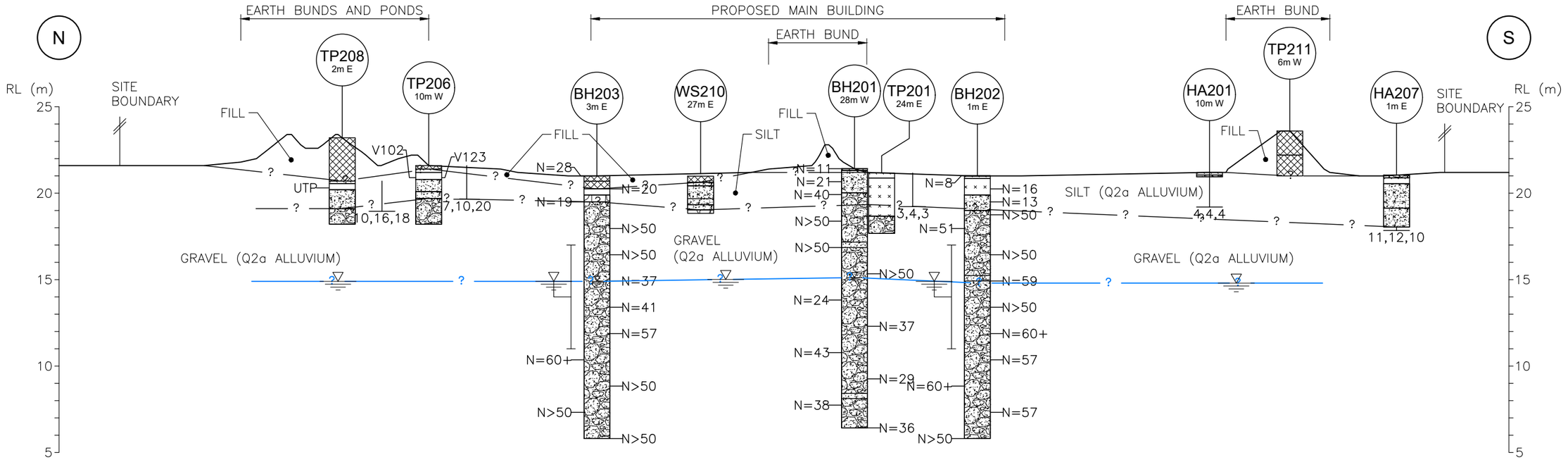
ACENZ
ISO 9001 CERTIFIED GCS

CADFILE	190417–4.dwg
SCALE (A3)	1:2000
ORIG. SHEET SIZE	A3
DRAWING No.	190417-4
REV.	1



SECTION A/4

SCALE 1:1250



SECTION A/4

SCALE 1:1250 HORIZONTAL
1:250 VERTICAL

LEGEND

- HA201 — HAND AUGER BOREHOLE LOCATION
- BH201 — MACHINE BOREHOLE LOCATION
- TP201 — TEST PIT LOCATION
- WS210 — WINDOW SAMPLING LOCATION
- (5,6,7) — SCALA PENETROMETER TEST (blows/50mm for last 150mm)
- PIEZOMETER RESPONSE ZONE AND INITIAL GROUNDWATER LEVEL
- N>50 — SPT–N VALUE (UNCORRECTED)
- V123 — SHEAR VANE PEAK STRENGTH (kPa)

GEOTECHNICAL MATERIALS: SILT, SAND, TOPSOIL, GRAVEL, FILL (NON–ENGINEERED)

GEOTECHNICAL CONTACTS: APPROXIMATE, INFERRED

NOTES:

1. GROUND SURFACE GENERATED FROM GRAHAM SURVEY (27/02/2020).
2. TEST LOCATIONS APPROXIMATE AND SUBJECT TO SURVEY CONFIRMATION.
3. OFFSET IN RELATION TO SECTION LINE INDICATED IN METERS/BEARING
4. MAIN CROSS SECTION EXAGGERATED 5x VERTICALLY.

12.5 0 25 50m
SCALE 1:1250

2.5 0 5 10m
SCALE 1:250

FOR RESOURCE CONSENT

REV	DATE	ISSUE	BY
1	17.07.20	RESOURCE CONSENT ISSUE	FY

DESIGN	DES CHECK	APPROVED FOR ISSUE
DL	AVD	B. BLACK
DRAWN	CAD CHECK	
FY	FY	
DATE DRAWN		ISSUE DATE
22.06.2020		17 / 07 / 20

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Summerset

CLIENT	SUMMERSET GROUP HOLDINGS LTD
ADDRESS	578-606 SPRINGS ROAD, PREBBLETON
PROJECT	GEOTECHNICAL ASSESSMENT FOR RESOURCE CONSENT
SHEET TITLE	GEOTECHNICAL CROSS SECTION A

ACENZ
ISO 9001 CERTIFIED GCS

CADFILE	190417–6.dwg
SCALE (A3)	AS SHOWN
ORIG. SHEET SIZE	A3
DRAWING No.	190417-6
REV.	1