

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

Engineers and Geologists



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

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Appendix A: Test Logs

Appendix A: Test Logs

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

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:
 - o 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 4000m² 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.	Range 0.1 – 3.5	SPT-N ₆₀ (Avg):
Oiit	May grade to fine medium dense to dense sand with depth or contain lenses of fine sand.	Typical 0.2 – 2.0	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.	Range 1.0 – Unknown Typical 2.0 – Unknown	SPT-N ₆₀ (Avg): 50+ (with isolated values of 25-35, likely within sand lenses)
	May contain lenses of clean sand up to 0.3m thick at intervals of several metres.		1611363)

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
		TP201 1.9m – 2.1m	9% Sand, 91% Silt (1)
	Crading	TP205 1.5m – 1.7m	20% Sand, 80% Silt (1)
	Grading	TP206 0.5m – 0.7m	20% Sand, 80% Silt (1)
		TP209 1.0m – 1.3m	14% Sand, 86% Silt (1)
			Water Content (As Received) 12.2%
		TP205 1.5m – 1.7m	Maximum Dry Density 1.83t/m ³
	Compaction		Optimum Water Content 15.0%
	Compaction		Water Content (As Received) 12.3%
Silt		TP209 1.0m – 1.3m	Maximum Dry Density 1.73t/m ³
Ont			Optimum Water Content 15.5%
			Water Content (As Received) 12.2%
	Plasticity Index	TP205 1.5m – 1.7m	Liquid Limit 25
			Plastic Limit 19
			Plasticity Index 6
	riasticity index		Water Content (As Received) 12.3%
		TP209 1.0m – 1.3m	Liquid Limit N/A ⁽²⁾
		17 209 1.0111 - 1.3111	Plastic Limit 24
			Plasticity Index N/A (1)
0	Grading	TP201 3.3m – 3.5m	17% Cobbles, 60% Gravel, 17% Sand, 6% Silt ⁽¹⁾
Gravel	Grauling	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.

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.

²⁾ Liquid limit test reported as not applicable, unable to cut groove past 12 blows at water content of 27.4%.

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)	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.

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).

²⁾ HA13 unable to penetrate tree roots, fill assumed to 0.5m depth based on TP202.

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:

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:

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.

¹⁾ SLS - Serviceability Limit State.

²⁾ ULS - Ultimate Limit State.

¹⁾ SLS-Service ability Limit State.

²⁾ ULS - Ultimate Limit State.

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.

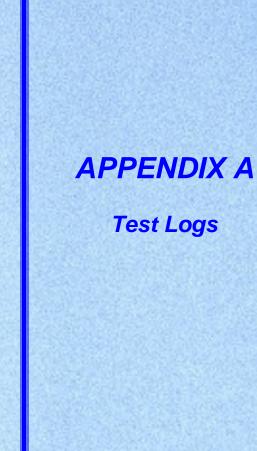
10.0 Limitation

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.





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GEOTECHNICAL AND **GEOLOGICAL INFORMATION**

SOIL TYPES AND SYMBOLS



FILL

TOPSOIL

GRAVEL

SILT





SAND



CLAY



PEAT



GROUNDWATER LEVEL

10,11,10

SCALA PENETROMETER LAST 3 NUMBER OF BLOWS PER 50mm INCREMENT

ROCK TYPES AND SYMBOLS



SANDSTONE



BASALT



SILTSTONE



TUFF



MUDSTONE



IGNIMBRITE

LIMESTONE

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 witl point of geological hammer. Can be peeled with pocket kni	
Weak	(W)	Difficult to peel with pocket kr	ife. 5 – 20
Moderately strong	(MS)	Cannot be scraped or peeled with pocket knife.	20 - 50
Strong	(S)	More than one blow of geologi hammer to fracture.	cal 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

DRILLING METHOD

FIELD TESTS

UNDISTURBED
MACHINE AUGER DISTURBED



HAND AUGER DISTURBED



STANDARD PENETRATION TEST (solid cone)



STANDARD PENETRATION TEST (hollow cone)

OB OPEN BARREL TT TRIPLE TUBE

WB WASH BORE

SH

RC

SPT

UNDISTURBED SHELBY TUBE

STANDARD PENETRATION TEST

ROCK CORE

V SHEAR VANE (corrected to BS:1377) R REMOULDED STRENGTH

Ρ 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

RILEY Consultants Ltd Level 2, 22 Moorhouse Ave **BORE HOLE LOG** Addington, Christchurch, 8024 Tel: +64 3 379 4402 Hole position: Proiect: Location: No.: Geotech Assessment Resource Consent 578-606 Springs Road, Prebbleton Refer to Site Plan Ground Level (m NZVD2016%-Ordinates (NZTM2000): **BH201** Job No.: Start Date: 08-06-20 190417 Finish Date: 08-06-20 E 1,560,234 0 N 5,174,326 4 21.10 Client: Hole Depth: Sheet: Direction: Summerset Group Holdings Ltd 15.00 m -90° NZTM2000 1 of 2 (m NZVD2016) Geological Interpretation Core box end (m)[TCR%] Material or Defect Description Rock Description (where applicable): Weathering; ROCK NAME; colour; texture; fabric and orientation; strength (GCOLOGICAL UNIT). Defect description Soil description (where applicable): Fraction (MAJOR / minor); colour; bedding. Strength, moisture; plasticity; additional (GEOLOGICAL UNIT) Fluid & Water Ξ Defects (depth, type, description) -egend Type Depth Tests Samples (type, reference, description) Geological Description (recovered as): levation Soil description (where applicable): Fraction (MAJOR / minor); colour; bedding. Strength, moisture; plasticity; additional Lab testing (depth, type(s)) (refer to separate Geotechnical and Geological Information sheet for further information) SPT 0.00 m 0, 1, 2, 2, 3, 4; N = 11 0.00 SPTLS - ; 0-0.45 SILT with some organics; dark brown; firm; moist. Organics, rootlets. (TOPSOIL) [100] Silty fine SAND; orangish brown with grey mottling; medium dense; moist. (SPRINGSTON FORMATION) × SPT 0.75 m 3, 4, 4, 4, 6, 7; N = 21 0.75 C -: 0.75-1.3 SPTLS - ; 0.75-1.09 × [87] +19.75 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. 1.50 0 0 0 SPT 1.50 m 12, 9, 8, 9, 10, 13; Nc = 40 1.35m - 1.50m CORE LOSS 1.40m - 9.50m Fines washed out. Drilling with water injection. 0000 106] 0.0.0 SUMMERSET PREBBLETON SPRINGS ROAD - 2020.GPJ <<DrawingFile>> 17/07/2020 14:23 Produced by gINT Professional - 3 SPT 3.04 m 11, 15, 17, 18, 23, 2/8mm; Nc > 50 3.04 SONIC GEOPROBE 8140LC (150Hz) [100] 0.00 $4.25 \mbox{m}$ - $4.56 \mbox{m}$ Fine to medium SAND with some gravel. Gravel, fine to coarse; subangular to rounded, sandstone. SPT 4.56 m 17, 30, 43, 17/20mm; 4.56 0.0 00.0 0.000 $N_{\rm C} > 50$ - 5 0000 [79] 0000 5.76m - 6.08m CORE LOSS SPT 6.08 m 20, 22, 33, 27/70mm; Nc > 50 6.08 0 0 0

7.60 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	7.60m CORE LOSS			-7 7 	5, 7, 5, 6;		
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 (SP	GRAVEL	Filter ma	e ngs sed hole	from Graham Surveying (27/02 2. Strength terms for soil layers 3. Drilled with water injection fr 4. Groundwater at 6.3m after be 5. Inferred cobble description b 6. Majority of core loss attribute coarse gravel/cobbles.	s are based on correlation with S rom 1.4m to 9.5m. Water topped being left to stand overnight with o	PT results. up from above 9.5 casing at 15m dept nd/or blockage of s	om to 15m. th. sampling barrel with
All dimensions in metres Scale 1:50	Contractor: McMillan Drilling Ltd.			lant Used: robe Sonic (McMillan)	Driller: Brian McMahon	Logged by: DDH	Checked by: AVD

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190417 -

RILEY AGS 3_1 NZ LIB 13.GLB Log RILEY RAKAIA BH (A4)

RILEY Consultants Ltd Level 2, 22 Moorhouse Ave Addington, Christchurch, 8024 Tel: +64 3 379 4402 Fax: Project: Geotech Assessment Resource Consent Job No.: Start Date: 08-06-20 Finish Date: 08-06-20 Finish Date: 08-06-20 Client: Summerset Group Holdings Ltd Geological Interpretation Rock Description (where applicable): Weathering: ROCK NAME: colour; texture: RILEY Consultants Ltd Level 2, 22 Moorhouse Ave Addington, Christchurch, 8024 Tel: +64 3 379 4402 Fax: Hole position: Refer to Site Plan Refe

С	lient Sun		set Grou	p Holdings Ltd	Summerset	Hole Deptl 15.00 m	h:				rection: 90° NZTM2000	Sheet: 2 of 2	
Туре	Run / Core box end (m)[TCR%]	Fluid & Water	Legend	fabric and orientation, Soil description (when Strength, moisture; pi Geological D Soil description (when bedding. Strength, mo	nterpretation ere applicable): Weatherin; strength (GEOLOGICAL re applicable): Fraction (M. lasticity; additional (GEOLO DESCRIPTION (TECOVET e applicable): Fraction (M. poisture; plasticity; additional echnical and Geological Informat	UNIT). Defect des AJOR / minor); co DGICAL UNIT) ed as): AJOR / minor); col al	scription lour; bedding. lour;	Elevation (m NZVD2016)	Depth (m)	Tests	Defects (depth,	Defect Description type, description) reference, description) oth, type(s))	Backfill / Piezometer
(C(150Hz)	9.12			8.20m - 9.12m CORE Sandy GRAVEL with s fine to coarse; subang	LOSS some cobbles; grey; dense jular to rounded; sandston termediate axis 150mm.	to very dense; m	oist. Gravel,		-10	SPT 9.12 m 11, 11, 9, 7, 12; Nc = 37 SPT 10.64 m 28, 19, 15, 1 9, 8; Nc = 43	∀ 3.		
SONIC GEOPROBE 8140LC (150Hz)	12.16			water injection but wat	· ·			,	-12	SPT 12.16 m 13, 11, 9, 6, 7; Nc = 29 SPT 13.68 m 10, 10, 12, 1: 8, 6; Nc = 38	7, \\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\		
-	[100]			EOH @ 15.00 m				+6.10	15	SPT 15.00 m 16, 19, 13, 8 6, 9; Nc = 36	, []		
	Explanations: Soil Types: Backfill: CLAY TOPSOIL Bentonite Bentonite Site Time (minutes) SILT PEAT Grout Filter material Filter material Filter material Filter material Standard Penetration Test (SPT) Standard Penetration: Standard Penetration: Site Time (minutes) No Recovery* Rig/Plant Used: Driller: Logged by: Checked by: Checked												

RILEY Consultants Ltd Level 2, 22 Moorhouse Ave Addington, Christchurch, 8024 Tel: +64 3 379 4402 Fax: Project: Geotech Assessment Resource Consent Job No.: 190417 Start Date: 09-06-20 Finish Date: 10-06-20 Client: Summerset Group Holdings Ltd RILEY Consultants Ltd Level 2, 22 Moorhouse Ave Addington, Christchurch, 8024 Tel: +64 3 379 4402 Fax: Hole position: Refer to Site Plan BH202 E 1,560,263.4 N 5,174,290.9 Client: Summerset Group Holdings Ltd Geological Interpretation Refer to Site Plan BH202 E 1,560,263.4 N 5,174,290.9 Direction: -90° NZTM2000 1 of 2

	1	904	17	Finish Date: 10-06-20		21.00		E 1,	560,2	263.4 N 5,1	74,290.9		-
	ent: Summ	erset	Group	Holdings Ltd	nerset	Hole Depth 15.20 m	1:			Direc -90°	tion: NZTM2000	Sheet: 1 of	2
lype	Run / (רומום א אאמופו	Legend	Geological Interpretation Rock Description (where applicable): fabric and orientation; strength (GEO Soil description (where applicable): F Strength, moisture; plasticity; addition Geological Description (Soil description (where applicable): F bedding. Strength, moisture; plasticity (refer to separate Geotechnical and Geological Description and Geological Description)	Weathering; I DLOGICAL UN Fraction (MAJC nal (GEOLOGI (recovered fraction (MAJC y; additional	IIT). Defect des OR / minor); col ICAL UNIT) I <mark>d as):</mark> OR / minor); col	cription our; bedding. our;	Elevation (m NZVD2016)	Depth (m)	Tests	Defects (depth,	Defect Descript type, description) reference, descript oth, type(s))	/ H34
	0.00	× 7	1, \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\	SILT with some gravel and organics;	dark brown; fir	rm; moist. Grave	el, medium to	+20.85		SPT 0.00 m 1, 0, 1, 2, 2, 3; N = 8	SPTLS -		-\
	[100]	×	× × /	coarse; angular. Organics, rootlets. (1	IOPSOIL)			/	-	N - 0	H		- -
	0.75	×	^ x	SILT; dark brown; firm to stiff; moist. ()		- - -	SPT 0.75 m	H c-		=
.		×	××	0.75m - 1.10m Grades to medium bro	own; dry to moi	ist. - — — — — -		+19.90	- - 1	3, 3, 4, 4, 4, 4; N = 16	SPTLS -		-
	[160]	×	. × .	Silty fine SAND; light yellowish brown	; medium dens	se; dry.			- -	'			-
-	1.50	×							-	SPT 1.50 m			-
	[160]	×	. × .					+19.00	-	3, 3, 4, 3, 3, 3; N = 13	SPTLS -		-
.		0	200	Sandy GRAVEL with some cobbles; g	grey; dense to	very dense; m	— — — — — pist. Gravel,	10.00	-2 -				-
	-[8]		0.0	fine to coarse; subangular to rounded rounded; maximum intermediate axis	l; sandstone. S	Sand, fine to co	arse. Cobbles,		-	SPT 2.25 m 17, 26, 25, 30, 5/10 mm;	SPTLS -		-
		0	00	2.70m - 3.04m CORE LOSS					-	N > 50			
-	2.04	<u> </u>	\times	3.00m - 3.60m Fines washed out.					-3	CDT 2.04			-
	3.04	0	000	olooni olooni ilioo naolioa oali					- - -	SPT 3.04 m 13, 16, 15, 13, 11, 12;			1.
(150		°2	200						- -	Nc = 51			1
40LC	[100]	0.0	0.0						- - -				1.
BE 91		0	0.0						-4 -				-0
SONIC GEOPROBE 8140LC (150Hz)		10	000						_ -				
C GE	4.56	0	0.0						- - -	SPT 4.56 m 9, 17, 27, 23,			-0
SON		0	j ood						- - -5	10/15 mm; Nc > 50			-0
	[118]	°	200						- -				-0
	=		0.0						- -				-0
		ما		5.76m - 6.08m Gravelly fine to mediur	m SAND. Grav	vel, fine to coars	se;		_				-0
-	6.08	ס	00	subrounded to rounded. - — — — — — — — — — —					-6 -	SPT 6.08 m			-0
		9.0	200						_ -	9, 17, 16, 18, 12, 13; Nc = 59			-
		ò	0.00						-	.10 - 00			-0
_	[75]	0	000						- - -7				
		0	<u>\(\)</u>	7.22m - 7.60m CORE LOSS					-				-0
-			\times						-				=
	7.60	0	0.0	7.60m - 7.80m Grades to with some s	ome cobbles.				-	SPT 7.60 m 5, 8, 10, 10, 10, 13/43mm;]
-		0	j o q						- -8 -	Nc > 50			-
Ex	plana			C-U Towns		Doslatii		narks					
1 1 2 -	Water Water Rise Ti Small [Large I	Strike Rise (* me (m Disturb Disturb Tube	(1st, 2nd lst, 2nd inutes) ed Sampled Sample (**	e (SDS) SAND SILT SILT GE(LDS) SAND GERVEL	TOPSOIL PEAT FILL	Backfill: Bentonite Grout Drill arisi or collaps Filter ma	from 0 2. Str. 3. Dri 4. Infe 5. Ma coars 6. SP 7. SP	Graham S ength term lled with w erred cobb jority of co e gravel/c	urveying ns for so vater injule desco ore loss obbles. c indica	ng (27/02/2020). oil layers are based ection from 3m to 1 arription based in parattributed to wash tes solid cone; rem	on correlation with S 5m. t on nearby test pits.	nd/or blockage of sam	
All	dimer		s in me		RECOVERY *		Rig/Plant I Geoprobe		(McN	Drille Millan) Pau	er: I Taulava	Logged by: C	hecked AVD

RILEY Consultants Ltd Level 2, 22 Moorhouse Ave Addington, Christchurch, 8024 Tei: +64 3 379 4402 Fax: Project: Geotech Assessment Resource Consent Job No.: 190417 Start Date: 09-06-20 Finish Date: 10-06-20 Client: Summerset Group Holdings Ltd RILEY Consultants Ltd Level 2, 22 Moorhouse Ave Addington, Christchurch, 8024 Tei: +64 3 379 4402 Fax: Hole position: Refer to Site Plan BH202 E 1,560,263.4 N 5,174,290.9 Client: Summerset Group Holdings Ltd Rilevel 2, 22 Moorhouse Ave Addington, Christchurch, 8024 Tei: +64 3 379 4402 Fax: Hole position: Refer to Site Plan BH202 E 1,560,263.4 N 5,174,290.9 Client: Summerset Group Holdings Ltd Rilevel 2, 22 Moorhouse Ave Addington, Christchurch, 8024 Tei: +64 3 379 4402 Fax: Hole position: Refer to Site Plan BH202 E 1,560,263.4 N 5,174,290.9 Client: Summerset Group Holdings Ltd Rilevel 2, 20 Moorhouse Ave Addington, Christchurch, 8024 Tei: +64 3 379 4402 Fax: Hole position: Refer to Site Plan BH202 E 1,560,263.4 N 5,174,290.9 Client: Summerset Group Holdings Ltd Rilevel 2, 20 Moorhouse Ave Addington, Christchurch, 8024 Tei: +64 3 379 4402 Fax: Hole position: Refer to Site Plan BH202 E 1,560,263.4 N 5,174,290.9 Client: Summerset Group Holdings Ltd

C	ient: Sun		et Grou	ıp Holdiı	ngs Ltd	Summerset	Hole Deptl 15.20 m	1:				Directi -90°	ion: NZTM2000	Sheet: 2	of 2	
Туре	Run / Core box end (m)[TCR%]	Fluid & Water	Legend	Rock De fabric an Soil desi Strength Ge Soil desi bedding	ological Interpre escription (where applied orientation; strength cription (where applied, moisture; plasticity; ological Description; where applied strength, moisture; page separate Geotechnical ar	icable): Weathering h (GEOLOGICAL U able): Fraction (MA- additional (GEOLO otion (recovere able): Fraction (MA- olasticity; additional	NIT). Defect des JOR / minor); co GICAL UNIT) ed as): JOR / minor); col	cription our; bedding. our;	Elevation (m NZVD2016)	Depth (m)	Test	ts	, ,	type, description	,	Backfill / Piezometer
-	7 ₆ 0		0.00	fine to co rounded; (continu	RAVEL with some con arse; subangular to n maximum intermedia led) 0.12m CORE LOSS	ounded; sandstone.				- - - - -						0 0
-	9.12		0000							- 9 - - - - -	SPT 9.12 6, 8, 15, 1 15, 18; Nc = 60+	m 5,				
	[100]		0 0 0 0							- - - - 10					- - - -	0 0
Professional	10.64		0.0.0							- - - - - -11	SPT 10.64 8, 8, 10, 1 12, 23; Nc = 57				-	
17/07/2020 14:23 Produced by gINT Professional SONIC GEOPROBE 8140LC (150Hz)	[100]		0.000							-						
17/07/2020 14:23 SONIC GEC	12.16		0.000							12 	SPT 12.16 10, 16, 16 16, 16; Nc = 60+				- - - -	
J < <drawingfile>></drawingfile>	[100]		0000							- - - - 13 - -					-	
S ROAD - 2020.GP	13.68		0 0 0 0							- - - - - 14	SPT 13.68 7, 5, 5, 15 22; Nc = 5	, 15,			- - - -	
BBLETON SPRING	[115]		0.00							- - - - -					-	
SUMMERSET PRE			0.000	EOH @ 1	15.20 m				+5.80	- 15 - - - -	SPT 15.20 17, 15, 15 25, 5/10m Nc > 50	i, 19, 📙			- - - - -	
V BH (A4) 190417 -										- - -16 -					-	
RILEY AGS 3_1 NZ UB 13 GLB Log RILEY RAKAA BH (A4) 190417 - SUMMERSET PREBBLETON SPRINGS ROAD - 2020 GPU W	Wa Wa Ris Sm Lar	ater Rise ie Time nall Distu ge Distr elby Tub	ke (1st, 2nd e (1st, 2nd (minutes) urbed Sam urbed Sam pe Sample) and aple (SDS) aple (LDS)	Soil Types: CLAY SILT SAND GRAVEL	TOPSOIL PEAT FILL NO RECOVER	Backfill: Bentonit Grout Drill aris: Filter ma	1. Co from 2. St 3. Dr 4. Int 5. Mi coars 6. SF 7. SF	Graham S rength terrilled with vi- ferred cob- ajority of cose gravel/e	Surveying ms for sowater injusted ble descourse loss cobbles. Ic indica	g (27/02/202 bil layers are ection from a cription base attributed to tes solid con	20). e based of 3m to 15 ed in part o wash o	d subject to survey c on correlation with Si on nearby test pits. ut of finer material ar ining tests undertake	PT results. nd/or blockage of s		
A AG	l din		ons in m e 1:50		Contractor: McMillan Drillin	g Ltd.		Rig/Plant Geoprobe		(McN	/lillan)	Drille Paul	r: Taulava	Logged by: DDH	Checke AVI	

RILEY Consultants Ltd Level 2, 22 Moorhouse Ave **BORE HOLE LOG** Addington, Christchurch, 8024 Tel: +64 3 379 4402 Hole position: Proiect: Location: No.: 578-606 Springs Road, Prebbleton Refer to Site Plan Geotech Assessment Resource Consent Ground Level (m NZVD20160-Ordinates (NZTM2000): **BH203** Job No.: Start Date: 11-06-20 190417 Finish Date: 12-06-20 E 1,560,265.1 N 5,174,401.1 21.00 Client: Hole Depth: Direction: Sheet: Summerset Group Holdings Ltd 15.20 m -90° NZTM2000 1 of 2 (m NZVD2016) Geological Interpretation Core box end (m)[TCR%] Material or Defect Description Rock Description (where applicable): Weathering; ROCK NAME; colour; texture; fabric and orientation; strength (GCOLOGICAL UNIT). Defect description Soil description (where applicable): Fraction (MAJOR / minor); colour; bedding. Strength, moisture; plasticity; additional (GEOLOGICAL UNIT) Fluid & Water Piezometer Ξ Defects (depth, type, description) -egend Type Depth Tests Samples (type, reference, description) Geological Description (recovered as): levation Soil description (where applicable): Fraction (MAJOR / minor); colour; bedding. Strength, moisture; plasticity; additional Lab testing (depth, type(s)) (refer to separate Geotechnical and Geological Information sheet for further information) SPT 0.00 m 3, 5, 7, 8, 8, 5; Nc = 28 0.00 GRAVEL with some sand and minor silt; dark brown; moist. Gravel, fine to +20.70 coarse; subangular to rounded. Sand, fine to coarse. (FILL) [100]

Fine SAND; dark grey; moist. (FILL) +20.25 0.75 SPT 0.75 m 0.50m - 1.80m Fines washed out SPTLS -× 2, 3, 3, 3, 4, 10; N = 20 +19.90 ××× [100] SILT with some sand; light orangish brown; moist. Gravel, fine to medium; rounded. (SPRINGSTON FORMATION) ٥× +19.50 0000 1.50 SPT 1.50 m 9, 9, 7, 6, 3, 3; Nc = 19 Gravelly SILT with some sand; light orangish brown; moist. Gravel, fine to medium: rounded. 0.0.0 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. 0000 100] 1.80m - 3.00m Gravel predominantly fine to medium, higher proportion of coarse SUMMERSET PREBBLETON SPRINGS ROAD - 2020.GPJ <<DrawingFile>> 17/07/2020 14:23 Produced by gINT Professional 0.0.0 - 3 SPT 3.04 m 15, 20, 30, 25, 5/10 mm; Nc > 50 3.00m - 4.40m Gravel predominantly fine to medium, becoming silty. 3.04 SONIC GEOPROBE 8140LC (150Hz) SPT 4.56 m 10, 18, 20, 30, 10/15 mm; 4.56 $N_{\rm C} > 50$ - 5 [100] 0.0.0 0 0 0 SPT 6.08 m 6, 8, 8, 8, 9, 12; Nc = 37 6.08 6.08m - 6.20m Fines washed out. 0000 [100] 190417 -RILEY RAKAIA BH (A4) RILEY AGS 3_1 NZ LIB 13.GLB Log

7.60 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0						SPT 7.60 10, 12, 12 12, 7; Nc	, 10,		
Explanations: Water Strike (1st, 2nd) Water Rise (1st, 2nd) and Rise Time (minutes) Small Disturbed Sample (SDS Large Disturbed Sample (TNX) Standard Penetration Test (SF	GRAVEL	Backfill: Bentonite Grout Drill arisin or collapse Filter ma	ngs sed hole	from Gi 2. Strer 3. Drille 4. Grou 5. Inferi 6. Majo coarse 7. PT te	dinates based of raham Surveyin ngth terms for seed with water injunded and water at 7m of red cobble descrifty of core loss gravel/cobbles.	ng (27/02/20) oil layers are jection from after being le cription base attributed to es solid cone	based on correlation with	SPT results. casing at 15.2m. s. and/or blockage of s	
All dimensions in metres Scale 1:50	Contractor: McMillan Drilling Ltd.		Rig/Pl Geopr		sed: Sonic (McN	/lillan)	Driller: Paul Taulava	Logged by: DDH	Checked by: AVD

RILEY Consultants Ltd Level 2, 22 Moorhouse Ave Addington, Christchurch, 8024 Tel: +64 3 379 4402 Fax: **BORE HOLE LOG** Hole position: Project: Location: No.: 578-606 Springs Road, Prebbleton Refer to Site Plan Geotech Assessment Resource Consent Job No.: 190417 Start Date: 11-06-20 Finish Date: 12-06-20 Ground Level (m NZVD2016à-Ordinates (NZTM2000): 21.00 E 1,560,265.1 N 5,174,401.1 **BH203** Direction: Client: Hole Depth: Sheet:

	Su	mmer	set Grou	ıp Holdi	ngs Ltd	Summersel	15.20 m					-90°	NZTM2000	2	of 2	
H i	Run / Core box end (m) TCR%	Fluid & Water	Legend	Rock De fabric ar Soil des Strength Ge Soil des bedding	ological Interpre escription (where app and orientation; strengt cription (where applica, n, moisture; plasticity; ological Descrip cription (where applica, strength, moisture, preparate Geotechnical a	licable): Weathering th (GEOLOGICAL Usable): Fraction (MA additional (GEOLO ption (recovere table): Fraction (MA plasticity; additional	INIT). Defect des JOR / minor); co IGICAL UNIT) ed as): JOR / minor); col	cription lour; bedding. our;	5	Depth (m)	Tes	ts		type, description)	Backfill / Piezometer
	769	0		fine to co rounded; (continu	RAVEL with some co parse; subangular to i maximum intermedia ued)	rounded; sandstone			S,	9					- - - - - -	
-	9.1	2	0.0.0	}						-	SPT 9.12 13, 12, 13 12, 17; Nc = 57				- - - -	0 0
	[100]		0 0 0 0	; ;						- 10 - 10					-	0 0
l Professional	10.6	64	0.00							- - - - 11	SPT 10.6- 15, 17, 17 13, 15; Nc = 60+				- - - -	
17/07/2020 14:23 Produced by gINT Professional	[6]		0.00							- - - - - - - -					- - - - - -	
	12.	16	0.00	<u>.</u>						- - - - -	SPT 12.1 12, 12, 17 14, 13/45 Nc > 50	7, 16,			- - - - -	
GPJ < <drawingfile>></drawingfile>	[100]		0000	;						-13 - -					- - - - -	
INGS ROAD - 2020	13.6	68	0 0 0							- - - -14	SPT 13.6 25, 28, 28 12/35 mm Nc > 50	3, 24, 🕌			-	
REBBLETON SPR	[100]		0 0 0 0 0 0 x		15.00m Silty fine SA	ND. — — — — — — .			_	- - - - - - - 15					- - - -	
17 - SUMMERSET I			0.00	EOH @	15.20 m				+5.80	-	SPT 15.2 37, 23/20 Nc > 50	0 m mm;			- - - - -	-
AIA BH (A4) 1904										- 16 - - -					- - - - - -	
SPT 13.68 m SPT 13.68 m											on correlation with S m. and overnight with ca on nearby test pits. ut of finer material an	PT results. sing at 15.2m. nd/or blockage of s				
RILEY AG	All di		ons in m le 1:50	netres	Contractor: McMillan Drillir	ng Ltd.		Rig/Plan		(McN	/lillan)	Drille Paul	er: Taulava	Logged by: DDH	Checke AV	

RILEY Consultants Ltd Level 2, 22 Moorhouse Ave Addington, Christchurch, 8024 Tel: +64 3 379 4402 **BORE HOLE LOG** Hole position: Proiect: Location: No.: Geotech Assessment Resource Consent 578-606 Springs Road, Prebbleton Refer to Site Plan Ground Level (m NZVD20160-Ordinates (NZTM2000): **BH204** Job No.: Start Date: 15-06-20 190417 Finish Date: 15-06-20 E 1,560,310.6 N 5,174,375.5 21.00 Client: Hole Depth: Direction: Sheet: Summerset Group Holdings Ltd 15.00 m -90° NZTM2000 1 of 2 (m NZVD2016) Geological Interpretation Core box end (m)[TCR%] Material or Defect Description Rock Description (where applicable): Weathering; ROCK NAME; colour; texture; fabric and orientation; strength (GCOLOGICAL UNIT). Defect description Soil description (where applicable): Fraction (MAJOR / minor); colour; bedding. Strength, moisture; plasticity; additional (GEOLOGICAL UNIT) Fluid & Water Œ Defects (depth, type, description) -egend Type Depth Tests Samples (type, reference, description) Geological Description (recovered as): Elevation Soil description (where applicable): Fraction (MAJOR / minor); colour; bedding. Strength, moisture; plasticity; additional Lab testing (depth, type(s)) (refer to separate Geotechnical and Geological Information sheet for further information) 000 +20.85 CONCRETE. (FILL) +20.70 SPT 0.30 m 1, 1, 2, 2, 3, 3; N = 10 0.30 SPTLS -× [100] CLAY with some gravel; dark brown; moist. Gravel, fine to medium. (FILL) +20.25 0.75 SILT with some clay and minor gravel; medium brown; firm; moist. Gravel, fine. (SPRINGSTON FORMATION) 1, 0, 1, 1, 0, 1; N = 3 SPTLS -× × [100] × × SILT with some sand and clay; medium brown; soft to firm; wet × 1.50 SPT 1.50 m 1, 0, 3, 2, 3, 3; N = 11 × SPTIS. × × 100] +19.00 Fine SAND with some silt; orangish brown; dense; wet. 2.25 SPT 2.25 m 2, 2, 2, 6, 12, 11; N = 31 SPTLS -2.40m - 2.55m Grades to with some fine to medium gravel 2020.GPJ <<DrawingFile>> 17/07/2020 14:23 Produced by gINT Professional 00.00 [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. 0.0.0 - 3 3.00 SPT 3.00 m 11, 15, 20, 23, 17/65 mm; Nc > 50 3.00m - 3.40m Fines washed out. 0000 SONIC GEOPROBE 8140LC (150Hz) 0.0.0 [100] 3.80m - 4.00m Fines washed out. 0000 0000 SPT 4.56 m 7, 9, 10, 14, 19, 17/65mm; 4.56 4.56m - 4.70m Fines washed out. 0000 $N_{\rm C} > 50$ - 5 0.00 [100] 5.30m - 5.50m Grades to silty. 0000 0:00 SUMMERSET PREBBLETON SPRINGS ROAD -0000 00000 SPT 6.08 m 5, 6, 5, 5, 5, 6; Nc = 21 6.08m - 7.60m Grades to medium dense. 6.08m - 8.30m Fines washed out, some cobbles. 6.08

IA BH (A4)				- 20,6 - 8 Nc >	6/40mm; > 50	
3_1 NZ LIB 13.GLB Log RILEY RAKA	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 TOPSOIL SILT PEAT SAND FILL GRAVEL NO RECOVE	Backfill: Bentonite Grout Drill arisings or collapsed hole Filter material	from Graham Surveying (27/ 2. Strength terms for soil layd 3. Groundwater at 6.3m after 4. Inferred cobble description 5. Majority of core loss attributionarse gravel/cobbles.	(/02/2020). Pers are based on correlation was being left to stand overnight was based in part on nearby test.	with casing at 15m depth. pits. rial and/or blockage of sampling barrel with
93						

SPT 7.60 m 9, 12, 18, 16, 20, 6/40mm; Nc > 50

0.0.0

0000 0000

0 0 0

[100]

7.60

190417 -

AGS 3_1 NZ LIB 13.GLB Log RILEY RAKAIA

RILEY A

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

RILEY Consultants Ltd Level 2, 22 Moorhouse Ave Addington, Christchurch, 8024 Tel: +64 3 379 4402 Fax: Project: Geotech Assessment Resource Consent Job No.: 190417 Start Date: 15-06-20 Finish Date: 15-06-20 Client: Summerset Group Holdings Ltd RILEY Consultants Ltd Level 2, 22 Moorhouse Ave Addington, Christchurch, 8024 Tel: +64 3 379 4402 Fax: Location: 578-606 Springs Road, Prebbleton Refer to Site Plan BH204 E 1,560,310.6 N 5,174,375.5 Client: Summerset Group Holdings Ltd Hole Depth: 15.00 m 15.00 m Project: BH0le position: Refer to Site Plan BH204 BH204 Sheet: -90° NZTM2000 2 of 2

	ient: Sun		set Grou	ıp Holdi	ngs Ltd	Summersel	Hole Dept 15.00 m	h:				irecti -90° ا	on: NZTM2000	Sheet: 2	of 2
Туре	Run / Core box end (m)[TCR%]	Fluid & Water	Legend	Rock De fabric an Soil des Strength Ge Soil des bedding	nd orientation; strencription (where apply, moisture; plasticielological Description (where apply, Strength, moisture).	pretation pplicable): Weathering ngth (GEOLOGICAL L blicable): Fraction (MA ty; additional (GEOLO sription (recovere blicable): Fraction (MA e; plasticity; additional al and Geological Informatio	JNIT). Defect des JOR / minor); co GICAL UNIT) ed as): JOR / minor); co	scription lour; bedding. lour;	Elevation (m NZVD2016)	Depth (m)	Test	s	, ,	type, description	Xfill /
-	700		0.000	fine to co	oarse; subangular t ; maximum interme	cobbles; grey; dense to rounded; sandstone diate axis 150mm.				-					
-	9.12		0000	9.12m -	10.50m Fines wash	ned out, some cobbles	3 .			- -9 - - -	SPT 9.12 16, 16, 12 13, 12; Nc = 50				
	[0/2]		0 0 0 0							-10					
rofessional (150Hz)	10.64		0.00		- 11.00m Fines was - 12.16m Grades to					- - - -11	SPT 10.64 4, 6, 12, 1 10, 10; Nc = 42				
17/07/2020 14:23 Produced by gINT Professional	[02]		0.000							- - - - - - - - -					
< <drawingfile>> 17/07/2020 1 SONIC 0</drawingfile>	12.16			12.16m -	- 13.68m Gravel pr	edominantly fine to me	edium.			- 13	SPT 12.16 6, 8, 10, 1 12, 11; Nc = 46				
	13.68		0.000	13.68m -	- 15.00m Fines was	shed out, gravel predo	ominantly fine to i	nedium.		- - - - - - - 14	SPT 13.68 20, 21, 28 4/5 mm; Nc > 50				
REBBLETON SPRING	[76]		0.000						+6.00	- - - - - - -					
A4) 190417 - SUMMERSET PI				ЕОН @	15.00 m					- 16	SPT 15.00 22, 38/75r Nc > 50				
I HAIA BH (l _D	marka	-					
RILEY AGS 3.1 NZ LIB 13 GLB Log RILEY RAKAJA PH (A4) 190417 - SUMMERSET PREBBLETON SPRINGS ROAD - 2020.GPU A	Wa Wa Z Ris Sm Lar She	ater Ris e Time nall Dist ge Dist elby Tu	ke (1st, 2nd e (1st, 2nd (minutes) urbed Sam urbed Sam be Sample Penetration) and aple (SDS) aple (LDS) (TNX)	GRAVEL	S: TOPSOIL PEAT FILL NO RECOVER	Filter ma	1. C from 2. S 3. G 4. Irr 5. N coal 6. P 7. S	n Graham Strength terr Groundwate Inferred coblematers Majority of corse grayel/o	Surveyir ms for s r at 6.3r ble desc ore loss cobbles indicate	ng (27/02/202 oil layers are n after being cription base attributed to es solid cone	20). based of the	d subject to survey con correlation with S tand overnight with on nearby test pits. ut of finer material ai ing tests undertaken	PT results. casing at 15m dept nd/or blockage of s	h.
IN I	l din		ons in m e 1:50	netres	Contractor: McMillan Dril	ling Ltd.		Rig/Plant Geoprobe		(McN	/lillan)	Drille Briar	r: n McMahon	Logged by: DDH	Checked by AVD

	tech As	and Geologists.	el: +64 3 379 4402 ax: esource Consen		6 Sprin	gs Road,			F	Refer	osition: to Site F		- -	T LO	No.:	
Job N		0417	Start Date: 10 Finish Date: 10		Ground	d Level (N 21.3m	IZVD200				2000): N 5,17	74,318	.7	T	P20 1	
$\overline{}$	nmerse	et Group Holo	lings Ltd	Summers		Hole Dept 3.50 m	h:							Sheet:	1 of 1	
Elevation B NZVD2016	Depth (m)	(refer to	Geological Descr separate Geotechnical nation sheet for further	and Geologic	al	윤	Strength Rock	Groundwater		lows / 5	etrometer 0 mm)	18	Samples + I ab Testing	Te Ro	Field esting esults	Instrument/
+21.00	-	medium dense;	gravel and organics; d "stiff to very stiff"; mois s, rootlets. (TOPSOIL)	t. Gravel, med	ose to dium to	\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\			*					No. 1 1, 2, 2, 4, 4, 3, 2, 2, 2, 3, 2, 2,		
.40.00	-122	SILT with some moist. Sand, fine	sand; light orangey bro a. (SPRINGSTON FOF	own; "stiff to ve	ery stiff";	x x x x x x x x x x x x x x x x x x x							1.9m: Grading	3, 2, 2, 5, 4, 3, 4, 3, 4, 3, 3, 4, 4, 4, 4, 5, 4, 3, 3, 3, 4, 4, 4, 4, 3, 3, 3, 4, 4, 4, 3, 4, 3, 3, 4, 4, 5, 4, 5, 4, 5, 4, 5, 4, 5, 4, 5, 4, 5, 4, 5, 4, 5, 4, 5, 5, 6, 6, 6, 6, 6, 6, 6, 6, 6, 6, 6, 6, 6,		
+18.80	- - -3 -	brownish grey; r		arse. Gravel,	55,	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0							3.3m: Grading	570		NOWOWOWOW!
	-4 -															
	-4															
SKE		нот											245			
SKE	- - - - - -	HOT			***							IAPHSC214	215 BH203 WS EH	296/204 2210	W s 20))9
SKE		HOT									SITE N EH	HSC214	WS EHS	28H204 C210	ws	010000000000000000000000000000000000000
SKE -		HOT									EH HA202	HSC214	WS EHS 1 TP2 BH202	286/204 2210 201 WS208	WS21	0
			SAMPLES AI Grab Sample Bulk Sample Scala Penetr Insitu Vane S P: Peak; R: R UTP: Unable Lab Testing; I OMC: optimu max dry dens	(Disturbed) (Disturbed) cometer (blows hear Strength desidual; to penetrate PSD: particle m moisture co	s/50mm) n (kPa): size dist. ont.; MDD:	X None Slow Rapid TEF X Targe	GROUND\ Seep 1 Inflow \(\frac{1}{2} \) RMINATION t depth	Water Str Water Ris 7 Time (min	se nutes) e	Rem 1. Coo confirm (27/02/2. Stree in quot	TP210 TP220 TP220 arks rdinates bataion. Elev 2020). ngth terms attorn mark	BH20 BH20 BH20 BH20 BSEED ON THE SEED OF THE SEED	WS EH	WS208	t to survey Surveying test results	0 50 100 1:5,0

Project: Geotech	rs and Geologists	Tel: +64 3 379 4402 Fax: Locat Lesource Consent 578-6	ion: 606 Springs Ro	ad, Prebbleton		Hole position: Refer to Site Plan			lo.:
Job No.: 1	90417	Start Date: 10-06-20 Finish Date: 10-06-20	Ground Leve	l (NZVD2 006) m	Ordinates (E 1,560	(NZTM2000):),367.0 N 5,174,23	3.0	TP	202
	set Group Holo	dings Ltd	Hole E 3.40					Sheet: 1	of 1
Elevation By NZVD2016 Depth (m)	(refer to	Geological Description separate Geotechnical and Geolog mation sheet for further information	jical 🖁	Field Strength Soil Rock	Sca (k	ala Penetrometer blows / 50 mm) 6 9 12 15 18	Samples + Lab Testing	Fie Test Resu	ing
+18.90 -2 2. +17.60 3.	grey, dense; me to rounded. Col (NON-ENGINE) SILT; dark brow Clayey SILT; or moist. (SPRING) Sandy medium brownish grey; subrounded to 150mm/200mm	angish brown with grey mottling; version FORMATION) to coarse GRAVEL with some coblimoist. Sand, fine to coarse. Gravel rounded. Cobbles max intermediate.	with the state of				0.9m: Not tested	9	P= 154 R= 37 P= 167 R= 31
SKETCH,		SAMPLES AND TESTIN Grab Sample (Disturbed)		GROUNDWA		SITE MAR 12210	TP 2 (203	WS211	1 1:5

2	RI	ULTANTS	RILEY Consultants evel 2, 22 Moorhouse Ave Addington, Christchurch, 802 Fel: +64 3 379 4402 Fax:							TES	T PI	T LOG	;
Proje Geot	ech As		esource Consent Start Date: 10-	Location: 578-606 S						Site Plan			lo.:
	190)417	Finish Date: 10-		21	.2m				N 5,174,19	6.7		
<u></u>		t Group Hole	dings Ltd	Summersel		Depth: 0 m						Sheet: 1	of 1
the Elevation (B) NZVD2018	Depth (m)	(refer to	Geological Descrip separate Geotechnical a nation sheet for further in	nd Geological	Legend	Field Stren	6	Sca (t	ala Penetro blows / 50 i	mm)	Samples + Lab Testing	Fie Test Res	ing 🖺
+21.00	0.20	SILT with minor Organics, rootle	organics; dark brown; "fi ets. (TOPSOIL)	irm to stiff"; moist	. (<u>\lambda //</u>			1				No. 1 1, 1, 2, 2, 2, 3,	
+17.70	-1 -1 2 3 3 44.00	dense; moist. C FORMATION) Sandy medium brownish grey;		some cobbles;	X						0.7m: Not tested	4, 5, 4, 4, 3, 4, 3, 10, 10 No. 2 10, 8, 9, 7, 7, 6, 8, 8, 6, 7, 7, 6, 8, 8, 6, 7, 7, 4	P= 139 R= 65
		HC 								SITE MAP	wszRd304	4	
									-i	BH201	TP201 WS208	8	WS211
 -					1					209 HA201	HAZO6 TPZC	TP202	0 m 50 m 100 m 1:5,000
Shorin Stabili	ıg/Suppo	rt: e	SAMPLES AND Grab Sample (I		X	GROU None	JNDWA		Remar		handheld CE	OS and cubicat to	
Shorin Stabili		m → I	Bulk Sample (C V Scala Penetron Insitu Vane She P: Peak; R: Re: UTP: Unable to Lab Testing: PS OMC: optimum max dry density	Disturbed) neter (blows/50r ear Strength (kP sidual;	dist. X	Slow Seep Rapid Inflow TERMINA Target depti	TION DI	Collapse Machine limit	(27/02/20	20). th terms for cohe			st results, indicated
All d		ons in metre e 1:50	S Contractor: Taggart Earth	moving Ltd			/Plant chine E	Used: Excavator ((13 tonne	e)		Logged by: DDH	Checked by AVD

		ddington, Christchurch, 802 al: +64 3 379 4402 ax:	4					ì			
	ssessment Re	esource Consent	Location: 578-606 Spri				Hole position	ite Plan			0.:
Job No.: 19	0417	Start Date: 15- Finish Date: 15-		23.4m			(NZTM2000 0,426.4 N		.2	IP.	204
Client: Summerse	et Group Holdi	ngs Ltd	Summersel	Hole De _l 5.10 m						Sheet: 1 of 1	
Elevation (B) NZVD2016 Depth (m)	(refer to se	Geological Descrip eparate Geotechnical a ation sheet for further in	ind Geological	<u>&</u>	Il Rock	Sconnowater (Country Sconnows)	cala Penetromo (blows / 50 mn		Samples + Lab Testing	Fiel Testi Resu	ng g
+20.90 2.50 +20.75 2.65 	SILT; light yellowi plasticity index. (\$	ht yellowish brown; dry. lar to rounded. (NON-E ; "soft"; dry. (BURIED T ish brown; "very stiff to I SPRINGSTON FORMA	NGINEERED FILL). **OPSOIL) hard"; dry; low	\(\text{\frac{1}{2}} \) \(\text{\frac{1}} \) \(\text{\frac{1}{2}} \) \(\text{\frac{1}} \) \(\text{\frac{1}} \) \						No. 1 0, 1, 1, 1, 2, 4, 4, 4, 4, 4, 4, 4, 4, 5, 5, 4, 3, 4, 5, 5, 5 No. 2 6, 6, 4, 3, 4, 4,	
+18.30 -5 5.10	Gravel, fine to co- coarse.	with minor cobbles; brovarse; subrounded to rou	wnish grey; moist. unded. Sand, fine to	0.0						♥ 5, 4, 12, 18	
F											
SKETCH/		-		N. M. W.	W. 100 0		SIT	E MAP			
SKETCH/							SIT SIT	Н	A205 TP205		
SKETCH/ 								H 3 VS2 ^{Rb} 204 H-C210		TP204	0
SKETCH/ 								NS2801204	TP205	TP204	50
SKETCH/	ole om ————————————————————————————————————	 Insitu Vane She P: Peak; R: Res UTP: Unable to Lab Testing: PS OMC: optimum 	Disturbed) Disturbed) neter (blows/50mm) ear Strength (kPa): sidual;	Rap	w Seep 💆	Water Strike Water Rise Time (minutes)	TP208	P201 WS208 Ps based on h Elevation basenarks.	andheld GPS seed on data fr	TP204	100 1:5,0 survey rveying t results, indica

2	CONS	LEY ULTANTS	RILEY Consultants Level 2, 22 Moorhouse Ave Addington, Christchurch, 802 Fel: +64 3 379 4402 Fax:						TI	EST PI	T LOG	G	
Proje Geot		ssessment R	esource Consent	Location: 578-606 Sp	rings Ro	oad, Prebl	oleton		Hole position: Refer to Site P	lan	N	No.:	
Job N		0417	Start Date: 15- Finish Date: 15-		und Leve	•	200766-)0		(NZTM2000): 0,378.6 N 5,17	4.447.5	TP205		
Clier Sun		et Group Hole	dings Ltd	Summerset		Depth:			.,	-,,	Sheet: 1 of 1		
Elevation Structure By NZVD2016	Depth (m)	(refer to	Geological Descript separate Geotechnical a mation sheet for further in	nd Geological	Legend	Field Streng	· 6		ala Penetrometer blows / 50 mm) 6 9 12 15	Samples + + + Carting 18	Fie Tesi	ting 🖺	
+21.40 +21.10 +19.50 +18.60	- - - - -	SILT with trace moist. (BURIED SILT with some with grey mottlin index. (SPRING SILT)	sand and minor clay; ligh ng; "very stiff to hard"; mc STON FORMATION)	iff to very stiff"; nt orangey brown plasticity	X					3.7m: Grading plasticity index	No. 1 1, 2, 3, 4, 3, 4, 4, 4, 4, 5, 6, 7, 5, 5, 5 No. 2 6, 5, 9, 21		
	A	m	 ✓ Insitu Vane She P: Peak; R: Re UTP: Unable to Lab Testing: PS OMC: optimum 	Disturbed) Disturbed) Ineter (blows/50mn ear Strength (kPa) sidual; Ineter entrate Disturbed: Distu	sst. X	None Slow Seep Rapid Inflow TERMINA Target depth Refusal	TION DI	/ater Strike /ater Rise ime (minutes)	Remarks 1. Coordinates bas confirmation. Eleve (27/02/2020). 2. Strength terms f in quotation marks 3. Test pit starts with	HA205 TP204 /S208 sed on handheld Gation based on dat or cohesive soils by	WS209 WS211 WS211 SPS and subject to a from Graham Subased on Scala termana	st results, indicate	
All d		ons in metre		y; Disp: dispersivit moving Ltd	<u>y </u>	Rig	/Plant	Used:	(13 tonne)		Logged by:	Checked by	

2	RI	ULTANTS	RILEY Consultants evel 2, 22 Moorhouse Ave Addington, Christchurch, 802 Fel: +64 3 379 4402 Fax:								7	ES	T PI	T LOG	;	
Proje Geot	ech As	sessment R	esource Consent Start Date: 15-	Location 578-606 06-20	Spring	*			n Ordinate	Refe	position er to Site				o.: 206	
Clien)417	Finish Date: 15-			21.6 lole D	m					5,174,452.1 Sheet:				
Sum		t Group Hole	dings Ltd	Summerse		3.40 r						ı		1	of 1	
្នុំ Elevation ខ្លាំ NZVD201	Depth (m)	(refer to	Geological Descrip separate Geotechnical a mation sheet for further in	nd Geological	I	ege.	ield Streng	gth	o onlindwater of onli		enetromete / 50 mm)		Samples + Lab Testing	Fie Test Res	ing	Instrument/ Backfill
+21.40	0.20		with minor organics; dark bavel, fine to coarse; angulets. (FILL)		ı. ' /	× × ×							,	No. 1 1, 3, 4, 3, 4, 3, 3, 2, 2, 1, 1, 2,		
+20.80	- - - - - 1 -	Organics, rootle	organics; dark brown; "vets. (BURRIED TOPSOIL; ; sandy fine to medium G e to coarse.).	11.	× ^ × · · · · · · · · · · · · · · · · ·							0.5m: Grading 1.0m: Not tested	1, 1, 1, 2, 2, 2, 2, 2 No. 2 2, 2, 2, 4, 1, 2,	P= 102 R= 28 P= 123 R= 32	
+20.10	- 1.50 - -	SILT with some	sand; light yellowish brov	wn; very stiff; ı N)	moist.	× ×		 					Not tested (3, 4, 4, 3, 2, 5, 4, 4, 3, 4, 7,		
+19.70	1.90 - 2 -	Fine to medium moist.	SAND; medium brown; r	medium dense		× 0 0 0					· — — — — — — — — — — — — — — — — — — —			10, 20		
	-	Sandy SILT; ora moist.	angey brown with grey mo	ottling; "very s	stiff";	0.0										
+18.20	- -3 - - - - 3.40	Gravel, fine to o	with some cobbles; brow coarse; sunbrounded to robles max intermediate/lon n.	ounded. Sand	d, fine	000										
	-	END OF HOLE	@ 3.40m													
+18.20																
	-5 - - - - - - -					 		 				 				
SKE	гф									 	SITE	MAP		1		
SKE*	_++_+										- - -	EH	TP20 EHSC215 SC214 BH		HA205	N
 							A.	100	1		HA20 TP207	3	BH201	WS2F07204 EHSC210		0 m
 					1	A STATE OF				└	H.	TP210	BH	TP201 WS208		100 m
Shorin	g/Suppo		SAMPLES AND		4 41.5	XN	GROU lone	INDW	ATER		marks					1:5,000
Stabilii	<u>Y:</u> Stabl — 3.5□ — A — H	e m 	Grab Sample (I Bulk Sample (D Scala Penetron Insitu Vane She P: Peak; R: Res UTP: Unable 10	oisturbed) neter (blows/sear Strength (sidual; penetrate	(kPa):	S	slow Seep Rapid Inflow TERMINA	, ⊈ TION [(27/ 2. S	(02/2020).	s for cohes		S and subject to from Graham Su sed on Scala tes		ndicated
Shorin Stabilii	<u>N</u> C		Lab resurig. Po	moisture cor	nt.; MDD:	=	arget depth		Collapse Machine lir	nit						
All di		ons in metre e 1:50	S Contractor: Taggart Earthr	moving Ltd	d				t Used: Excavato	or (13 to	onne)			Logged by: DDH	Check A\	ed by: VD

2	RII	LEY LE	RILEY Consultants evel 2, 22 Moorhouse Ave ddington, Christchurch, 802 si: +64 3 379 4402 ax:							ST PI	T LOG)	
Project Geote		ssessment Re	esource Consent	Location: 578-606 Spr	ings R	Road, Preb	bleton		Hole position: Refer to Site Plan	1		lo.:	
Job No)417	Start Date: 16- Finish Date: 16-			vel (NZVE .4m	0200166		(NZTM2000): 0,140.8 N 5,174,3	343.5	TP	207	
Client Sumr		t Group Hold	ings Ltd	Summersel		Depth: 0 m	· ·				Sheet:	of 1	
Elevation	Depth (m)	(refer to s	Geological Descrip eparate Geotechnical a ation sheet for further in	nd Geological	Legend	Field Stren	Ĭ 1	Sc. (cala Penetrometer (blows / 50 mm)	Samples +	Fie Test	ld ing ults	Instrument/ Backfill
+19.40	22.00 2.15 33.00 44.00	SILT with trace of rootlets [BURIED] SILT with some svery stiff; moist; I	gravel minor cobbles and by. Gravel, medium to de N-ENGINEERED FILL). Irganics; "firm"; moist; da TOPSOIL]. (BURIED TOPSOIL]. (BURIED TOPSOIL). (BURIED TOPSOIL). (SPRINGSOFT). (SPRING	ark brown. Organics OPSOIL) wn with grey mottling STON FORMATION,	× × × × × × × × × × × × × × × × × × ×					2.2m: Not tested	No. 1 1, 2, 2, 3, 2, 3, 4, 5, 4, 4, 5, 4, 4, 3, 4, 3, 4, 2, 2, 2, 2, 2, 2, 2, 2, 2, 2, 2, 3, 3, 3, 2, 2, 2, 2, 2, 2, 2, 2, 2, 2, 2, 2, 2,	P= 182 P= 134 PR= 25	
Sket		е	 Insitu Vane She P: Peak; R: Res UTP: Unable to Lab Testing: PS OMC: optimum 	Disturbed) Disturbed) Disturbed) Disturbed) Disturbed Di	st. X	None Slow Seep Rapid Inflov TERMINA	v ½ 1	Vater Strike Vater Rise Fime (minutes)	Remarks 1. Coordinates based of confirmation. Elevation (27/02/2020). 2. Strength terms for or in quotation marks. 3. Test pit starts within	A203 07 HA202 TP210 HA204 TP220 on handheld Gibased on data	PS and subject to a from Graham Su ased on Scala tes	WS208 SURVEY SURVEY SURVEY STREET SURVEY STREET STREET	0 m
All dir		ons in metres le 1:50	Contractor: Taggart Earthr	moving Ltd				Used: Excavator	(13 tonne)		Logged by: DDH	Checked AVD	

2	RI	LEY ULTANTS and Greengans	RILEY Consultant Level 2, 22 Moorhouse Ave Addington, Christchurch, 802 Tel: +64 3 379 4402 Fax:						TES	ST PI	T LOG	;
Proje Geot	tech As	ssessment	Resource Consent Start Date: 16-	Location: 578-606 Sp 06-20 Gro			_		Hole position: Refer to Site Plan (NZTM2000):			lo.: 208
Clier	190)417	Finish Date: 16-		22.9		20.07		0,263.5 N 5,174,47	Sheet:	200	
Sun		t Group Ho	ldings Ltd	Summersel	5.00							of 1
Elevation	Depth (m)		Geological Descriposeparate Geotechnical automation sheet for further in	nd Geological	Legend	Field Streng	_ Ę		ala Penetrometer blows / 50 mm) 6 9 12 15 18	Samples +	Fie Test	ting 🗒
+20.40 +20.25 +19.90 +18.80	- - - - - -	SILT with trace TOPSOIL) SILT with son "firm"; moist. (Fine SAND; growards base Sandy medius brownish grey	n to coarse GRAVEL with r; moist. Sand, fine to coars rounded. Cobbles max ir m.	m"; moist. (BURIEI wn with grey mottlin DN) ————— moist. Becoming si ————— some cobbles; se. Gravel,	g; ×						No. 1 1, 1, 1, 2, 1, 1, 2, 1, 1, 1, 2, 1, 4, 4, 6, 7, 5, 5 No. 2 6, 8, 11, 10, 9, 9, 9, 5, 6, 9, 7, 9, 10, 16, 18	F
	TCH/P		SAMPLES ANI Grab Sample (Bulk Sample (Disturbed) Disturbed)		None GROU Slow Seep	₹ W		Remarks 1. Coordinates based or confirmation. Elevation I (27/02/2020).		WS2RH204 EHS 210 TP201 WS208 PS and subject to a from Graham Su	
Shorir Stabili	A N C	m → I E 3.	Insitu Vane Sh P: Peak; R: Re UTP: Unable to Lab Testing: P: OMC: optimum max dry densit		ist. X	Rapid Inflow TERMINA Target depth Refusal	, ½ Ti TION DL	me (minutes) JE TO Collapse Machine limit	Strength terms for colin quotation marks. Test pit starts within be			d level.
		e 1:50	Taggart Earth	moving Ltd					(13 tonne)		DDH	AVD

2	RI	LEY Le	ILEY Consultants vel 2, 22 Moorhouse Ave Idington, Christchurch, 802 II: +64 3 379 4402 IX:										ES	ΓPI	T LOG	; 	
Proj Geo		ssessment Re	source Consent	Location: 578-606		ıs Road	d, Prebb	leton	1			osition: to Site F	Plan			lo.:	_
Job		0417	Start Date: 16- Finish Date: 16-		Ground	Level 23.0m	(NZVD2 1	200166				2000): N 5,17	74,219.	.1	TP	209	
Clie Su		et Group Holdi	ngs Ltd	Summerset		lole De 5.60 m									Sheet:	of 1	
Elevation Rn NZVD2016	Depth (m)	(refer to se	eeological Descripe parate Geotechnical a ation sheet for further in	nd Geological		Э <u>е</u>	eld Streng	1 1	0		lows / 5	etrometer 0 mm)	18	Samples + Lab Testing	Fie Test Res	ing	Instrument/ Backfill
+21.00 +20.80 +20.00 +18.40	22.00	SILT with minor of Organics, rootlets SILT; mottled greplasticity index. (\$ SILT with some s moist. Sand, fine	organics and gravel; me as. Gravel, fine to medic in GINEERED FILL). organics; dark brown; "fines, (BURIED TOPSOIL) organics	rm to stiff"; dry. ry to moist; low TION)	g axis	×								2.5m: Not tested 3.0m: Grading ar compaction	No. 2 No. 2 8, 7, 12, 15, 15	P= 169 R= 40 P= >216	
+17.40	5.60	END OF HOLE (@ 5.60m			0 1	<u> </u>										100
SKE	TCH/P	HC	AN SI				1 7 mg	100		_		SITE N	IAP HA203	3	W: EH	S2PH204 C210	ł
*17.40 *17.40 SKE	- - - - 	-	ANT -						- + - - + -	- - - -	-		TP207	4202	BH201 TP	201 WS208	Ň
	- + - - 					1	100		_ + -	- -			HASO	TP210	BH202		
	- -							4		_ <u> </u> - _			HA20	TP <u>2</u> 0:	9 HA201	HA206	0 m
	- 					1			 	- -	-i			•		TP203	50 m
	_		· V		1			4	_	<u> </u>					TPRA207		100 m
		Mark Sala	OAMPI FO AN	TECTIO			CPOU	NDWA	TED								1:5,000
Stabi	ing/Suppo lity: Stabl	е	SAMPLES ANI Grab Sample (I Bulk Sample (I Scala Penetron Insitu Vane She P: Peak; R: Res UTP: Unable to Lab Testing: PS OMC: optimum max dry density	Disturbed) Disturbed) Disturbed) Disturbed) Disturbed) Disturbed D	(Pa): ze dist. t.; MDD:	Ra X Ta	GROUI ne ow Seep pid Inflow ERMINAT rget depth fusal		Water Stri Water Ris Time (min	se iutes)	confirm (27/02/ 2. Strei in quot	rdinates banation. Elev (2020). ngth terms ation mark	ation base for cohesi s.	ed on data ive soils ba	PS and subject to from Graham Su ised on Scala tes ve natural groun	rveying t results, i	ndicated
All		ons in metres le 1:50	Contractor: Taggart Earth	moving Ltd					t Used: Excava		13 ton	ne)			Logged by: DDH	Check A\	ed by /D

2	RII CONSI	LEY LA	RILEY Consultants evel 2, 22 Moorhouse Ave ddington, Christchurch, 802 sl: +64 3 379 4402 ax:	4							T PI	T LOG)	
Proje Geof		ssessment Re	esource Consent	Location: 578-606 Sprii					Hole position	ite Plan			lo.:	
Job N)417	Start Date: 16-6 Finish Date: 16-6		nd Level (23.4m	NZVD200	16)Or		NZTM2000 ,190.1 N		.2	TP	210	
Clier Sun		t Group Hold	ings Ltd	Summersel	Hole Dep 5.00 m	th:						Sheet: 1	of 1	
E Elevation	Depth (m)	(refer to s	Geological Descrip eparate Geotechnical a ation sheet for further in	nd Geological	g	d Strength	Groundwater		la Penetromo lows / 50 mn		Samples + Lab Testing	Fie Test Res	ing	Instrument/ Backfill
+21.90	- - - - - 1 - 1.50	SILT with some of (NON-ENGINEE	organics; medium brown RED FILL).	; dry.								No. 1		
+21.30	- 2 2.10 	very stiff" with de	trace organics; dark broughth; moist. Organics, roo	otlets. FILL vn with grey mottling;	× × × × × × × × × × × × × × × × × × ×							1, 1, 1, 3, 3, 4, 5, 6, 6, 6, 3, 3, 2, 2, 3, 3, 3, 3, 2, 3 No. 2 4, 8, 4, 5, 12, 12	P= 200 R= 52	
+19.40	44.00	Sandy medium t brownish grey; n subrounded to re		some cobbles; ie. Gravel,	× × × × × × × × × × × × × × × × × × ×							▼ 19, 19, 20		
	TCH/P									HA22	13 1A202 TP210	BH201 TP	201 WS208 HA206 TP203	0 m 50 m 1:5,000
	ng/Suppo ty: Stabl — 4.0 A — A V	е	 Insitu Vane She P: Peak; R: Res UTP: Unable to Lab Testing: PS OMC: optimum 	Disturbed) visturbed) neter (blows/50mm) ear Strength (kPa): sidual;	Rapi	d Inflow Seep RMINATIO et depth	Wate Wate Time N DUE	er Strike er Rise (minutes)	confirmation. (27/02/2020) 2. Strength to in quotation i	es based on has Elevation bas erms for cohes marks.	sed on data sive soils ba	'S and subject to from Graham Su sed on Scala tes ve natural groun	rveying et results, in	ndicated
All d		ons in metres e 1:50	Contractor: Taggart Earthr	moving Ltd		Rig/Pl Machi			13 tonne)			Logged by: DDH	Check A\	ed by

Job No.: 1904 Client: Summerset (a) Logo Job Job Job Job Job Job Job Job Job Jo	417 t Group Ho (refer t Info	Start Date: 16-06-20 Grou	Hole E 2.60	epth:	ates (N 1,560,	254.0 N 5,174,17		TP Sheet:	of 1
1904 Client: Summerset ((a) (a) (b) (b) (d) (c) (d) (d) (d) (d) (d) (d) (d) (d) (d) (d	t Group Ho (refer t Info	Finish Date: 16-06-20 oldings Ltd Geological Description to separate Geotechnical and Geological ormation sheet for further information) me gravel and minor organics; brown; dry. o coarse: subangular to rounded. Organics.	23.0 Hole E 2.60	m E 2 Depth: m Field Strength	1,560, Scal	254.0 N 5,174,17		Sheet:	
Summerset (w) Hade Control Hade Control Hade Control Hade Control Hade Ha	(refer t Info	Geological Description to separate Geotechnical and Geological ormation sheet for further information) the gravel and minor organics; brown; dry. o coarse: subangular to rounded, Organics.	2.60 puag	Field Strength			les	1 .	of 1
+21.60 1.40 str	SILT with som	to separate Geotechnical and Geological ormation sheet for further information) me gravel and minor organics; brown; dry, o coarse: subangular to rounded, Organics.	Legend	Field Strength Soil Rock Soil Rock Soil Rock Soil Rock Rock			les	<u> </u>	
+21.60 1.40 str	Gravel, fine to	coarse: subangular to rounded. Organics.		0 0		ows / 50 mm)	Samples + ab Testing	Fiel Testi Resu	ing 🖁
+20.40					3 6	9 12 15 18	_	1	
-3	SILT with som tree roots. (FII	ne organics; dark brown; moist. Organics, sma LL)							
SREIC + + +	END OF HOL	LE @ 2.60m							
-						SITE MAP HA203 TP207 HA202 HA204 HA204) LIA 20	W\$28d1204 EH\$2210 TP201 W\$208 01 HA206 TP203	TP202 ⁰ 50 1:5,(
Shoring/Support: Stability: Stable 3.0m A D 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 dison.	st.	GROUNDWATER None Water St Water St Water Ri Rapid Inflow TERMINATION DUE TO Target depth Collaps Refusal X Machine	se nutes) e	Remarks 1. Coordinates based on confirmation. Elevation b (27/02/2020). 2. Test pit starts within br 3. Excavator broke down 4. Hand auger TPHA211 to excavator breakdown.	und 1.4m abo	ove natural ground	survey rveying d level.

2	CONSI	ULTA and Ge	NTS T	RILEY Co evel 2, 22 Moo addington, Chris fel: +64 3 379 fax:	rhouse Ave stchurch, 80	24								D	Αl	JG	ER L		
	ech As	ses	sment Ro	esource C			06 Spri	ngs Roa				Refer	osition: to Site Pl	an				lo.:	
Job N)417	•	Start Da Finish D			Groui	nd Level 21.0	•	/D20 36 }		ates (NZT 60,252.5	M2000): N 5,174	1,223	3.7		HA	201	
		set C	Group Ho	oldings Ltd	d	Summer	rset	Hole D 0.25 r									Sheet: 1	of 1	
Elevation By NZVD2016	Depth (m)	Geological Unit	(refe Ir	Geologic r to separate nformation sh	Geotechni	cal and Geo	ological ion)	Legend		near Stre (kPa)			netrometer 50 mm) 9 12	Groundwater	Soil Moisture	Samples	Tes	sts	Instrument/ Backfill
+20.85	0.15		SILT with r moist. Gra (TOPSOIL	minor gravel a vel, medium;)	and organi rounded.	cs; dark bro Organics, ro	wn; "firm"; ootlets.	/ <u>*</u> ·×									No. 1 1, 2, 3, 4, 4, 4, 3, 4, 5, 6, 7, 7,		
20.73	-		Sandy SIL to moist. G FORMATION	T with trace of Gravel, mediu ON)	ıravel; darl m; rounde	k brown; "ve d. (SPRING	ry stiff"; di STON	у									8, 8, 7, 7, 9, 6, 7, 7		N. S.
	-		EOH @ 0.	25 m															
	- - -1										 	\\	1.00m	 			No. 2 8, 6, 6,		
-	-																5, 4, 4, 4, 4, 4, 4, 4, 4, 5, 6, 5, 4, 4, 4, 4, 4		
	-																		
	-													 					
	-2 -)			2.00m				V		
	-													 					
	-																		
	- - -3													 					
	-																		
	-											 	 						
<u> </u>	anatio		neter - blows	s/50mm •	Small Dis	turbed Sam	ple		NDWATE				Remar		20004	an han	idhald CDC ai	ad aubiaat	
Ť P ▼ S ∨ Ir	ermeabi schmidt F nsitu Van	ity Te lamm e She	st	(kPa) 1	Large Dis U100 Und Water Str	turbed Sam listurbed Sa ike (1st, 2nd	iple imple d)	Slo	-	ntered (depth) v (depth)		survey co Surveying	nfirma (27/0 h term	ition. E 2/2020 ns for o	Elevatio 0). cohesiv	idheld GPS ai on based on d re soils based marks.	ata from G	raham
to Soil N	penetra Moisture:	te	W = wet; S =	$\bar{\underline{\underline{\zeta}}}$		se (1st, 2nd e (minutes)) and	HOLE 1	ERMINA	XTED DU	E TO:	Collapse							
All di	mensi Scal		in metres 20	Contra	actor:					g/Plant L nd Auge		m				T	ogged by:	Checke	

2	RI	ULTA	NTS	RILEY Co Level 2, 22 Moo Addington, Chris Tel: +64 3 379 Fax:	orhouse Ave stchurch, 802							HAN	D .	AU	GE	ER L	OG	
Proje		200		lesource C	Consent	Locatio		nas Roa	d, Prebbl	eton		osition: to Site Pla	an			N	lo.:	
Job N	lo.:)417		Start Da	ite: 08-	06-20			(m NZVI	020 06) Ordi	inates (NZ					HA	202	
Clien	t:			oldings Ltd		Summer	rset	Hole Do	epth:		1,000,170	1 10 0,17 4	,010	·-•	S	Sheet: 1	of 1	
Elevation (gn NZVD2016)	Depth (m)	Geological Unit	(refe	Geologic er to separate nformation sh	Geotechnic	cal and Geo	ological tion)	Legend	(F	ar Strength (Pa)		netrometer / 50 mm) 9 12 1	വ Groundwater	Soil Moisture	Samples	Tes	sts	Instrument/ Backfill
+21.40	- 0.20	(TOPSOIL)	SILT with Organics,	minor organic rootlets. (TOF	cs; dark bro PSOIL)	wn; "soft"; c	dry to mois	t. <u>// /</u>	,		1	9 12 1				No. 1 0, 1, 1, 1, 3, 2, 3, 3, 2,		
	-	(SPRINGSTON FORMATION)	SILT; ligh (SPRING	t yellowish bro	own; "stiff to ATION)	very stiff";	dry.	× × × × × × × × × × × × × × × × × × ×								2, 2, 4, 4, 3, 4, 6, 6, 5, 6, 4	UTP	
+20.70	0.90		EOH @ 0	.90 m				X				1.00m			•	No. 2 3, 4, 4, 4, 4, 4, 2, 2, 2, 3, 2, 3, 3, 2, 3, 3, 3, 2, 2, 6		
	- - 2 - - -											2.00m			,			
	- - - - 3 - -																	
	-											 						<u></u>
▼ S ▼ S ∨ Irr ∨ to	Permeabi schmidt h nsitu Var /=Peak, l o penetra Moisture:	netron lity Te lamm e She R=Res	er ear Strength sidual, UTP	n (kPa)	Large Dist U100 Und Water Stri	urbed Sam urbed Sam isturbed Sa ke (1st, 2nd e (1st, 2nd (minutes)	ample	X No Slo	IDWATER of Encounter of Seep (control of Inflow FERMINAT of depth X	ered lepth) (depth) ED DUE TO	: Collapse	survey con Surveying	ates b firmat (27/02 terms	tion. El 2/2020) s for co	evation). ohesive	held GPS ar based on di soils based narks.	ata from G	Graham
		ons	in metre	= saturated Contra	actor:				Rig/f	Plant Used: I Auger 70		<u> </u>			Lo	ogged by: DDH	Check A\	

Proje	CONSI	ULT/	NTS A	evel 2, 22 Moorhouse A addington, Christchurch, fel: +64 3 379 4402 fax:		on:				Hole r	HANI	D A	AU(GER L	No.:	
•	ech As	ses	sment Re	esource Conser		<u> </u>		d, Prebbl	eton 02 <mark>036)</mark> Ordi	Refer	to Site Pla	n			A203	
יו טטן)417	7	Finish Date: 0		Gioui	21.90	<u> </u>	E 1	,560,152.4	N 5,174,	360.	9	П	4203	
$\overline{}$		set (Group Ho	ldings Ltd	Summer	rset	Hole Do							Sheet: 1	of 1	
Elevation By NZVD2018	Depth (m)	Geological Unit	(refe In	Geological De r to separate Geotech formation sheet for fu	nnical and Geo	ological tion)	Legend	(F	ar Strength (Pa)		netrometer / 50 mm) 9 12 1	Groundwater	Soil Moisture	Te	ests	Instrument
21.70	- 0.20	(TOPSOIL)	SILT with r Organics,	minor organics; dark t rootlets. (TOPSOIL) (orown; "soft"; r TOPSOIL)	moist.	<u>// //</u>							No. 1 0, 1, 1, 1, 1, 3, 3, 4, 4, 5, 3, 3,		ON CONTRACT
21.50	- 0.40		SILT; med FORMATIO	ium brown; "very stiff' ON)	'; moist. (SPRI	INGSTON	× × × ×							3, 6, 3, 2, 2, 3, 2, 2		STATE OF THE PARTY
	-		Silty fine S dense; mo	AND; light yellowish t	orown; mediun	m dense to	X								∕ ИТР	STATE STATES STATES
20.80	1 1.10 -			edium SAND with somense; moist.	— — — — ne silt; orangey	— — — y brown;	- × · · · · · · · · · · · · · · · · · ·				1.00m			No. 2 2, 2, 3, 2, 2, 2, 2, 3, 2, 2, 2, 2, 2, 2, 2, 2, 2, 2, 1, 2		STATE STATE STATES
20.00	- - 1.90		SILT with s mottling; "s	ome sand and clay;	———— orangey browr t. Sand, fine.	— — — n with grey	- × × × ×				2.00m			No. 3 2. 2. 3.		
19.60	- - 2.30						× × × ×							2, 2, 3, 3, 4, 12, 18		DY DY DY
			ЕОН @ 2.	30 m				1			2.35㎡			V		
	- -3 -															
	-								 	 						
F S S S S S S S S S S S S S S S S S S S	Permeabi Schmidt F nsitu Van	netror lity Te lamm e She R=Re		Large DU100 U(kPa) Water S	Disturbed Sam Disturbed Sam Indisturbed Sa Strike (1st, 2nd Rise (1st, 2nd me (minutes)	ample d)) and	X No Slo Rap	_	ered epth)	_	survey conf Surveying (2. Strength results indic	tes ba firmation 27/02/2 terms cated in	on. Elev 2020). for cohe n quotat	handheld GPS a ation based on o esive soils base ion marks. at 2.3m depth.	data from Gra	aha
		ons	W = wet; S =	Ta		[[Plant Used: I Auger 70		<u> </u>			Logged by	Checke	

Proje	CONS	ULT/	Y L	RILEY Con evel 2, 22 Moorl ddington, Christ el: +64 3 379 4 ax:	house Ave church, 802		on.						Hole	H/ positi		D .	Αl	UG	ER L	OG	
Geot	ech As	ses	sment R	esource C		578-6	06 Spri	ings Roa					Refe	r to S	ite Pla	n					
Job N)417	7	Start Dat Finish Da			Grou	nd Level 21.6	0						5,174,	,250	0.3		ПА	\204	
		set (Group Ho	ldings Ltd		Summer	rset	Hole D 0.55 r	-										Sheet: 1	of 1	
the Elevation	Depth (m)	Geological Unit		Geologica r to separate Offermation she	Geotechnic	al and Geo		Legend	Soil 5	(kP	Strengtha)	"		enetror : / 50 m		Groundwater	Soil Moisture	Samples	Te	sts	Instrument/ Backfill
+21.35	- 0.25 -		Organics, SILT; med	minor organics rootlets. (TOP: ium yellowish l STON FORMA	SOIL) brown; "sti			× × ×	,										No. 1 0, 1, 1, 1, 3, 3, 2, 2, 3, 3, 2, 4, 6, 5, 5, 3, 2, 3, 3, 2, 3,		
+21.05	0.55 - - -		EOH @ 0.	55 m				×													
	1 														1.00m				No. 2 3, 3, 4, 2, 2, 2, 2, 2, 2, 3, 2, 2, 3, 3, 3, 2, 3, 2, 2, 3		
	- - -																				
	- -2 - -											+			2.00m				V		
	- - - -																				
	-3 - - -													 							
Expl	anatio	ns:						GROUN	NDW <i>A</i>	TER				Re	emark	s			<u> </u>		
F S S S S S S S S S S S S S S S S S S S	Permeabi Schmidt H nsitu Var /=Peak, I o penetra Moisture:	lity Te Hamm le She R=Re ate	er ear Strength sidual, UTP:	(kPa) 1 =Unable 1	Large Dist U100 Undi Water Stril	urbed Sam urbed Sam sturbed Sa ke (1st, 2nd e (1st, 2nd (minutes)	ple imple d)	X No Slo	ot End ow Se pid In FERM	countered ep (dep flow (de INATEI	oth)	_	ollapse	1. C surv Sur 2. S resi	Coordina vey conf veying (Strength	ites b firma 27/0: term	ition. 2/202 is for	Elevati 20). cohesi	indheld GPS a ion based on d ive soils based n marks.	ata from (Graham
		ons	W = wet; S : 	Ta .	ctor:					Rig/Pla	ant Used	<u></u> I:		_					Logged by	Check	ed by

Proje	CONS Legiseeri	ULT/	ANTS	evel 2, 22 Moo ddington, Chri el: +64 3 379 ax:	stchurch, 80		on:					Hole i	HAN	ID	Αl	JG	ER L	OG	
Geot		ses	sment R	esource (Start Da			06 Sprii Grour						to Site P TM2000):					205	
Clien	190)417	7	Finish D				21.3 Hole D	0				7 N 5,17		2.2		Sheet:		
Su		set (Group Ho	ldings Ltd	t	Summer	rsef	1.20	-									of 1	
Elevation On NZVD2016	Depth (m)	Geological Unit	(refe	Geologic r to separate formation sh	Geotechni	cal and Geo	ological tion)	Legend	Soil S	Shear S (kPa)			enetrometer / 50 mm) 9 12	Groundwater	Soil Moisture	Samples	Tes	sts	Instrument/ Backfill
21.15	0.15		SILT with rootlets. (1	minor organio OPSOIL)	s; dark bro	wn; "soft"; o	dry. Organi	× // //									No. 1 1, 1, 1, 4, 5, 5, 5, 5, 5, 4, 5, 4,		
20.90	0.40		SILT; dark FORMATI	brown; "very ON)	stiff"; dry.	(SPRINGS)	ΓON	× × × × ×									4, 3, 4, 4, 3, 4, 3, 3, 4, 3, 4		
	-		SILT with	some sand; li	ght orange	y brown; "ve	ery stiff"; d	ry.											
20.10	- - 1 - - 1.20												1.00m	 			No. 2 4, 4, 4, 5, 25		
	-		EOH @ 1.																
	- - - -2																		
	- - -												2.25m	 			V		
	- - -																		
	-3 -3																		
	-										 								
▼ S ▼ S ∨ Ir	ermeabi chmidt F nsitu Var	netror lity Te lamm e She R=Re		(kPa) 1	Large Dis U100 Und Water Str Water Ris	turbed Sam turbed Sam disturbed Sa ike (1st, 2nd	ample	X N	pid Inflo	untered o (depth	•		survey co Surveying 2. Strengt results in	nates onfirma g (27/0 th tern dicate	ation. E 02/2020 ns for c d in qua	levation)). cohesiventation	dheld GPS ar n based on da e soils based marks. .2m depth.	ata from G	iraham
D = d			W = wet; S	٦, ,		(minutes)	[_	et depth	n Re	efusal	Collapse				Τ.	owed by	Charl	
All di	mensi Sca		in metre: :20	Contra	acioi.						t Used: ger 70 r	mm				-	ogged by: DDH	Checke AV	

٤	CONS	ULT/	ANTS	Level 2, 22 Moorhouse Ave Addington, Christchurch, 80 Tel: +64 3 379 4402 Fax:							HAN	D A	AU	GER L	OG
Proje Geot		sses		Resource Consent	Location 578-6		ngs Roa	d, Prebblet	on		osition: to Site Pla	an		ı	No.:
Job N	lo.:)417		Start Date: 16 Finish Date: 16	-06-20			(m NZVD2	0 06)Ordii		ГМ2000): В N 5,174	,219	.0	H.	A206
Clien		set (Group H	oldings Ltd	Summer		Hole De 3.00 n	•		•	•	<u>*</u>		Sheet:	of 1
្នុំ Elevation ខ្ញា NZVD2016	Depth (m)	Geological Unit	(refe	Geological Des er to separate Geotechr nformation sheet for fur	ical and Geo	ological tion)	Legend	Soil Shear (kP	a)		netrometer / 50 mm) 9 12 1	Groundwater	Soil Moisture	Te	ests ests
+20.90	- 0.30	(TOPSOIL)	SILT with Organics, (TOPSOII	some organics, some to roots and rootlets. San L)	o minor sand d, fine to me	d; "stiff"; dry edium.	× × × × × × × × × × × × × × × × × × ×							No. 1 2, 2, 3, 3, 2, 1, 2, 2, 1, 2, 2, 2, 2, 3, 4, 5, 3, 2,	
+20.30	- - - - - 0.90	(SPRINGSTON FORMATION)	Sandy SII dry. Sand	LT; yellowish brown with I, fine to medium. (SPRI	orange mot NGSTON FO	itling; "stiff"; DRMATION	·×							2,2	
+19.60	- 1 - - - - - 1.60		SILT with "stiff"; dry	some sand; greyish bro . Sand, fine to medium.	— — — — wn with orar	nge mottling	g; × × × × × × × × × × × × × × × × × × ×				1.00m			No. 2 3, 2, 2, 3, 2, 2, 2, 2, 2, 2, 2, 3, 2, 2, 3, 2, 2, 3, 2, 3	
				edium SAND with some and orange mottling; med			y.				2.00m			No. 3 2, 1, 1, 1, 1, 1, 2, 2, 4, 4, 3, 4, 4, 4, 4, 5, 5, 4,	
	-		2.40m - 3	.00m Grades to minor s	ilt. Medium c	dense; mois	st. ::::::::::::::::::::::::::::::::::::							5, 10	
+18.20	_3 3.00		EOH @ 3	3.00 m			· . · .				3.00m 3.04m			No. 4 20	
▼ S ▼ S ∨ In	ermeabi schmidt F nsitu Var	netror lity Te lamm le She R=Re	ner ear Strength	Large Dis U100 Un n (kPa) P=Unable	sturbed Sam disturbed Sam disturbed Sa rike (1st, 2nd se (1st, 2nd e (minutes)	d)) and	X No Slor	DWATER t Encountere w Seep (depoid Inflow (de	oth) epth) DUE TO:	7	survey con Surveying	ates ba firmati (27/02 terms	ion. Elev 2/2020). s for coh	handheld GPS a vation based on o esive soils based tion marks.	data from Graha
D = d	ry; M = r	ons	in metre	= saturated Contractor:			X Targe	Rig/Pla	Refusal ant Used: Auger 70 r	Collapse				Logged by	Checked AVD

6	ONSL	JLT/	Add	ington, Chris +64 3 379	orhouse Ave stchurch, 802 4402	24						HANI	D A	AL	JGE	ER LO	OG
Project: Geotec	h As	ses	sment Res	ource C	Consent		06 Spri	ings Road		eton 20 06)Ordir	Refer	osition: to Site Pla	ın				o.: 207
Client:	190	417			ate: 16-			21.00 Hole De				N 5,174,	,169	.5		Sheet:	
Sum	mers	et C	Group Hold	ings Ltd	t	Summer	rsef	3.00 m	pui.								of 1
B NZVD201	Depth (m)	Geological Unit	(refer to	separate		ription cal and Geo er informati		Legend	(k	or Strength Pa)		netrometer / 50 mm) 9 12 1	Groundwater	Soil Moisture	Samples	Tes	ts
0.85	0.15		Gravelly fine brown; very of subrounded 30mm. (FILL	lense; dry. and suban	Gravel, fin	e to coarse	,	ish			• - • - • - • -					No. 1 5, 15, 6, 3, 3, 2, 2, 2, 3, 2, 2, 2, 3, 2, 3, 2, 2,	
0.50	0.50		SILT with sor "stiff"; dry to and rootlets.	noist. San (BURRIED	d, fine to m	edium. Orga)	brown; anics, roc	ots 1/2 1/4								2, 2, 2	
-			Sandy SILT; moist. Sand, FORMATION	yellowish b	orown with o	orange mott	— — — tling; "stiff	/ × . "; × . × . × . × .									
- -1 - - -	ı	(SPRINGSTON FORMATION)	1.20m Grade with orange r	es to SILT v	with some s d grey stair	and; yellow ning. Moist.	ish brown	× × × × × × × × × × × × × × × × × × ×				1.00m			•	No. 2 0, 2, 2, 2, 2, 2, 2, 2, 3, 3, 3, 3, 3, 3, 2, 2, 2, 4	
9.10	1.90		Fine to medit dense; moist 2.20m Grade			. — — — ·	 oose to	× · · · · · · · · · · · · · · · · · · ·				2.00m	•		,	No. 3 2, 3, 3, 2, 4, 4, 3, 4, 3, 4, 5, 5, 4, 4, 5, 5, 13	
8.00	3.00		EOH @ 3.00	m				×				3,00m	-		,	No. 4 6, 11, 12, 10	
-												3.20m					
Perr Schi V=P	la Pen meabili midt H tu Vand Peak, R enetra	etron ity Te amm e She t=Re		Pa) 1	Large Dist U100 Und Water Stri	urbed Sampurbed Sampisturbed Sampisturbed Sampisturbed Sampister (1st, 2nd e (1st, 2nd (minutes)	ple imple d)	X Not Slow Rapi		epth) depth)	_	survey conf Surveying (ites bates bates firmat (27/02) terms	ion. El 2/2020 s for co	evation). ohesive	held GPS an based on da soils based narks.	ata from Gra
D = dry;	M = m		W = wet; S = s	aturated	actor:			X Target		Refusal lant Used:	Collapse				1.	ogged by:	Checke
	ensid Scal		in metres 20	Jonia						Auger 70 r	mm					DL DL	AVI

_	Engineers and Geet	Addir Tel: Fax:	+64 3 379 44	402														ER L		
Proje Geot	ct: ech Assess	ment Reso	ource Co	onsent	Locatio		nas Ra	ad F	Prehhl	eton			position		n			N	o.:	
Job N		s	tart Dat	e: 17-0 ate: 17-0	06-20	•		el (m			Ordin E 1.5	ates (N. 560,254	ZTM20	000):		.5		TPH	A211	
Clien Su	ıt: ımmerset Gı	roup Holdi	ngs Ltd	-	Summer	sef	Hole I		า:			<u> </u>						Sheet:	of 1	
Levation ກ NZVD2016	Depth (m) Geological Unit	(refer to	separate G	al Descr Geotechnica et for furthe	al and Geol		Legend		(ŀ	ar Stre (Pa)		•	s / 50 m	ım)	Groundwater	Soil Moisture	Samples	Tes	ts	Instrument/
+22. 5 0	0.30 (nosdo)	SILT with som "Stiff" to "very roots; sand, fir (TOPSOIL) EOH @ 0.30 r	e organics stiff"; moisi ne to mediu	and minor t. Organics,	sand; blac	kish brow	n. ×	+	50 10 1		1	3 6 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7	9	12 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	5			No. 1 0. 1, 1, 1, 1, 2, 6, 18, 2, 2, 2, 2, 2, 2, 3, 4, 3, 3, 5 No. 2 6, 6, 6, 6, 10, 8, 13, 15		
F Soil M	anations: Coala Penetrome Permeability Test Cohmidt Hammer Insitu Vane Shea I/=Peak, R=Resid Io penetrate Insiture: Iry; M = moist; W	t r ır Strength (kP dual, UTP=Un	ra) 1 vable $\frac{1}{1}$ \ $\frac{1}{2}$ \ $\frac{1}{2}$	Small Distur Large Distur J100 Undis Water Strik Water Rise Rise Time (rbed Samp sturbed Sar e (1st, 2nd (1st, 2nd	nple)	S R HOLE	lot Er low Se apid I TERI	ncounte eep (c nflow MINAT		Ξ ΤΟ:	Collaps	1. C surv Surv 2. S resu 3. H due 4. R	rey con reying (trength ults, indi and au	ates b firma (27/02 term icated ger u hine	tion. E 2/202 s for o d in qu nderta break	Elevation O). Cohesion Lotation aken fr down f	ndheld GPS ar on based on da ve soils based n marks. om ground lev for TP211. e roots.	ata from Gra on Scala te	st

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Proje Geo		ses	sment Res	source C	Conser	Loca	tion: 606 Sp	orings	Roa	d, Prel	bleto	on			position or to Sit		n			N	lo.:
Job I)417		Start Da Finish D		6-06-20		ound L		(m NZ		0 (60		tes (N2 60,310			298	8 4		WS	3208
Clie		set C	Group Holo	lings Ltd	d	Sunio	tersel	Н	ole D	epth:				,-		<u>, , , , , , , , , , , , , , , , , , , </u>				Sheet:	of 1
្នុំ Elevation ទ្វា NZVD2016	Depth (m)	Geological Unit	(refer to	o separate	Geotech	scription nical and G rther inform	Seological	l	Legend	50	(kPa	Strenga)		Scala P (blows	s / 50 mi		Groundwater	Soil Moisture	Samples	Tes	sts
	-	(FILL)	Gravelly SIL to very dens to coarse sa 0.30m - 0.50 sand; brown	e; moist; gr ndstone; sa om Grades	ravel, sub and, fine to SILT v	orounded to to medium.	angular, (FILL)	fine	× ₀ × × × × × × × × × × ×						•	0.18m				No. 1 8, 10, ▼13	
+20.80	0.50	SPRINGSTON FORMATION)	SILT with min mottling. Moi (SPRINGST	nor to trace	e sand; g	reyish brow	n with ora	ange edium.	× × × × × × × × × × × × × × ×												
+20.10	- 1 - 1.20 	(SPRINC	Silty SAND/S orange mottl plastic; sand subrounded	ling. Moist; , fine to me to subangu	loose to edium; gr ular.	medium de avel, fine to	nse; sligh medium,	ntly	× × × × × × × × × × × × × × × × × × ×					- /						No. 1 2, 2, 2, 2, 2, 2, 2, 2, 2, 2, 2, 2, 2,	
	-		1.70m - 2.40 1.70m - 2.40 trace gravels	m Grades				or to	×		 					 .95m				2 V No. 1	
+18.90	-								× × × × × × × × × × × × × × × × × × ×		 									4, 4, 3, 2, 2, 2, 2, 4, 7, 31	
	-		EOH @ 2.40) m												2.45m 				'	
	-3																				
-	L														1						
▼	Permeabi Schmidt H Insitu Van	etrom ity Te lamm e She R=Res		□ EPa) 1	Large D U100 U Water S Water F	isturbed Sa isturbed Sa ndisturbed S strike (1st, 2 Rise (1st, 2r ne (minutes	ample Sample 2nd) nd) and		Slo Ra _l	IDWAT It Encou W Seep Did Inflo	intered (dept w (de ATED	th) pth) DUE T		Oall-	1. Co surve Surv 2. St resul 3. W Hand depti	ey conf eying (rength lts, indi indow s d auger	ites b firma 27/0: term cated samp	tion. I 2/202 s for d in q oling t	Elevation (0). cohesion uotation to 1.2m	ndheld GPS are the soll of the solls based on depth with pectical refusal because of the soll of the s	ata from G on Scala ercussion c
D =	dry; M = n	oist; \	N = wet; S = s	saturated				\square	ıarge	et depth	X F	ketusal	1 1	Collapse	∍						

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Proje Geot		ses	sment Res	ource (Conse		ation:		ngs Roa	id. P	rebbl	eton		- 1	•	ositio		ın			Ν	lo.:
Job N	lo.:)417	5	Start Da	ate: 1	6-06-20 6-06-20	0 0		id Leve 20.8	l (m				nates	(NZT		00):		2.2		WS	3209
Clier		set (Group Hold	ings Ltd	d	Sun	imerse		Hole D	epth	1:						, ,				Sheet: 1	of 1
Elevation By NZVD2016	Depth (m)	Geological Unit	(refer to	separate	Geotech	scriptio nnical and urther info	Geolog		Legend		(ŀ	ar Stre				netrom 50 mr	n)	Groundwater	Soil Moisture	Samples	Tes	sts
+20.65	- 0.15		CONCRETE.	(CONCR	ETE SLA	AB)			P 5	A		0 150 :				9 1	2 1:	-				
	-	(FILL)	Fine to coarse Loose; sand, smell). (FILL)	fine to me									 	1	 		 				No. 1 2, 2, 2, 4, 5, 4,	
+20.40	0.40 	(SPRINGSTON FORMATION)	SILT with son "Stiff"; sand, t (SPRINGSTO 0.50m Grade 0.70m - 0.95r	fine to me ON FORM s to brown	dium. Hy ATION) n with ora	drocarbor	n smell.	prown.	× × × × × × × × × × × × × × × × × × ×					۱۱ ۱۱ ۱۱ ۱۱مو) 						4, 3, 4, 4, 2, 1, 0, 1, 2	
+19.40	- 1 - - - 1.40		Sandy SILT; of 1.05m - 1.40r gravel; greyis gravel, fine to sandstone. 1.25m - 1.55r	m Grades sh brown v medium,	back to swith orang	some to m ge mottling	ninor sa g. "Very	nd, min	× .×							0	95m 				No. 2 Undertaker at 1m with 1m extension rod. 3, 3, 2, 2, 2, 8, 6, 7,	1
113.40	-		Fine to mediu	ım SAND ng. Dense	— — — with som e.	— — — ne silt; gre	yish bro		l. 1					į							12, 10,	
+19.10	- 1.70								× ×		 				-	1	.55m 					
	- 2 																					
	-																 <u> </u>					
Y 's		etron	neter - blows/50	Omm _		Disturbed S			GROUI		ATER					1. Co	nark: ordina	ites b	asec	on har	ndheld GPS ai	nd subje
▼ 5		lamm e She R=Re			U100 U Water S	Disturbed Strike (1st Rise (1st, 1 Rise (minut	d Samp , 2nd 2nd)	ole)	Sid	ow Se	eep (d	epth) (depth				Surve Surve 2. Str result 3. Wi Unab	ey conf eying (ength s, indi ndow :	firma 27/02 term cated samp and a	tion. 2/202 s for d in q oling auge	Elevation (20). cohesivation (1.7m)	on based on do we soils based on marks. depth with pe d 1.7m due to	ata from on Scala rcussion

Job No.: Client: Summ Loron No.: Client: Summ Loron No.: 420.85	merset ((w) 190417 (m) (covokere sive (eoological Unit () () () () () () () () () (Group Holdin Grefer to a Inform CONCRETE. (Sandy fine to a brown. Mediun subrounded to SILT with some sand, fine to me	purce Consent tart Date: 18-inish Date: 18-inish Date: 18-ings Ltd eological Desc separate Geotechnic mation sheet for furth (CONCRETE SLAB) coarse GRAVEL with m dense; sand, fine to angular. (FILL) e sand; brown with o nedium. (SPRINGSTO	off-20 off-20 ription call and Geer informa	Ground and a cological strong and a color		epth: I Soil She	020 06) Ord	nates (NZ ,560,289.	enetrometer / 50 mm)		T. T	Samples	Sheet:	6210 of 1 ts
Sumr (8) (9) (9) (9) (9) (9) (9) (9) (9) (9) (9	merset ((LIT) CONCHERE 81/8 Geological Unit 0.50 0.70	Group Holdin Grefer to a Inform CONCRETE. (Sandy fine to a brown. Mediun subrounded to SILT with some sand, fine to me	eological Desciseparate Geotechnic nation sheet for furth (CONCRETE SLAB) coarse GRAVEL with n dense; sand, fine to angular. (FILL) e sand; brown with onedium. (SPRINGSTO	ription cal and Ge er informa	cological tion)	Hole D 2.30 r	epth: I Soil She	ar Strength	,560,289. Scala Pe (blows	enetrometer / 50 mm)	Groundwater		Samples	Sheet:	of 1
Sumr (8) (9) (9) (9) (9) (9) (9) (9) (9) (9) (9	(FILL) (CONCRETE SLAB Geological Unit	Gi (refer to sinform CONCRETE. (Sandy fine to obrown. Mediun subrounded to	eological Desci separate Geotechnic nation sheet for furth (CONCRETE SLAB) coarse GRAVEL with n dense; sand, fine to angular. (FILL)	ription cal and Ge eer informa n minor silt; o medium;	rological tition)	2.30 r	Soil She	:Pa)	(blows	/ 50 mm)	Groundwater	Soil Moisture	Samples	1 0	
+20.85 - +20.85 - +20.50 - +20.50	0.15 (CONCELLE SYB) 0.50 0.70	CONCRETE. (Sandy fine to a brown. Mediun subrounded to SILT with some sand, fine to medium subrounded to sand, fine to medium subrounded to sand, fine to medium sand.	separate Geotechnic nation sheet for furth (CONCRETE SLAB) coarse GRAVEL with n dense; sand, fine to angular. (FILL) e sand; brown with o nedium. (SPRINGSTO	cal and Gener information	; greyish ; gravel,		(I	:Pa)	(blows	/ 50 mm)	Groundwater	Soil Moisture	Samples	Tes	ts
+20.85	0.15 (CONCELLE SYB) 0.50 0.70	Sandy fine to o brown. Mediun subrounded to SILT with some sand, fine to m	coarse GRAVEL with m dense; sand, fine to b angular. (FILL) e sand; brown with o nedium. (SPRINGSTO	n minor silt; o medium;	; gravel,		30 10								
+20.50	0.50 0.70	brown. Mediun subrounded to SILT with some sand, fine to m	m dense; sand, fine to angular. (FILL) e sand; brown with onedium. (SPRINGSTO	o medium;	; gravel,										
-				range mot ON FORM	tling "C+:ff	-								No. 1 7, 5, 7, 4, 3, 5, 4, 5, 3, 3, 3, 2, 3, 2	
- - - 1 - -		Sandy SILT; bi	rown. "Firm"; sand, fi		IATION)	';									
- - -				ine to med	ium	× × × × × × × × × × × × × × × × × × ×								No. 1 1, 2, 2, 2, 2, 3, 4, 10, 12, 30	
		1.35m Grades	s to "very stiff".			× × × × × × × × × × × × × × × × × × ×				1.45m				\	
+19.20	1.80		m SAND with some s	— — — silt; greyish	— — — ı brown witl	- x x x x x x x x x					 				
+18.90	2.10	2.00m Grades	to include some gra	vels.		× · ·									
+18.70	2.30		coarse GRAVEL with fine to medium; cobb								i I				
- - -		EOH @ 2.30 n	n												
-3	3														
-															
Evolor	nations					25:		1 1			1				
▼ Scala ▼ Perm ▼ Schr ∨ Insitu	meability Te midt Hamm tu Vane Sho Peak, R=Re enetrate		Large Disturbing U100 Undi	urbed Sam isturbed Sa ke (1st, 2nd e (1st, 2nd	ample ample ad)	X No Slo	_	ered epth)	: Collapse	survey cor Surveying 2. Strength results, inc 3. Strength results und from mach	ates of terms of term	ation. I 02/202 ns for ed in q ns for ken at auger.	Elevation (20). cohesion (20) uotation (20) soil layer (20) EHSC	ndheld GPS an on based on da ve soils based in marks. rers are based of 210. Approximatorded as water is	on Scala on Scala on Scala tately 5m a

Solution		CONS	ULT/	ANIS T	ddingtor el: +64 ax:			n, 8024	+													ıH	IVI	ע	H	UG	ER L	JG
September Sept	-		ses	sment Re	esour	ce C	Conse	ent				inas	Roa	ıd F	Preb	blet	on		- 1		•			ın				No.:
Explanations: Explanations: Cold Cold		lo.:			Star	rt Da	ite:	17-0	06-20)		nd l	_evel	(m				Ordii	nate	s (N	ZTM	200	0):		١ 1		W	S21 1
Solution			set (Group Ho					_		er	Н	ole D	eptl	n:					, - 10			,	,000				of 1
Explanations: Stat Temperature Concrete (Concrete SLAR)	Elevation By NZVD2018	Depth (m)	Geological Unit	(refe In	r to sep	arate	Geote	chnica	al and	Geolo	ogical n)		Legend			(kPa	a)	Ū		(blow	s / 50) mm	1)	Groundwater	Soil Moisture	Samples	Te	ests
Supplications: Solid Reveals browned and supplications Social Disturbed Sample Permediating Supplications Social Disturbed Sample Permediating Supplications Social Disturbed Sample Permediating Supplications Permediations Pe			NCRETE SLAB)	CONCRET	TE (CO	NCRE	ETE SL	_AB)					A 4	4														
Fine to medium SAND with some sitt greyish brown with crange motiling. Medium dense, mold. 19.40	-		PRINGSTON FORMATION)	staining. "F	Firm"; d	and; b lry; sar	orown v nd, fine	with or e to m	range n nedium	nottlin	g with g	grey ON	× × × × × ×					 - - - -					 				2, 2, 2, 2, 1, 2, 2, 2, 2, 5, 3, 4, 4, 3, 3,	
Explanations: Sale Penetrometer - blows/50mm Sale Penetromete	-	-	<u>)</u>							— —	own wit	th	× .	\ \ \ \ \ \ \					1			 	 					
Explanations: Scala Penetrometer - blows/50mm Small Disturbed Sample Large Disturbed Sample Slow Saen (denth.)	+19.40	- 1.20 - -		iwht orang	e mottli	ing. De	ense; r	moist;	gravel	el; gre	eyish bro to medi	own ium,	× · · · · · · · · · · · · · · · · · · ·	\ \ \ \ \ \								 - • - -	 				7, 10, 10, 9, 7, 8, 9,	
Explanations: Scale Penetrometer - blows/50mm Permeability Test Permeability Test Up Oundisturbed Sample Large Disturbed Sample Schmidt Hammer Schmidt Hammer Schmidt Hammer Stown Seen (depth.)	+19.00	1.60		EOH @ 1.	20 m						- — —	_	·× ·									1.8 	55mî 					
Explanations: Scala Penetrometer - blows/50mm Permeability Test Schmidt Hammer Scala Penetrometer - blows/50mm U100 Undisturbed Sample Large Disturbed Sample U100 Undisturbed Sample Slow Seen (depth.) Slow Seen (depth.)	-	-2																				 	 					
Explanations: Scala Penetrometer - blows/50mm Permeability Test Schmidt Hammer Scala Penetrometer - blows/50mm U100 Undisturbed Sample Large Disturbed Sample U100 Undisturbed Sample Slow Seen (depth.) Slow Seen (depth.)	-	-																 - - -			 	 	 					
Explanations: Scala Penetrometer - blows/50mm Permeability Test Schmidt Hammer Scala Penetrometer - blows/50mm U100 Undisturbed Sample Large Disturbed Sample U100 Undisturbed Sample Slow Seen (depth.) Slow Seen (depth.)																					 	 	 					
Scala Penetrometer - blows/50mm Small Disturbed Sample Thermeability Test Schmidt Hammer Schmidt Hammer Scala Penetrometer - blows/50mm Small Disturbed Sample X Not Encountered 1. Coordinates based on handheld GPS and subjective survey confirmation. Elevation based on data from Survey confirmation. Elevation based on data from Surveying (27/02/2020).		- -3																					 -					
Scala Penetrometer - blows/50mm Small Disturbed Sample Thermeability Test Schmidt Hammer Schmidt Hammer Scala Penetrometer - blows/50mm Small Disturbed Sample X Not Encountered 1. Coordinates based on handheld GPS and subjective survey confirmation. Elevation based on data from Survey confirmation. Elevation based on data from Surveying (27/02/2020).	- - -																					 	 					
Scala Penetrometer - blows/50mm Small Disturbed Sample Thermeability Test Schmidt Hammer Schmidt Hammer Scala Penetrometer - blows/50mm Small Disturbed Sample X Not Encountered 1. Coordinates based on handheld GPS and subjective survey confirmation. Elevation based on data from Survey confirmation. Elevation based on data from Surveying (27/02/2020).	Eval	- anotic	no:											<u></u>	 	<u> </u>					11			<u>L</u>				
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SC 190417 - SUMMERSET PREBBLETON SPRINGS ROAD - 2020 GPJ < <drawingfile>></drawingfile>																										EHS	SC210			10 m 20 m
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weath comp Relati firm/m	Relative soil Strength - very soft/very loose, soft/loose, firm/medium dense, stiff/dense, very stiff/very dense					~	Cle Insi P=F pen	rermeability Test legg Hammer: impact value (test repetitions) lisitu Vane Shear Strength (kPa) lePeak, R=Residual, UTP=Unable to enetrate Vater Strike (1st, 2nd) Vater Rise (1st, 2nd) & Rise Time (min's.)						Rods wet below and st Elevat Survey 2. Stre based quotat holds Target depth X Refusal					nd sub levation surveying. Strend ased of uotation Scala nviron	dinates based of operation based on dation of the control of the c	confirmation ta from Gral). ohesive soil sults indicat the bottom	n. ham ls ted in of									
All di	All dimensions in metres Scale 1:21 Contractor						or:										Plant Used: 1 Penetrometer						Logged by	Checke							

APPENDIX B **Borehole Core** Photography



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



Box No 2 From 1.50m **To** 3.36m Client Summerset Villages Ltd Location Refer to Site Plan **Project** Prebbleton, Springs Rd Total depth 15.0m **Project No** 190417 Date drilled 8 June 2020 Borehole BH201 76mm DT45 Sonic Core size









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 76mm DT45 Sonic Core size



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



Client Summerset Villages Ltd
Project Prebbleton, Springs Rd
Project No 190417
Borehole BH201

Box No 6 From 11.56m

Location Refer to Site Plan

Total depth 15.0m

Date drilled 8 June 2020

Core size 76mm DT45 Sonic

To 13.68m







Client Su Project Pr Project No 19

Borehole

Summerset Villages Ltd Prebbleton, Springs Rd

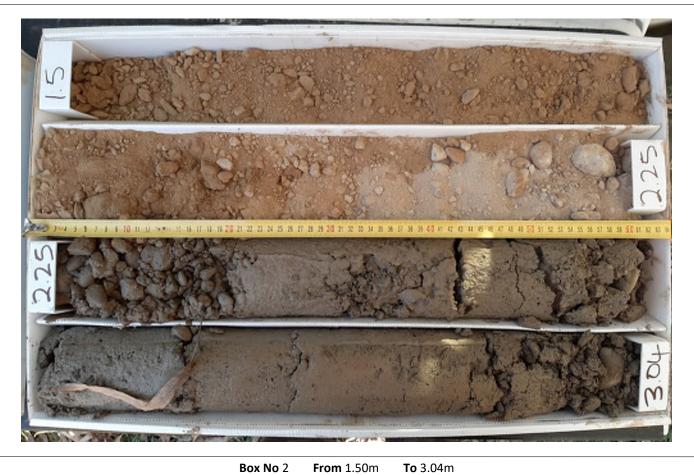
190417 **BH201** LocationRefer to Site PlanTotal depth15.0mDate drilled8 June 2020Core size76mm DT45 Sonic







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



Client Summerset Villages Ltd
Project Prebbleton, Springs Rd
Project No 190417
Borehole BH202

Box No 2 From 1.50m

Location Refer to Site Plan

Total depth 15.20m

Date drilled 9 to 10 June 2020

Core size 76mm DT45 Sonic

RILEY







Client Summerset Villages Ltd
Project Prebbleton, Springs Rd
Project No 190417
Borehole BH202

Box No 4 From 4.86m

Location Refer to Site Plan

Total depth 15.20m

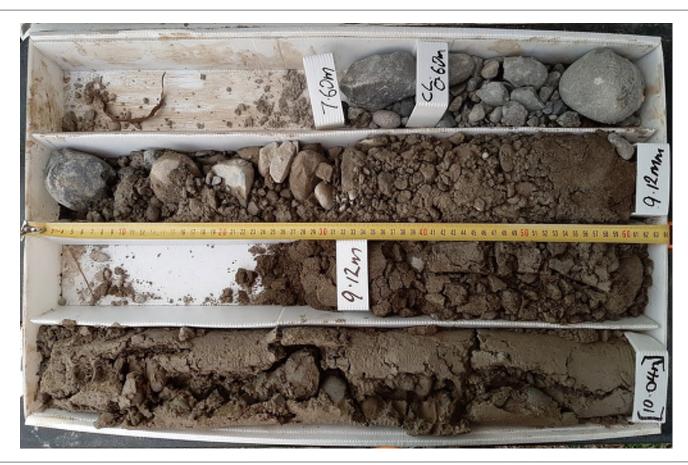
Date drilled 9 to 10 June 2020

Core size 76mm DT45 Sonic

To 7.60m Notes









Client Summerset Villages Ltd
Project Prebbleton, Springs Rd
Project No 190417
Borehole BH202

Box No 6 From 10.04m

Location Refer to Site Plan

Total depth 15.20m

Date drilled 9 to 10 June 2020

Core size 76mm DT45 Sonic

To 12.16m Notes







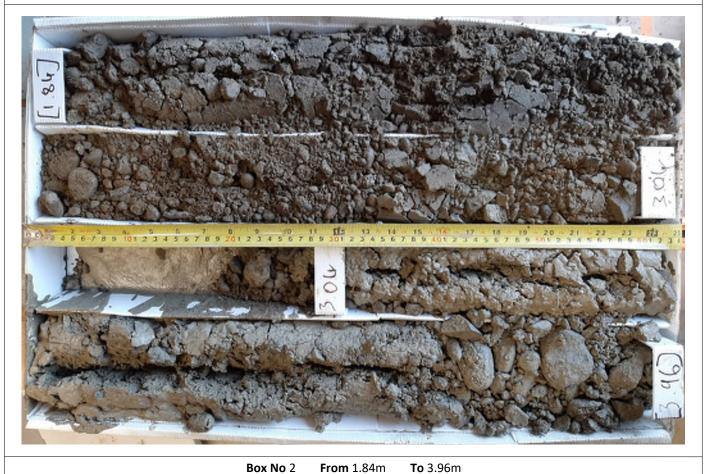
Box No 7 **From** 12.16m **To** 14.00m



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 RILEY
CONSULTANTS
Engineers and Generalizes **Project No** 190417 Date drilled 9 to 10 June 2020 Borehole BH202 76mm DT45 Sonic Core size



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



Client Summerset Villages Ltd
Project Prebbleton, Springs Rd

Project No 190417 Borehole BH203 Box No 2 From 1.84m

Location Refer to Site Plan

Total depth 15.20m

Date drilled 10 to 11 June 2020

Core size

76mm DT45 Sonic









Client Summerset Villages Ltd
Project Prebbleton, Springs Rd
Project No 190417
Borehole BH203

Box No 4 From 6.08m

Location Refer to Site Plan

Total depth 15.20m

Date drilled 10 to 11 June 2020

Core size 76mm DT45 Sonic

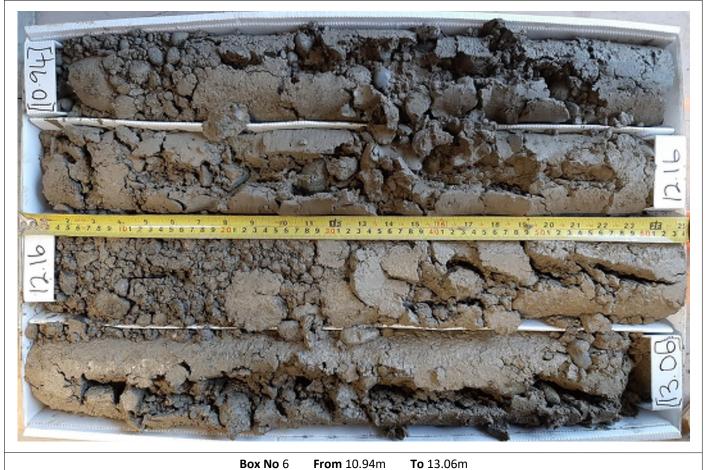
To 9.12m Notes







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



Client Summerset Villages Ltd
Project Prebbleton, Springs Rd
Project No 190417
Borehole BH203

Box No 6From 10.94mLocationRefer to Site PlanTotal depth15.20mDate drilled10 to 11 June 2020Core size76mm DT45 Sonic







Client Su Project Project No 19

Borehole

Summerset Villages Ltd Prebbleton, Springs Rd 190417

190417 **BH203** Location Refer to Site Plan
Total depth 15.20m

Date drilled 10 to 11 June 2020 Core size 76mm DT45 Sonic

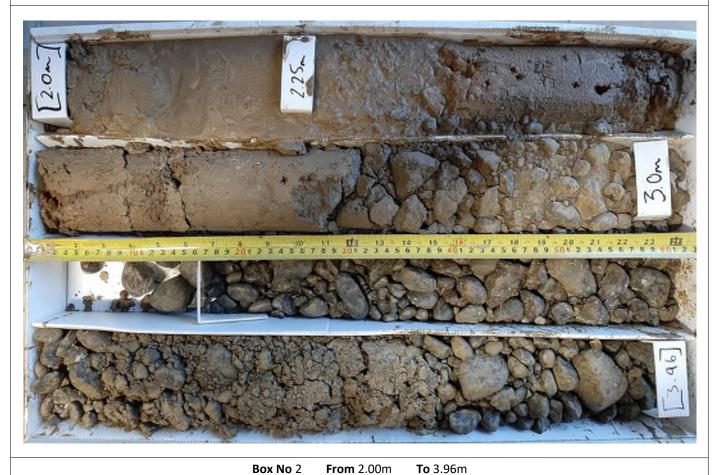








From 0.00m **To** 2.00m Box No 1



Client Summerset Villages Ltd **Project** Prebbleton, Springs Rd **Project No** 190417

Borehole BH204

Box No 2 **From** 2.00m Location Refer to Site Plan Total depth 15.20m Date drilled 15 to 15 June 2020 76mm DT45 Sonic Core size



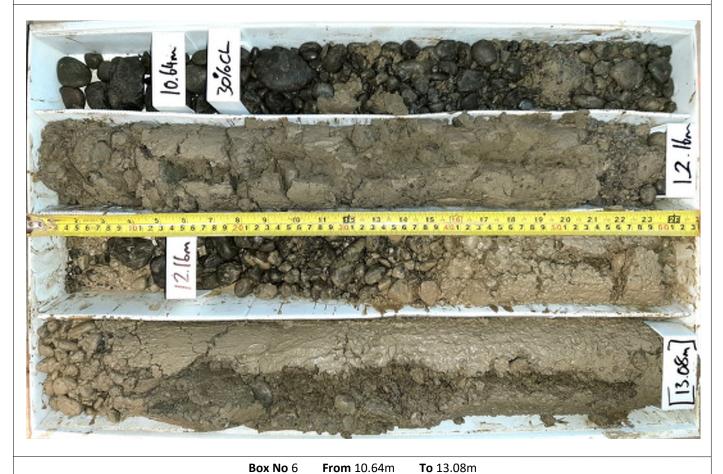






Box No 4 **From** 6.08m **To** 7.92m Client Summerset Villages Ltd Location Refer to Site Plan Notes **Project** Prebbleton, Springs Rd Total depth 15.20m **Project No** 190417 Date drilled 15 to 15 June 2020 Borehole BH204 76mm DT45 Sonic Core size





ClientSummerset Villages LtdProjectPrebbleton, Springs RdProject No190417BoreholeBH204

Box No 6 From 10.64m

Location Refer to Site Plan

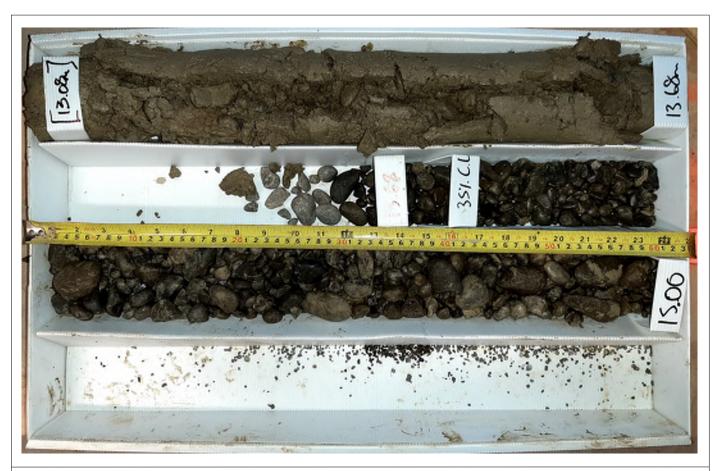
Total depth 15.20m

Date drilled 15 to 15 June 2020

Core size 76mm DT45 Sonic







Box No 7 Fron

From 13.08m

To 15.00m

Client Project Summerset Villages Ltd Prebbleton, Springs Rd

Project No 190417 Borehole BH204 Ltd **Location**

Refer to Site Plan

Total depth 15.00m

Date drilled 15 to 15 June 2020 **Core size** 76mm DT45 Sonic





APPENDIX C Laboratory Test Reports

Page 1 of 8 Pages

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

	ZE ANALYSIS 986, Test 2.8.1)		100				0.063	0.075	0.212	1.18	2.36	9.50	26.5 37.5 53.0	63.0 75.0 106 150	200	
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19.0			70	Ш		-		-				1111	11 201	(a) 1.7H	- 2.1	1
13.2		(ss	60													
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4.75		ing (t	50	H				-				-			Н	Н
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0.30	100		10													Ш
0.212	99		10													Ш
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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.
- 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: emples





Page 2 of 8 Pages

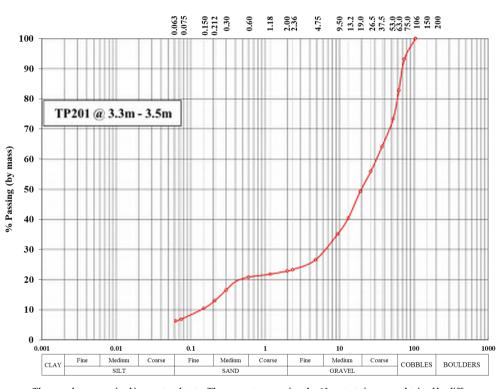
Reference No: 20/1390

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

106.0 100 75.0 93 80 80 83 53.0 83 73 73 75 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	Test Sieve (mm)	% Passing (by mass)	100			Ш		0.063
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	, ,		90				Ш	Ш
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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	53.0	73	7		P201 @	@ 3.3m	- 3.5m	
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0.212 13 0.001 0.01 0.1 Fine Medium Coarse Fin	0.60	21	10	-				
0.212 13 0.001 0.01 0.1 0.1	0.30	17						
0.150 10 CLAY Fine Medium Coarse Fin	0.212	13		0.001				0.1
	0.150	10		CLAY	Fine		Coarse	Fir



e 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

empleo Checked By:

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



Page 3 of 8 Pages

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

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	IZE ANALYSIS 986, Test 2.8.1)							2 to 0	7.0	e & 9	9 1	0.79	ء بڻ بڻ ح	99999	2
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75.0	97												1 1		
63.0	90		80	_				4		-		-			
53.0	86		70	TI	P204 (@ 2.5m	- 2.7m								
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0.150	6		C	CLAY	Fine	Medium SILT	Coarse	rine	Medium SAND	Coarse	Fine	Medium GRAVEL	Coarse	COBBLES	BOULDERS
0.075	4		The	sam	ple was	received ii	n a natur	al state. T	he perce	ntage pass	ing the	63µm test :	sieve was	s obtained	by difference
0.063	4														

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: emples

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



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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

	IZE ANALYSIS 986, Test 2.8.1)					690	0.075	0.212	1.18	2.36 4.75	9.50	19.0 26.5 37.5	535.0 63.0 75.0 106 150	200	
Test Sieve (mm)	% Passing (by mass)	10	0				/								П
53.0		9	0	ш								Ш			H
37.5		8	0	ш		ш	/	ш		ш				Ш	Ш
26.5												TP205	@ 1.5n	n - 1.7	m
19.0		7	0			ш		ш	Ш		111				П
13.2		mass)	0												\mathbb{H}
9.50		% Passing (by mass)													
4.75		ssing													
2.36		F4 %	0	ш	-							ш	-		H
2.00		3	0	ш		Ш		ш		Ш		Ш		Ш	Ш
1.18															
0.60	100	2	0	ш	Ш	Ш								П	П
0.30	99	1	0				-								Н
0.212	97	Π.	ل												
0.150	93	<u> </u>	0.001	Fine	0.01 Medium	Coarse	0.1 Fine	Medium	1 Coarse	Fine	10 Medium	Coarse	100		
0.075	83		CLAY		SILT			SAND			GRAVEL		COBBLES	BOUL	DER
0.063	80		The san	nple was	received i	n a natur	al state. T	The percer	ıtage pass	sing the 6	3μm test	sieve wa	s obtained	by diffe	ere

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 pla	sticity index material tested was the fraction passing the 425 µm test sieve.							

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

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

semplio 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:	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

		10%	5%		0% Air Voids Line	
% Retained (+19.0mm Fraction) 0.0 %	1.84					
Water Content: ("All In" As Received) 12.2 %	1.83		- X	1		
Maximum Dry Density: 1.83 t/m ³	1.82 -					
Optimum Water Content: 15.0 %	Dry Density (t/m³)			11		
lotes:	Den Si			1 0	1	
 The sample was received in a natural state. 	1.79		1	11		
The material tested in the NZ Standard Compaction test was whole soil.	1.78		7			
• The air voids lines were calculated from an assumed solid density of 2.70 t/m³.	1.70				8	
	1.77		7	1	1	
	1.76					

Notes:

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

empluo Checked By:



Page 6 of 8 Pages

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 Re	ef. No:	1904147
Sample Source:	TP206	Sample I	Depth:	0.5m - 0.7m
Date & Time Sampled:	Unknown	Sampled	By:	Riley Consultants Ltd
Sample Method:	Test Pit *	Date Rec	quested:	22-Jun-20

Sample Methou:	restric									att Het	acstee		22 0 u			
	ZE ANALYSIS 086, Test 2.8.1)		100	_			,	0.05	0.212	1.18	2.36	9.50	26.5 37.5 53.0	63.0 75.0 106 150	007	
Test Sieve (mm)	% Passing (by mass)		90										Ш			
37.5								1								
26.5			80			-		-				Шг	TD206	@ 0.5n	0.70	_
19.0			70				ш	-				∟	11200	@ 0.5n	- 0.711	•
13.2		(ss														
9.50		y ma	60													
4.75		% Passing (by mass)	50			-										-
2.36		Passi	40						Ш				Ш			Ш
2.00		%														
1.18	100		30		ш	1111	ш		ш		ш		ш	Ш	711	Ш
0.60	99		20										ш			Ш
0.30	99		10													
0.212	98		10													
0.150	96		0	0.001		0.01		0.1		1		10		100		1000
0.075	86			CLAY	Fine	Medium SILT	Coarse	Fine	Medium SAND	Coarse	Fine	Medium GRAVEL	Coarse	COBBLES	BOULDE	RS
0.063	80		1	he sam	ple was	received i	n a natur	al state.	The percei	ntagepass	ing the	63µm test	sieve was	obtained	by differe	ence.

Notes:

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

empleo Checked By:



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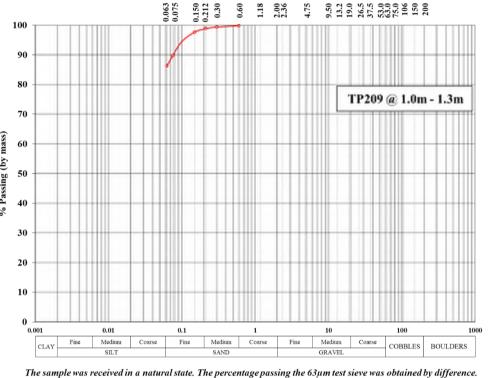
Reference No: 20/1390

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

	SIZE ANALYSIS 986, Test 2.8.1)	
Test Sieve	% Passing	
(mm)	(by mass)	
37.5		
26.5		
19.0		
13.2		(ssi
9.50		y ma
4.75		ing (I
2.36		% Passing (by mass)
2.00		%
1.18		
0.60	100	
0.30	99	
0.212	99	
0.150	98	
0.075	90	
0.063	86	



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

emplio 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

			10%	5%	0% Air Voids Line
% Retained (+19.0mm Fraction)	0.0 %	1.75			070 All Voltis Line
Water Content: ("All In" As Received)	12.3 %	1.74			
Maximum Dry Density:	1.73 t/m ³	1.73			
Optimum Water Content:	15.5 %	Dry Density (t/m³)		4	
Notes:		Densi	+ $+$ $/$ $+$ $+$	N N	
The sample was received state. The material tested in the		Žr 1.71	+/-	3 /	
Compaction test was wh		1.70		1	
 The air voids lines were an assumed solid density 					
		1.69		1	1
		1.68			
		10 11		16 17 18 1 ster Content (%)	19 20 21 22 23

Notes:

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

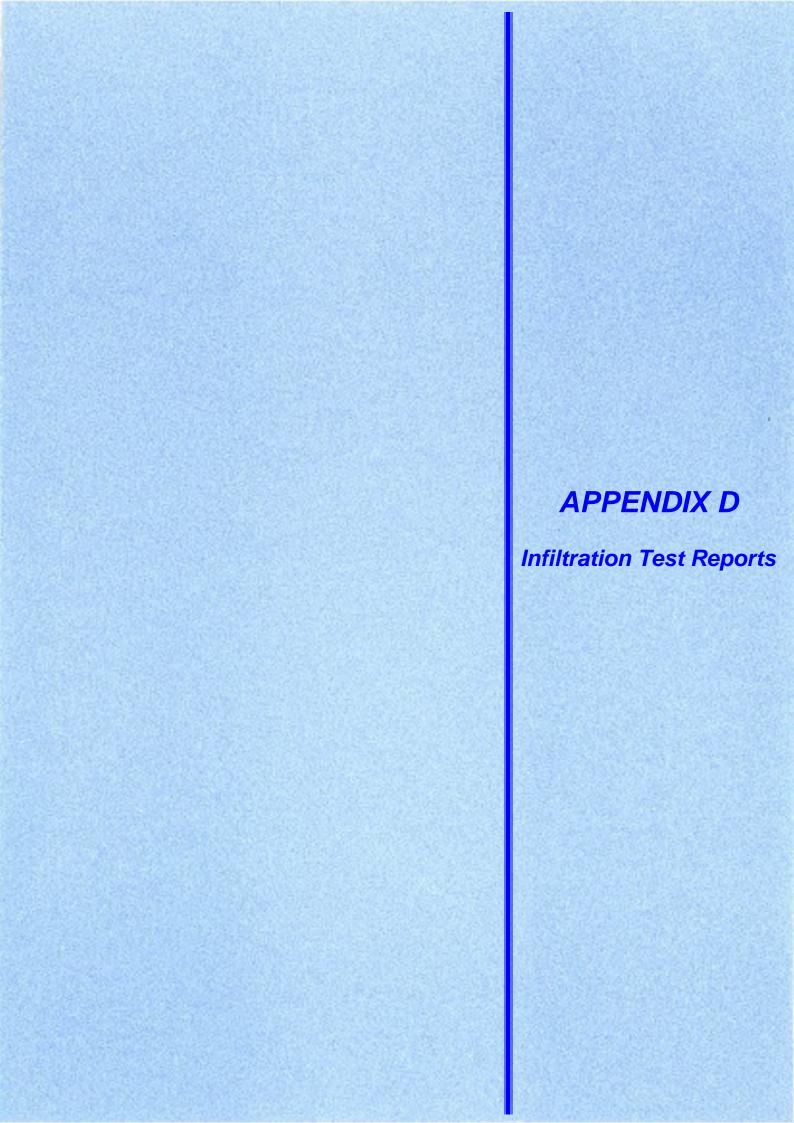
Checked By:

Approved Signatory

A.P. Julius

Laboratory Manager







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 md 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:

Authorised for Geotechnics by:

Mike Lang

Geotechnical Project Lead

Vic O'Connor Project Director

Report checked by:

Corey Papu-Gread Christchurch Manager Approved Signatory ACCREDITED LABORATORY

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

22-Jun-20

 $\verb|\ttgroup.local| corporate \verb|\geotechnicsgroup| projects \verb|\1014405| working material| 2020.06.22. mdl. 1014405. prebbleton in fill rep01. docx and the corporate of the corp$





LOCATION PLAN

Site Location Prebbleton G CH Prebbleton Summerset Project

Summerset Prebbleton Intiltration Testing 16th & 18th June 202						
Summerset Prebbleton	Our Ref	1014405.0.0.0/REP01	Drawn	MDL		
578-606 Springs Road	Customer	190417 - 578-606				

N/A

Springs Road,

Ref

Lab Ref

only Date 19/06/2020 Checked CXPG Date 22/06/2020

Scale

Not to Scale



Aerial photograph sourced from Canterbury Maps Copyright 2020)



