FRONTIER
ESTATE

Geotechnical Report

Stage 03 - Frontier Estate Subdivision,
Pioneer Drive & Gateway Drive, Te Awamutu.
Lots 42 to 64

STAGE 03

GEOTECHNICAL SUBDIVISION COMPLETION REPORT
(INSPECTING ENGINEERS REPORT)
FRONTIER DEVELOPMENTS SUBDIVISION – Stage 3
PIONEER DRIVE, TE AWAMUTU

for

Frontier Developments Ltd
c/- Design Management Consultants Ltd
PO Box 5254
Hamilton 3242

by

Mark T Mitchell Ltd
Consulting Geotechnical Engineers
1150 Victoria Street – PO Box 9123
Hamilton 3240

27 May, 2021

Mark T Mitchell Ltd

Consulting Geotechnical Engineers

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Ref: W – 16638.7
27 May, 2021

Frontier Developments Ltd
c/- Design Management Consultants Ltd
PO Box 5254
Hamilton 3242

Attn: Lyall Green – Design Management Consultants Ltd

Dear Sir,

Re: Geotechnical Completion Report - Soils and Earth Fill Report,
Frontier Developments Residential Subdivision
Stage 3 - Lots 42 to 64
Pioneer Drive, Te Awamutu

Please find enclosed four copies of our Soils Investigation and Geotechnical Completion Report for the above-referenced project.

The results of our studies indicate that the site is suitable for use as a residential subdivision. A test hole has been drilled within each of the lots so as to provide a guide to the soil conditions present. The results of these tests indicate that standard foundations are to be used on all lots with the exception of Lots 44, 45 and 63 which will require Ribraft/Pod Floor foundations, as detailed in the attached report.

At the time of building site preparation work, where site soils are found to be different from those shown on the attached Bore Hole Logs, which could arise following wet weather conditions, we should inspect the site excavations to advise on the extent of remedial work required.

Yours faithfully

Mark T Mitchell Ltd

Mark T Mitchell
Director

GEOTECHNICAL SUBDIVISION COMPLETION REPORT
(INSPECTING ENGINEERS REPORT)
FRONTIER DEVELOPMENTS SUBDIVISION – STAGE 3
PIONEER DRIVE, TE AWAMUTU

1. INTRODUCTION

This report combines the Soils Investigation Report and the Subdivision Completion Report (or the Inspecting Engineer's Report) for Frontier Developments Residential Subdivision Stage 3, which is located off Pioneer Drive, Te Awamutu. This stage of the development comprises Lots 42 to 64, the locations of which are shown on the attached Site Plan, Drawing No. 16638-10. The development is being undertaken by Frontier Developments Ltd, with the land surveying and engineering design carried out by Design Management Consultants (DMC).

The topography of Stage 3 of the subdivision consists of an elevated low hill that sloping upwards from Pioneer Drive that has been terraced to create level building areas on each lot.

The purpose of the Soils Investigation was to determine the subsurface conditions within the specified lots and to evaluate what special conditions, if any, would be required for the foundation support of residential dwellings to be constructed on the site. This Geotechnical Completion Report also details the extent of filling and other activities that have taken place during the site development and outlines limitations of earth filling that has been placed during the subdivision development.

2. FIELD INVESTIGATION AND SITE TESTING

2.1 Soil Testing

The soil conditions within the Stage 3 subdivision areas were investigated following completion of the site earthworks, which consisted of cut and fill land re-contouring. These earthworks were generally carried out between the 2018-2019 construction season and the 2020-2021 construction season. This included excavations of up to 2.5 metres in depth within elevated regions and filling of up to about 4.0 metres in lower areas. The Filling was placed and compacted within localised areas to produce near-level building sections as shown on the attached DMC Cut/Fill Isopach Plan, Drawing No. 16638-11.

The earthworks included Pioneer Drive, with compacted filling placed up to about 7 metres in depth in parts to obtain the required road gradient.

The Filling that has been placed within this Stage 3 Development has been inspected and tested under the direction of Geocon Geotechnical Ltd and Mark T Mitchell Ltd geotechnical staff. On-site testing included nuclear density (NDM) testing, in-situ shear vane and Scala Penetrometer probe testing. Laboratory testing including soil compaction, water content and shear vane testing. The testing criteria adopted were in general accordance with NZS 4431:1989 "Code of Practice for Earthfill for Residential Development".

The soil conditions within the Stage 3 project site were investigated by drilling, twenty three, 2.0 metre hand auger test borings, together with Scala Penetrometer probe and in-situ shear vane tests at the centre point of each lot, as shown on the attached Site Plan. The designated bore hole number corresponds to the relevant Lot number, with Bore Hole Logs and associated test results presented on Figs. A-1 to A-12.

The purpose of the bore holes and associated testing was to provide guidance as to the general consistency, relative density and shear strength of soils located within the building site areas. This testing was also to determine general requirements for foundation construction for residential dwellings.

It should be noted that the Topsoil depths encountered within each of the bore holes are likely to vary across the general lot areas.

2.2 Soil Descriptions

The near-surface soil conditions consist of 200 to 300mm of Topsoil over natural soils or Engineer-certified Fill to variable depths. The Fill composition is a mixture of yellowish to orangey brown, compacted, Clays and Silts. The natural soils and naturally occurring soils below the Filling consist of firm to very stiff, Silts and Clays which continue to at least the base of the 2 metre deep bore holes.

The original soils have developed by the progressive weathering of volcanic ash (tephra) erupted about 60,000 to 350,000 years B.P. and described generally as the Hamilton Ash Formation. The ash layers are a few metres thick and are representative of a sequence of volcanic ash deposits weathered to Clay and Silt soils. Some of these ash soils were excavated during earthworks and provided the bulk material for the filling operations.

In some of the Bore Holes, soils of the underlying Walton Subgroup are present. The Walton Subgroup consists of two geological units referred to as the Karapiro and Puketoka Formations and underlies the Hamilton Ash sequence. These soils are older and are distinguished from the Hamilton Ash soils as pumiceous in nature. The Walton Subgroup soils are believed to have been deposited as primary or re-worked alluvial deposits or as non-welded distal ignimbrites (volcanic deposit). These soils typically consist of pumiceous silts, clays and consolidated fine-grained sands with weathered pumice inclusions.

Due to the non-uniform manner in which the alluvial soils were deposited and the continually changing river channel alignments, variations in soil grain size, density and shear strength may occur within relatively short distances.

3. ENGINEER-CERTIFIED FILL – LOT NOS. 42 TO 49 AND 51 TO 64

3.1 Fill Areas and Depths

Earth filling has been placed within all, or part of the following lots to form near-level building site areas. Note that the filling will typically cover only a portion of the lots concerned.

Approximate Fill Depth	Lot Numbers
Less than 0.5 metres	44, 46, 48, 49, 58 and 59
Between 0.5 and 1.0 metres	45, 47, 51, 52, 53, 55, 57, 60 and 61
Between 1.0 and 1.5 metres	54, 56, 62, 63 and 64
Less than 4.0 metres	42 and 43

3.2 Fill Description

The Engineer-certified Fill was placed and compacted between May 2019 and November 2020 by C & R Developments Ltd, with periodic field and laboratory testing carried out by Geocon Geotechnical Ltd and Mark T Mitchell Ltd, to ensure that the filling was constructed to the requirements of New Zealand Standard NZS 4404:2010, Land Development and Subdivision Infrastructure. Compaction of these soils was carried out using a combination of 12 and 24 tonne sheep-foot/wedge-foot and flat-drum rollers and loaded HM300 and HM400 articulated dump trucks.

The Contract Specification required the level of compaction effort applied to achieve a density which is acceptable for building construction to the NZ Standard for Light Timber Framed Buildings, NZS 3604:2011. Engineer-verification consisting of site inspections and testing was carried out during regular inspections during the backfilling process.

The Engineer-certified Filling is generally capable of supporting residential foundation designed in accordance with NZS 3604:2011. However, because building sites may contain areas of well-compacted filling that are alongside naturally occurring soils of a lower density, it is recommended for lots within this category further compaction of soils takes place. This would take place after the building site area has been excavated to design level, with the entire building site area then to be compacted with a roller of minimum 2 tonne weight.

3.3 Fill Placement Procedures

Prior to placement of Engineer-certified Filling within the lots, the Topsoil and some of the underlying soils were removed and stockpiled for later re-spreading. Also, benching was carried out prior to any filling being placed in areas where natural slopes of greater than 1 vertical to 5 horizontal were present.

Within many lots, house foundations are likely to straddle areas of both filled ground and natural ground. The fill soils are generally stiffer and with a lower void ratio than those of natural ground, with a potential for minor differences in their performance over time as the near-surface soils dry out with time.

The recommendations provided in the following section of this report will alleviate potential problems associated with soil shrinkage with time and also with other variations in soil properties along the perimeter house foundations.

4. BUILDING SITE PREPARATION – ALL LOTS

4.1 Ground Conditions

The near-surface soils within Stage 3 typically consist of 200 to 300mm of Topsoil, overlying either naturally occurring, firm to very stiff, clayey Silt and silty Clay soils or alternatively, similar soil types that have been obtained from elsewhere and compacted in place. These Silt and Clay soils are expected to provide satisfactory support for residential foundations that are designed in accordance with NZS 3604:2011, providing site preparation works are carried out as recommended below.

Within some lots, house foundations may straddle areas of both filled ground and natural ground, with the fill soils being stiffer and with a lower void ratio than those of natural ground, with a potential for minor differences in their performance over time.

The recommendations provided in the following section of this report will alleviate potential problems associated with soil shrinkage with time and also with probable variations in soil properties along the perimeter house foundations.

4.2 Site Preparation

It is expected that building site areas will initially be excavated to about 1 metre beyond the building lines so as to remove the topsoil layer, with the depth of that excavation being about 200 to 300mm. If low-strength soils are exposed within the proposed building site areas, those soils should initially be compacted in place and then tested to determine whether they are of adequate strength, or alternatively removed and replaced with compacted pit sand.

Otherwise, the exposed surface should be well compacted with a vibrating roller of minimum 2 tonne roller over both natural ground and filled area so as to provide a uniform support to the concrete floor slab.

In addition, where house foundations straddle areas of filled ground and natural ground, undercutting of the soils supporting the exterior footings should be carried out so as to accommodate the variations in soil properties between natural and compacted fill soils, such as soil shrinkage over time. The recommended undercut details are as follows:

- Minimum 400mm below underside of concrete footing
- Extent to minimum 400mm beyond exterior foundation line
- Excavation width of minimum 1200mm wide at its base.

The undercut area to be backfilled with pit sand and compacted with a 2 tonne vibratory compactor in 2 layers up to the underside of the concrete slab.

5. TIMBER FLOOR CONSTRUCTION

The near surface, stiff to very stiff, Silt and Clay soils that are present within the project site are generally capable of supporting foundations for timber floor structures which are designed to the requirements of NZS 3604:2011 the NZ Standard for Timber Framed dwellings. However, where soil strengths are in doubt, the foundation soils should be tested to verify that shear strengths exceed 80kPa or Scala values exceed 5 blows per 100mm for sand or rockfill.

6. GROUNDWATER

Groundwater was not encountered in any of the Bore Holes during the autumn investigation due to the elevated nature of the site.

7. VARIATIONS OF SOIL TYPE, DENSITY AND SHEAR STRENGTH

Prospective purchasers and owners of lots within this development are advised that variations in soil type, density and shear strength will occur across the overall site and within individual sections. This fact applies to both unfilled and filled ground and in some circumstances, supplementary foundation preparation and construction work may be required where soft soil conditions are encountered.

8. ASSESSMENT OF NATURAL HAZARDS

For this particular residential site development, natural hazards consist of:

- ground subsidence
- surface flooding
- slope instability

8.1 Ground Subsidence – Building Sites

Sections 5 to 8 of the above report state that the results of the recent testing indicate that the soils underlying the subdivision are suitable for foundation support and ground subsidence is unlikely to develop to the extent that would affect building foundation support, subject to our recommendations being followed.

8.2 Surface Flooding

The land topography within Stage 3 development currently consists of a gently sloping ground surface and therefore surface water flooding of the respective lots in their as-developed state is not expected to occur.

8.3 Slope Instability

The completed land topography is such that all as-constructed ground slopes, within both cuts and fills possess a Factor of Safety of at least 1.5 and 'safe' building platforms have been provided, as required by Section 106 of the Resource Management Act (1991).

8.4 Certification

A Statement of Professional Opinion as to suitability of Land for Subdivision is presented at the end of this report, which includes a statement that providing the recommendations presented in this report are adhered to, the environmental risks associated with the proposed subdivision development are acceptable.

9. LIMITATIONS

The Geotechnical opinions and recommendations that are contained in this report are based on site conditions as they presently exist and further assume that the exploratory holes and soundings are representative of subsurface conditions throughout the site, i.e. inferences about the nature and continuity of ground conditions away from the bore holes have been made in the preparation of this report. It is assumed that subsurface conditions elsewhere are not significantly different from those disclosed by the investigation.

We should be notified of any subsurface conditions that appear to be different from those as disclosed by this investigation so that the conditions may be reviewed and our recommendations reconsidered where necessary.

This report and certification do not preclude routine foundation inspections by the Builder or the Waipa District Council Building Inspectors. Where such inspections reveal the presence of localised soft areas, further soils investigations may need to be carried out to assess the extent of the problem soils and to determine what treatment, if any, of the foundation soils is required.

10. CONCLUSIONS AND RECOMMENDATIONS

The results of this study indicate that, based upon all available information, there is a stable building site available on each of the proposed lots. A test hole has been drilled centrally within each of the lots so as to provide a guide to the soil conditions present. Some lots will require engineer-design of foundations on account of the soil conditions present.

A Statement of Suitability of Earth Fill for Residential Development (NZS 4431 Appendix A), a Statement of Suitability of Land for Building Development (Schedule 2A: NZS 4404:2010).

Mark T Mitchell Ltd
Consulting Geotechnical Engineers

Mark T Mitchell
Director

Attached:

Site Plan, Drawing No. 16638-10
Cut/Fill Isopach Plan, Drawing No. 16638-11
Geocon Geotechnical Ltd Bore Holes; Figs. A-1 to A-12
Schedule 2A: Ref: NZS 4404:2010
Appendix A: Ref: NZS4431:1989

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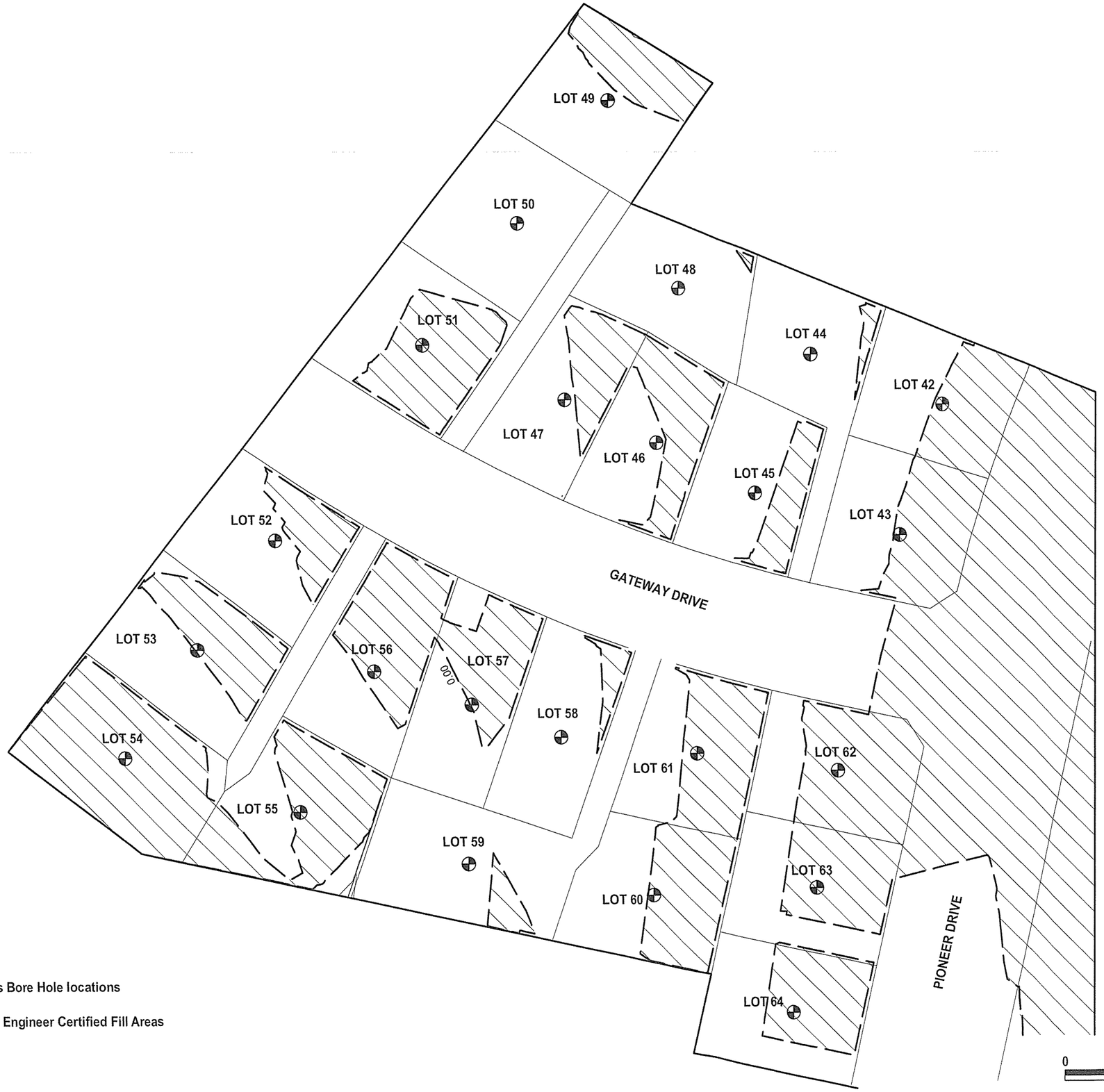
NOTE:

1. This drawing is reproduced from the Cut / Fill Plan prepared by DMC LTD based on data supplied by Shrimpton and Lipinski.
2. All areas and distances where shown are subject to survey.



LEGEND

denotes Bore Hole locations

" Engineer Certified Fill Areas

SCALE 1:750

0 15 30 45 60 75 Metres

Mark T Mitchell Ltd Consulting Geotechnical Engineers 1150 Victoria Street, P.O. Box 9123, Hamilton	FRONTIER DEVELOPMENTS LTD Site Investigation for Proposed Residential Subdivision Stage 3, Pioneer Drive, Te Awamutu	**SITE PLAN**	DRAWING No. 16638-10 INITIAL DATE May 2021 ISSUE DATE 27.05.2021

N

NOTE:

1. This drawing is reproduced from the Cut / Fill Plan prepared by DMC Ltd based on data supplied by Shrimpton and Lipinski.
2. All areas and distances where shown are subject to survey.
3. The locations of the Fill/No Fill boundaries are approximate only. Care should be taken when constructing foundations near these boundaries that the actual Fill/No Fill Boundary be located.
4. CONTOURS
   The Zero contour line is a thick black dotted line labeled 0.0
   Positive depth of Fill contours are shown as 1.00
   Negative height of Cut contours are shown as -1.00
   Contour intervals are 0.5m.
5. Fill depths are the difference between the original topsoil surface and asbuilt topsoil surface.

LOT 49 FILL 0.00 -1.00 -2.00
LOT 50 CUT -1.00 -2.00 -3.00
LOT 48 -1.00
LOT 51 FILL 0.00
LOT 47 FILL -1.00 0.00
LOT 46 0.00
LOT 44 FILL 0.00 -1.00
LOT 42
CUT
LOT 45 -1.00 0.00
LOT 43 -1.00 0.00
GATEWAY DRIVE
LOT 52 FILL -1.00 0.00
LOT 53 FILL 0.00
LOT 56 FILL 1.00 0.00
LOT 57 0.00
LOT 58 -1.00
FILL 0.00
LOT 61 1.00 0.00
LOT 62 FILL 1.00 0.00
LOT 54 FILL 1.00
LOT 55 0.00 0.00
CUT
LOT 59 -1.00
LOT 60 FILL -1.00
LOT 63 1.00
FILL 0.00
LOT 64 1.00
PIONEER DRIVE
FILL 7.00 6.00 5.00 4.00 3.00 2.00 1.00

SCALE 1:750

0 15 30 45 60 75 Metres

Mark T Mitchell Ltd Consulting Geotechnical Engineers 1150 Victoria Street, P.O. Box 9123, Hamilton	FRONTIER DEVELOPMENTS LTD Site Investigation for Proposed Residential Subdivision Stage 3, Pioneer Drive, Te Awamutu	**CUT / FILL ISOPACH PLAN**	DRAWING No. 16638-11 INITIAL DATE May 2021 ISSUE DATE 27.05.2021

BORE HOLE LOG Lot No. 42

SOIL DESCRIPTION

DEPTH (metres)	GEOLOGICAL FORMATION	VANE SHEAR STRENGTH - kPa (In-situ/Remoulded)	SCALA PENETROMETER (blows/100mm)
	TS		
	Hamilton Ash	94/40	
		96/40	
		92/30	
1		56/28	
		110/80	
2		140+/74	
3			

TOPSOIL.

silty CLAY. Stiff, moist, highly plastic, yellowish brown.
Becoming very stiff @1.5 metres.
" moist to wet @1.7 metres.
" orangey brown @ 1.8 metres.

Bottom of Bore Hole completed 16/04/21

PIEZOMETER / WATER LEVEL: No Groundwater

BORE HOLE LOG Lot No. 43

SOIL DESCRIPTION

NOTES
- The stratification lines represent the approximate boundary between soil types and the transition may be gradual.
- Vane shear values shown are as-recorded in the field, to which a calibration factor from Geotechnics Vane 443 of 1.39 should be applied to the top metre and a calibration factor from Geotechnics Vane 446 of 1.43 should be applied to the bottom metre to attain Undrained Shear Strength (kPa).
- Scala test was carried out in 1.0 metre depth increments.

DEPTH (metres)	GEOLOGICAL FORMATION	VANE SHEAR STRENGTH - kPa (In-situ/Remoulded)	SCALA PENETROMETER (blows/100mm)
	TS		
	Filling	140+/48	
		140+/35	
		140+/54	
1		122/24	
		108/18	
	Hamilton Ash	98/26	
2		76/24	
3			

TOPSOIL.

FILLING: Mix of Silt and Clay, Engineer certified, high strength, moist, slightly plastic, brown mottled light brown.
Becoming highly plastic and yellowish brown @ 0.5 metres.
" slightly plastic and brown @ 0.8 metres.

silty CLAY. Stiff, moist, moderately plastic, orangey brown.

Bottom of Bore Hole completed 16/04/21

PIEZOMETER / WATER LEVEL: No Groundwater

JOB NAME: FRONTIER DEVELOPMENTS LTD - Stage 3
JOB LOCATION: Pioneer Drive, Te Awamutu
JOB NUMBER: W-16638

DRILL METHOD: Hand Auger
RIG: VANE No. 443/446
DRILLER: MMC/CFK

LOGGED: MMC/CFK PLOTTED: CFK
DATE LOGGED: 16/04/21
CHECKED:

Geocon Geotechnical Ltd
Geotechnical Engineers
1150 Victoria Street, P.O. Box 9123, Hamilton

BORE HOLE LOG

BORE HOLE LOG Lots 42 & 43
LOCATION: refer Site Plan RL (m):
SHEET: 1 OF 1 Fig. No. A-1

BORE HOLE LOG Lot No. 44

GRAPHIC LOG	SOIL DESCRIPTION	DEPTH (metres)	GEOLOGICAL FORMATION	VANE SHEAR STRENGTH - kPa (In-situ/Remoulded)	SCALA PENETROMETER (blows/100mm) 1 2 3 4 5 6 7 8 9 10	PIEZOMETER / WATER LEVEL
	TOPSOIL.		TS	102/20		No Groundwater
	clayey SILT. Very stiff, moist, slightly plastic, yellowish brown. Becoming stiff @ 0.6 metres. Becoming orangey brown @ 1.0 metre.	1	Walton Subgroup	125/18 50/16 60/12 62/18		
	silty CLAY. Moist, moderately plastic, yellowish brown.					
	clayey SILT. Stiff, moist to wet, moderately plastic, orangey brown.			90/28		
	silty CLAY. Stiff, moist to wet, highly plastic, yellowish brown.	2		60/18		
	Bottom of Bore Hole completed 19/04/21					
		3				

BORE HOLE LOG Lot No. 45

NOTES
- The stratification lines represent the approximate boundary between soil types and the transition may be gradual.
- Vane shear values shown are as-recorded in the field, to which a calibration factor from Geotechnics Vane 443 of 1.39 should be applied to the top metre and a calibration factor from Geotechnics Vane 446 of 1.43 should be applied to the bottom metre to attain Undrained Shear Strength (kPa).
- Scala test was carried out in 1.0 metre depth increments.

GRAPHIC LOG	SOIL DESCRIPTION	DEPTH (metres)	GEOLOGICAL FORMATION	VANE SHEAR STRENGTH - kPa (In-situ/Remoulded)	SCALA PENETROMETER (blows/100mm) 1 2 3 4 5 6 7 8 9 10	PIEZOMETER / WATER LEVEL
	TOPSOIL.		TS	140+/49		No Groundwater
	FILLING: Mix of Silt and Clay, Engineer certified, high strength, moist, slightly plastic, yellowish brown mottled brown.		FILL	140+/54		
	silty CLAY. Stiff, moist, highly plastic, light yellowish brown. Becoming moist to wet @ 1.4 metres.	1	Walton Subgroup	80/20 78/22 56/13		
	silty CLAY. Stiff, moist to wet, highly plastic, light yellowish brown.			60/20		
	Bottom of Bore Hole completed 19/04/21	2		60/26		
		3				

JOB NAME: FRONTIER DEVELOPMENTS LTD - Stage 3
JOB LOCATION: Pioneer Drive, Te Awamutu
JOB NUMBER: W-16638

DRILL METHOD: Hand Auger
RIG: VANE No. 443/446
DRILLER: MMC/CFK

LOGGED: MMC/CFK PLOTTED: CFK
DATE LOGGED: 19/04/21
CHECKED: KH

Geocon Geotechnical Ltd
Geotechnical Engineers
1150 Victoria Street, P.O. Box 9123, Hamilton

BORE HOLE LOG

BORE HOLE LOG Lots 44 & 45
LOCATION: refer Site Plan RL (m):
SHEET: 1 OF 1 Fig. No. A-2

BORE HOLE LOG Lot No. 46

SOIL DESCRIPTION

GRAPHIC LOG	SOIL DESCRIPTION	DEPTH (metres)	GEOLOGICAL FORMATION	VANE SHEAR STRENGTH - kPa (In-situ/Remoulded)	SCALA PENETROMETER (blows/100mm) 1 2 3 4 5 6 7 8 9 10	PIEZOMETER / WATER LEVEL
	TOPSOIL.		TS			
	silty CLAY. Very stiff, moist, moderately plastic, brown.		Hamilton Ash	140+/68		
	clayey SILT. Very stiff, moist, slightly plastic, light yellowish brown.	1		140+/62 140+/42 140+/51		
	silty CLAY. Very stiff, moist, moderately plastic, yellowish brown.			110/32		No Groundwater
	clayey SILT. Very stiff, moist, slightly plastic, light yellowish brown.	2		140+/60		
	Bottom of Bore Hole completed 19/04/21	3				

BORE HOLE LOG Lot No. 47

SOIL DESCRIPTION

NOTES
- The stratification lines represent the approximate boundary between soil types and the transition may be gradual.
- Vane shear values shown are as-recorded in the field, to which a calibration factor from Geotechnics Vane 443 of 1.39 should be applied to the top metre and a calibration factor from Geotechnics Vane 446 of 1.43 should be applied to the bottom metre to attain Undrained Shear Strength (kPa).
- Scala test was carried out in 1.0 metre depth increments.

GRAPHIC LOG	SOIL DESCRIPTION	DEPTH (metres)	GEOLOGICAL FORMATION	VANE SHEAR STRENGTH - kPa (In-situ/Remoulded)	SCALA PENETROMETER (blows/100mm) 1 2 3 4 5 6 7 8 9 10	PIEZOMETER / WATER LEVEL
	TOPSOIL.		TS			
	clayey SILT. Very stiff, moist, slightly plastic, brown. Becoming light yellowish brown @ 0.6 metres.	1	Hamilton Ash	140+/27 140+/33 140+/35 140+/38 140+/50		
	silty CLAY. Stiff to very stiff, moist, slightly plastic, yellowish brown. Becoming moderately plastic @ 1.7 metres.			140+/72		No Groundwater
	Bottom of Bore Hole completed 19/04/21	2		92/18		
		3				

JOB NAME: FRONTIER DEVELOPMENTS LTD - Stage 3
JOB LOCATION: Pioneer Drive, Te Awamutu
JOB NUMBER: W-16638

DRILL METHOD: Hand Auger
RIG: VANE No. 443/446
DRILLER: MMC/CFK

LOGGED: MMC/CFK PLOTTED: CFK
DATE LOGGED: 19/04/21
CHECKED: KM

Geocon Geotechnical Ltd
Geotechnical Engineers
1150 Victoria Street, P.O. Box 9123, Hamilton

BORE HOLE LOG

BORE HOLE LOG Lots 46 & 47
LOCATION: refer Site Plan RL (m):
SHEET: 1 OF 1 Fig. No. A-3

BORE HOLE LOG Lot No. 48

GRAPHIC LOG	SOIL DESCRIPTION	DEPTH (metres)	GEOLOGICAL FORMATION	VANE SHEAR STRENGTH - kPa (in-situ/Remoulded)	SCALA PENETROMETER (blows/100mm) 1 2 3 4 5 6 7 8 9 10	PIEZOMETER / WATER LEVEL
	TOPSOIL.		TS			
	clayey SILT. Very stiff, moist, slightly plastic, light yellowish brown.	1	Hamilton Ash	140+/42 140+/43 140+/44 129/36		No Groundwater
	silty CLAY. Very stiff, moist, moderately plastic, yellowish brown.			140+/62		
	clayey SILT. Very stiff, moist, slightly plastic, yellowish brown.	2		140+/48		
	Bottom of Bore Hole completed 19/04/21	3				

BORE HOLE LOG Lot No. 49

NOTES
- The stratification lines represent the approximate boundary between soil types and the transition may be gradual.
- Vane shear values shown are as-recorded in the field, to which a calibration factor from Geotechnics Vane 443 of 1.39 should be applied to the top metre and a calibration factor from Geotechnics Vane 446 of 1.43 should be applied to the bottom metre to attain Undrained Shear Strength (kPa).
- Scala test was carried out in 1.0 metre depth increments.

GRAPHIC LOG	SOIL DESCRIPTION	DEPTH (metres)	GEOLOGICAL FORMATION	VANE SHEAR STRENGTH - kPa (in-situ/Remoulded)	SCALA PENETROMETER (blows/100mm) 1 2 3 4 5 6 7 8 9 10	PIEZOMETER / WATER LEVEL
	TOPSOIL.		TS			
	clayey SILT. Very stiff, moist, moderately plastic, brown.			72/17 140+/28		
	clayey SILT. Very stiff, moist, slightly plastic, orangey brown.	1	Hamilton Ash	140+/40 UTP		No Groundwater
	silty CLAY. Very stiff, moist, slightly plastic, dark yellowish brown.			140+/70		
	Bottom of Bore Hole completed 19/04/21	2 3		140+		

JOB NAME: FRONTIER DEVELOPMENTS LTD - Stage 3
JOB LOCATION: Pioneer Drive, Te Awamutu
JOB NUMBER: W-16638

DRILL METHOD: Hand Auger
RIG: VANE No. 443/446
DRILLER: MMC/CFK

LOGGED: MMC/CFK PLOTTED: CFK
DATE LOGGED: 19/04/21
CHECKED: KH

Geocon Geotechnical Ltd
Geotechnical Engineers
1150 Victoria Street, P.O. Box 9123, Hamilton

BORE HOLE LOG

BORE HOLE LOG Lots 48 & 49
LOCATION: refer Site Plan RL (m):
SHEET: 1 OF 1 Fig. No. A-4

BORE HOLE LOG Lot No. 50

SOIL DESCRIPTION

GRAPHIC LOG	SOIL DESCRIPTION	DEPTH (metres)	GEOLOGICAL FORMATION	VANE SHEAR STRENGTH - kPa (In-situ/Remoulded)	SCALA PENETROMETER (blows/100mm) 1 2 3 4 5 6 7 8 9 10	PIEZOMETER / WATER LEVEL
	TOPSOIL.		TS	140+/50		
	clayey SILT. Stiff to very stiff, moist, slightly plastic, yellowish brown.	1	Hamilton Ash	140+/47 140+/31 140+/20 74/12		No Groundwater
	silty CLAY. Stiff to very stiff, moist, highly plastic, yellowish brown.	2		138/30 92/36		
	Bottom of Bore Hole completed 19/04/21	3				

BORE HOLE LOG Lot No. 51

SOIL DESCRIPTION

NOTES
- The stratification lines represent the approximate boundary between soil types and the transition may be gradual.
- Vane shear values shown are as-recorded in the field, to which a calibration factor from Geotechnics Vane 443 of 1.39 should be applied to the top metre and a calibration factor from Geotechnics Vane 446 of 1.43 should be applied to the bottom metre to attain Undrained Shear Strength (kPa).
- Scala test was carried out in 1.0 metre depth increments.

GRAPHIC LOG	SOIL DESCRIPTION	DEPTH (metres)	GEOLOGICAL FORMATION	VANE SHEAR STRENGTH - kPa (In-situ/Remoulded)	SCALA PENETROMETER (blows/100mm) 1 2 3 4 5 6 7 8 9 10	PIEZOMETER / WATER LEVEL
	TOPSOIL.		TS			
	clayey SILT. Very stiff, moist, slightly plastic, brown.			132/57		
	silty CLAY. Very stiff, moist, highly plastic, brown.			140+/48		
	clayey SILT. Very stiff, moist, slightly plastic, brown. Becoming orangey brown @ 1.2 metres.	1	Hamilton Ash	140+/30 140+/25		No Groundwater
	silty CLAY. Very stiff, moist, slightly plastic, orangey brown. Becoming moderately plastic and dark yellowish brown @ 1.9 metres.	2		140+/68 120/36		
	Bottom of Bore Hole completed 19/04/21	3				

JOB NAME: FRONTIER DEVELOPMENTS LTD - Stage 3
JOB LOCATION: Pioneer Drive, Te Awamutu
JOB NUMBER: W-16638

DRILL METHOD: Hand Auger
RIG: VANE No. 443/446
DRILLER: MMC/CFK

LOGGED: MMC/CFK PLOTTED: CFK
DATE LOGGED: 19/04/21
CHECKED: KH

Geocon Geotechnical Ltd
Geotechnical Engineers
1150 Victoria Street, P.O. Box 9123, Hamilton

BORE HOLE LOG

BORE HOLE LOG Lots 50 & 51
LOCATION: refer Site Plan RL (m):
SHEET: 1 OF 1 Fig. No. A-5

BORE HOLE LOG Lot No. 52

SOIL DESCRIPTION

GRAPHIC LOG	SOIL DESCRIPTION	DEPTH (metres)	GEOLOGICAL FORMATION	VANE SHEAR STRENGTH - kPa (In-situ/Remoulded)	SCALA PENETROMETER (blows/100mm)	PIEZOMETER / WATER LEVEL
	TOPSOIL.		TS			
	silty CLAY. Stiff to very stiff, moist, highly plastic, yellowish brown. Becoming moist to wet @ 1.8 metres.	1 2	Hamilton Ash	140+/57 140+/64 140+/54 130/33 100/30 62/18	1 2 3 4 5 6 7 8 9 10	No Groundwater
	Bottom of Bore Hole completed 19/04/21	3				

BORE HOLE LOG Lot No. 53

NOTES
- The stratification lines represent the approximate boundary between soil types and the transition may be gradual.
- Vane shear values shown are as-recorded in the field, to which a calibration factor from Geotechnics Vane 443 of 1.39 should be applied to the top metre and a calibration factor from Geotechnics Vane 446 of 1.43 should be applied to the bottom metre to attain Undrained Shear Strength (kPa).
- Scala test was carried out in 1.0 metre depth increments.

SOIL DESCRIPTION

GRAPHIC LOG	SOIL DESCRIPTION	DEPTH (metres)	GEOLOGICAL FORMATION	VANE SHEAR STRENGTH - kPa (In-situ/Remoulded)	SCALA PENETROMETER (blows/100mm)	PIEZOMETER / WATER LEVEL
	TOPSOIL.		TS			
	FILLING: Mix of Silt and Clay, Engineer certified, high strength, moist, yellowish brown mottled brown.		FILL	140+/25 140+/68	1 2 3 4 5 6 7 8 9 10	
	silty CLAY. Very stiff, moist, highly plastic, brown. Becoming dark yellowish brown @ 0.9 metres. " yellowish brown @ 1.8 metres.	1 2	Hamilton Ash	140+/27 140+/38 140+/41 140+/40 140+/60		No Groundwater
	Bottom of Bore Hole completed 19/04/21	3				

JOB NAME: FRONTIER DEVELOPMENTS LTD - Stage 3
JOB LOCATION: Pioneer Drive, Te Awamutu
JOB NUMBER: W-16638

DRILL METHOD: Hand Auger
RIG: VANE No. 443/446
DRILLER: MMC/CFK

LOGGED: MMC/CFK PLOTTED: CFK
DATE LOGGED: 19/04/21
CHECKED: KH

Geocon Geotechnical Ltd
Geotechnical Engineers
1150 Victoria Street, P.O. Box 9123, Hamilton

BORE HOLE LOG

BORE HOLE LOG Lots 52 & 53
LOCATION: refer Site Plan RL (m):
SHEET: 1 OF 1 Fig. No. A-6

BORE HOLE LOG Lot No. 54

SOIL DESCRIPTION

DEPTH (metres)	GEOLOGICAL FORMATION	VANE SHEAR STRENGTH - kPa (In-situ/Remoulded)	SCALA PENETROMETER (blows/100mm)	PIEZOMETER / WATER LEVEL
0	TS	140+/38		No Groundwater
	Filling	140+/27		
		140+/39		
		140+/31		
1		140+/45		
	Hamilton Ash	122/30		
2		110/34		
3				

TOPSOIL.

FILLING: Mix of Silt and Clay, Engineer certified, high strength, moist, yellowish brown mottled brown.
Becoming light brown mottled greyish brown @ 0.7 metres.

silty CLAY. Very stiff, moist, slightly plastic, yellowish brown.
Becoming moderately plastic @ 1.7 metres.

Bottom of Bore Hole completed 16/04/21

BORE HOLE LOG Lot No. 55

SOIL DESCRIPTION

NOTES

- The stratification lines represent the approximate boundary between soil types and the transition may be gradual.
- Vane shear values shown are as-recorded in the field, to which a calibration factor from Geotechnics Vane 443 of 1.39 should be applied to the top metre and a calibration factor from Geotechnics Vane 446 of 1.43 should be applied to the bottom metre to attain Undrained Shear Strength (kPa).
- Scala test was carried out in 1.0 metre depth increments.

DEPTH (metres)	GEOLOGICAL FORMATION	VANE SHEAR STRENGTH - kPa (In-situ/Remoulded)	SCALA PENETROMETER (blows/100mm)	PIEZOMETER / WATER LEVEL
0	TS	140+/73		No Groundwater
	Hamilton Ash	140+/67		
		140+/23		
1		140+/23		
		140+/50		
2		140+/60		
3				

TOPSOIL.

silty CLAY. Very stiff, moist, highly plastic, brown.

clayey SILT. Very stiff, moist, slightly plastic, brown.

silty CLAY. Very stiff, moist, moderately plastic, yellowish brown.
Becoming slightly plastic @ 1.7 metres.

Bottom of Bore Hole completed 16/04/21

JOB NAME: FRONTIER DEVELOPMENTS LTD - Stage 3
JOB LOCATION: Pioneer Drive, Te Awamutu
JOB NUMBER: W-16638

DRILL METHOD: Hand Auger
RIG: VANE No. 443/446
DRILLER: MMC/CFK

LOGGED: MMC/CFK PLOTTED: CFK
DATE LOGGED: 16/04/21
CHECKED: KH

Geocon Geotechnical Ltd
Geotechnical Engineers
1150 Victoria Street, P.O. Box 9123, Hamilton

BORE HOLE LOG

BORE HOLE LOG Lots 54 & 55
LOCATION: refer Site Plan RL (m):
SHEET: 1 OF 1 Fig. No. A-7

BORE HOLE LOG Lot No. 56

GRAPHIC LOG	SOIL DESCRIPTION	DEPTH (metres)	GEOLOGICAL FORMATION	VANE SHEAR STRENGTH - kPa (In-situ/Remoulded)	SCALA PENETROMETER (blows/100mm) 1 2 3 4 5 6 7 8 9 10	PIEZOMETER / WATER LEVEL
	TOPSOIL.		TS			
	FILLING: Mix of Silt and Clay, Engineer certified, high strength, moist, yellowish brown mottled brown.		FILL	140+/56		
	silty CLAY. Very stiff, moist, highly plastic, brown.		Hamilton Ash	134/40		
	clayey SILT. Very stiff, moist, moderately plastic, yellowish brown. Becoming slightly plastic @ 0.9 metres.	1		124/26 140+/39		
	silty CLAY. Very stiff, moist, highly plastic, yellowish brown.			140+/58		
	Bottom of Bore Hole completed 16/04/21	2		110/48		No Groundwater
		3				

BORE HOLE LOG Lot No. 57

NOTES
- The stratification lines represent the approximate boundary between soil types and the transition may be gradual.
- Vane shear values shown are as-recorded in the field, to which a calibration factor from Geotechnics Vane 443 of 1.39 should be applied to the top metre and a calibration factor from Geotechnics Vane 446 of 1.43 should be applied to the bottom metre to attain Undrained Shear Strength (kPa).
- Scala test was carried out in 1.0 metre depth increments.

GRAPHIC LOG	SOIL DESCRIPTION	DEPTH (metres)	GEOLOGICAL FORMATION	VANE SHEAR STRENGTH - kPa (In-situ/Remoulded)	SCALA PENETROMETER (blows/100mm) 1 2 3 4 5 6 7 8 9 10	PIEZOMETER / WATER LEVEL
	TOPSOIL.		TS			
	clayey SILT. Very stiff, moist, moderately plastic, dark yellowish brown.	1	Hamilton Ash	138/44 140+/42 124/29 126/28 140+/38 128/30		
	silty CLAY. Very stiff, moist, highly plastic, yellowish brown.					
	Bottom of Bore Hole completed 16/04/21	2		110/40		No Groundwater
		3				

JOB NAME: FRONTIER DEVELOPMENTS LTD - Stage 3
JOB LOCATION: Pioneer Drive, Te Awamutu
JOB NUMBER: W-16638

DRILL METHOD: Hand Auger
RIG: VANE No. 443/446
DRILLER: MMC/CFK

LOGGED: MMC/CFK PLOTTED: CFK
DATE LOGGED: 16/04/21
CHECKED:

Geocon Geotechnical Ltd
Geotechnical Engineers
1150 Victoria Street, P.O. Box 9123, Hamilton

BORE HOLE LOG

BORE HOLE LOG Lots 56 & 57
LOCATION: refer Site Plan RL (m):
SHEET: 1 OF 1 Fig. No. A-8

BORE HOLE LOG Lot No. 58

SOIL DESCRIPTION

DEPTH (metres)	GEOLOGICAL FORMATION	VANE SHEAR STRENGTH - kPa (In-situ/Remoulded)	SCALA PENETROMETER (blows/100mm) 1 2 3 4 5 6 7 8 9 10	PIEZOMETER / WATER LEVEL
TOPSOIL.	TS			
clayey SILT. Very stiff, moist, slightly plastic, yellowish brown.	Hamilton Ash	114/18 114/20 140+/29 140+/44		No Groundwater
1				
silty CLAY. Very stiff, moist to wet, highly plastic, yellowish brown.		120/40		
2		122/32		
Bottom of Bore Hole completed 16/04/21				
3				

BORE HOLE LOG Lot No. 59

NOTES

- The stratification lines represent the approximate boundary between soil types and the transition may be gradual.
- Vane shear values shown are as-recorded in the field, to which a calibration factor from Geotechnics Vane 443 of 1.39 should be applied to the top metre and a calibration factor from Geotechnics Vane 446 of 1.43 should be applied to the bottom metre to attain Undrained Shear Strength (kPa).
- Scala test was carried out in 1.0 metre depth increments.

SOIL DESCRIPTION

TOPSOIL.	TS		1 2 3 4 5 6 7 8 9 10	
clayey SILT. Very stiff, moist, slightly plastic, brown.	Hamilton Ash	140+/56 140+/50 140+/42 140+/50		No Groundwater
1				
silty CLAY. Stiff, moist, moderately plastic, yellowish brown.		140+/60		
2		102/20		
Bottom of Bore Hole completed 16/04/21				
3				

JOB NAME: FRONTIER DEVELOPMENTS LTD - Stage 3
JOB LOCATION: Pioneer Drive, Te Awamutu
JOB NUMBER: W-16638

DRILL METHOD: Hand Auger
RIG: VANE No. 443/446
DRILLER: MMC/CFK

LOGGED: MMC/CFK PLOTTED: CFK
DATE LOGGED: 16/04/21
CHECKED: K.H.

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Geotechnical Engineers
1150 Victoria Street, P.O. Box 9123, Hamilton

BORE HOLE LOG

BORE HOLE LOG Lots 58 & 59

LOCATION: refer Site Plan RL (m):
SHEET: 1 OF 1 Fig. No. A-9

BORE HOLE LOG Lot No. 60

GRAPHIC LOG	SOIL DESCRIPTION	DEPTH (metres)	GEOLOGICAL FORMATION	VANE SHEAR STRENGTH - kPa (In-situ/Remoulded)	SCALA PENETROMETER (blows/100mm) 1 2 3 4 5 6 7 8 9 10	PIEZOMETER / WATER LEVEL
	TOPSOIL.		TS			
	clayey SILT. Very stiff, moist, slightly plastic, yellowish brown.	1	Walton Subgroup	115/19 120/20 135/24 110/30		No Groundwater
	silty CLAY. Stiff, moist, highly plastic, yellowish brown. Containing trace fine sand @ 1.7 metres.	2		72/38		
	Bottom of Bore Hole completed 16/04/21			80/40		
		3				

BORE HOLE LOG Lot No. 61

NOTES
- The stratification lines represent the approximate boundary between soil types and the transition may be gradual.
- Vane shear values shown are as-recorded in the field, to which a calibration factor from Geotechnics Vane 443 of 1.39 should be applied to the top metre and a calibration factor from Geotechnics Vane 446 of 1.43 should be applied to the bottom metre to attain Undrained Shear Strength (kPa).
- Scala test was carried out in 1.0 metre depth increments.

GRAPHIC LOG	SOIL DESCRIPTION	DEPTH (metres)	GEOLOGICAL FORMATION	VANE SHEAR STRENGTH - kPa (In-situ/Remoulded)	SCALA PENETROMETER (blows/100mm) 1 2 3 4 5 6 7 8 9 10	PIEZOMETER / WATER LEVEL
	TOPSOIL.		TS	140+/56		
	FILLING: Mix of Clay and Silt, Engineer certified, high strength, moist, moderately plastic, yellowish brown mottled brown. Becoming light yellowish brown mottled grey @ 0.5 metres.		FILL	133/45 119/22		
	clayey SILT. Stiff to very stiff, moist, slightly plastic, yellowish brown.	1	Walton Subgroup	110/32		No Groundwater
	clayey SILT. Stiff, moist to wet, moderately plastic, light greyish brown.			52/16		
	silty CLAY. Moist, moderately plastic, orangey brown.					
	silty CLAY with trace fine sand. Stiff, moist, moderately plastic, brownish grey. Becoming highly plastic and containing manganese nodules @ 1.8 metres.			78/38		
	Bottom of Bore Hole completed 16/04/21	2		70/32		
		3				

JOB NAME: FRONTIER DEVELOPMENTS LTD - Stage 3
JOB LOCATION: Pioneer Drive, Te Awamutu
JOB NUMBER: W-16638

DRILL METHOD: Hand Auger
RIG: VANE No. 443/446
DRILLER: MMC/CFK

LOGGED: MMC/CFK PLOTTED: CFK
DATE LOGGED: 16/04/21
CHECKED: KH

Geocon Geotechnical Ltd
Geotechnical Engineers
1150 Victoria Street, P.O. Box 9123, Hamilton

BORE HOLE LOG

BORE HOLE LOG Lots 60 & 61
LOCATION: refer Site Plan RL (m):
SHEET: 1 OF 1 Fig. No. A-10

BORE HOLE LOG Lot No. 62

GRAPHIC LOG	SOIL DESCRIPTION	DEPTH (metres)	GEOLOGICAL FORMATION	VANE SHEAR STRENGTH - kPa (In-situ/Remoulded)	SCALA PENETROMETER (blows/100mm)	PIEZOMETER / WATER LEVEL
	TOPSOIL.		TS			
	FILLING: Mix of Clay and Silt, Engineer certified, high strength, moist, brown mottled yellowish brown. Becoming orangey brown mottled light grey and containing fine to coarse sand @ 0.7 metres. Containing fine gravel @ 1.6 metres.	1	Filling	140+/55 140+/80 140+/32 140+/18 124/20	11	No Groundwater
	Bottom of Bore Hole completed 16/04/21	2		116/36		
		3				

BORE HOLE LOG Lot No. 63

NOTES
- The stratification lines represent the approximate boundary between soil types and the transition may be gradual.
- Vane shear values shown are as-recorded in the field, to which a calibration factor from Geotechnics Vane 443 of 1.39 should be applied to the top metre and a calibration factor from Geotechnics Vane 446 of 1.43 should be applied to the bottom metre to attain Undrained Shear Strength (kPa).
- Scala test was carried out in 1.0 metre depth increments.

GRAPHIC LOG	SOIL DESCRIPTION	DEPTH (metres)	GEOLOGICAL FORMATION	VANE SHEAR STRENGTH - kPa (In-situ/Remoulded)	SCALA PENETROMETER (blows/100mm)	PIEZOMETER / WATER LEVEL
	TOPSOIL.		TS			
	FILLING: Mix of Clay and Silt, Engineer certified, high strength, moist, yellowish brown.		Filling	140+/62 140+/27		
	silty CLAY. Firm to stiff, moist, highly plastic, yellowish brown. Becoming moist to wet @ 0.9 metres. " wet @ 1.2 metres.	1	Walton Subgroup	66/24 49/18		No Groundwater
	silty CLAY. Moist, highly plastic, micaceous, grey.			48/20		
	silty CLAY containing some fine sand. Very stiff, moist, slightly plastic, grey mottled orangey brown.	2		140+/60		
	Bottom of Bore Hole completed 16/04/21	3				

JOB NAME: FRONTIER DEVELOPMENTS LTD - Stage 3
JOB LOCATION: Pioneer Drive, Te Awamutu
JOB NUMBER: W-16638

DRILL METHOD: Hand Auger
RIG: VANE No. 443/446
DRILLER: MMC/CFK

LOGGED: MMC/CFK PLOTTED: CFK
DATE LOGGED: 16/04/21
CHECKED: KH

Geocon Geotechnical Ltd
Geotechnical Engineers
1150 Victoria Street, P.O. Box 9123, Hamilton

BORE HOLE LOG

BORE HOLE LOG Lots 62 & 63
LOCATION: refer Site Plan RL (m):
SHEET: 1 OF 1 Fig. No. A-11

BORE HOLE LOG Lot No. 64

GRAPHIC LOG	SOIL DESCRIPTION	DEPTH (metres)	GEOLOGICAL FORMATION	VANE SHEAR STRENGTH - kPa (In-situ/Remoulded)	SCALA PENETROMETER (blows/100mm) 1 2 3 4 5 6 7 8 9 10	PIEZOMETER / WATER LEVEL
	TOPSOIL.		TS			
	clayey SILT. Stiff to very stiff, moist, slightly plastic, yellowish brown.	1	Hamilton Ash	140+/34 124/20 133/24 96/23		No Groundwater
	silty CLAY. Stiff to very stiff, moist, moderately plastic, yellowish brown.	2		140+/36		
	Bottom of Bore Hole completed 16/04/21	3		56/12		

BORE HOLE LOG

NOTES
- The stratification lines represent the approximate boundary between soil types and the transition may be gradual.
- Vane shear values shown are as-recorded in the field, to which a calibration factor from Geotechnics Vane 443 of 1.39 should be applied to the top metre and a calibration factor from Geotechnics Vane 446 of 1.43 should be applied to the bottom metre to attain Undrained Shear Strength (kPa).
- Scala test was carried out in 1.0 metre depth increments.

SOIL DESCRIPTION

1 2 3 4 5 6 7 8 9 10

1 2 3 No Groundwater

JOB NAME: FRONTIER DEVELOPMENTS LTD - Stage 3
JOB LOCATION: Pioneer Drive, Te Awamutu
JOB NUMBER: W-16638

DRILL METHOD: Hand Auger
RIG: VANE No 443/446
DRILLER: MMC/CFK

LOGGED: MMC/CFK PLOTTED: CFK
DATE LOGGED: 16/04/21
CHECKED: KH

Geocon Geotechnical Ltd
Geotechnical Engineers
1150 Victoria Street, P.O. Box 9123, Hamilton

BORE HOLE LOG

BORE HOLE LOG Lot 64
LOCATION: refer Site Plan RL (m):
SHEET: 1 OF 1 Fig. No. A-12

Mark T Mitchell Ltd

Consulting Geotechnical Engineers

1150 Victoria Street
P O Box 9123
Hamilton 3240
New Zealand
Telephone 07 838 3119
Facsimile 07 839 3125
email: mtm@geocon.co.nz

SCHEDULE 2A (Ref: NZS 4404:2010)

To: The Director of Works/Development Engineer
Waipa District Council
Private Bag 2402
Te Awamutu 3840

Ref: W – 16638

STATEMENT OF PROFESSIONAL OPINION AS TO SUITABILITY

OF LAND FOR RESIDENTIAL BUILDING DEVELOPMENT

Subdivision	:	Frontier Developments – Stage 3
Owner/Developer	:	Frontier Developments Ltd
Location	:	Lots 42 to 64 Pioneer Drive, Te Awamutu

I, Mark Thomson Mitchell, a Director of Mark T Mitchell Ltd, Consulting Geotechnical Engineers of 1150 Victoria Street, Hamilton, hereby confirm that:

1. I am a geo-professional as defined in Section 1.2.2 of NZS 4404:2010 and was retained by the Developer, as the geo-professional on the above development.

2. The extent of our inspections during construction and the results of all tests carried out are as described in our Soils and Earthfill report dated 27 May, 2021.

3. In my professional opinion, not to be construed as a guarantee, I consider that:

   a. The Engineer-Certified Earth Fill has been placed in compliance with the requirements of the Waipa District Council.

   b. The completed works take into account land slope and foundation stability considerations, subject to the foundation recommendations contained in our report dated 27 May, 2021

   c. Subject to 3(a) and 3(b) of this Schedule, the <u>original</u> ground not affected by Filling is suitable for the erection thereon of buildings designed according to NZS 3604:2011, although the presence of groundwater within both naturally occurring and fill soils may result in a decrease in soil strength, thereby resulting in additional building site preparation work.

   d. The original ground not affected by Filling and the Filled ground are not subject to erosion, subsidence, or slippage in accordance with the provisions of Section 106 of the Resource Management Act 1991 provided the recommendations contained in our report dated 27 May, 2021 are followed.

4. This professional opinion is furnished to Waipa District Council and the Developer for their purposes alone on the express condition that it will not be relied upon by any other person and does not remove the necessity for the normal inspection of foundation conditions at the time of erection of any building.

5. This certificate shall be read in conjunction with our geotechnical report referred to in clause 2 and shall not be copied or reproduced except in conjunction with the full geotechnical completion report.

Signed by  Date: 27 May, 2021

Mark T Mitchell, BE (Civil), MS, CPEng
(Member ACENZ, IPENZ, ASCE)

On behalf of **Mark T Mitchell Ltd,** Consulting Geotechnical Engineers

Mark T Mitchell Ltd

Consulting Geotechnical Engineers

1150 Victoria Street
P O Box 9123
Hamilton 3240
New Zealand
Telephone 07 838 3119
Facsimile 07 839 3125
email: mtm@geocon.co.nz

APPENDIX A (Ref: NZS 4431:1989)

To: The Director of Works
Waipa District Council
Private Bag 2402
Te Awamutu 3840

Ref: W – 16638

STATEMENT OF SUITABILITY OF EARTH FILL
FOR RESIDENTIAL BUILDING DEVELOPMENT

Subdivision	:	Frontier Developments – Stage 3
Owner/Developer	:	Frontier Developments Ltd
Location	:	Lots 42 to 64 Pioneer Drive, Te Awamutu

I, Mark Thomson Mitchell, Consulting Geotechnical Engineer of 1150 Victoria Street, Hamilton and a Director of Mark T Mitchell Ltd, hereby confirm that:

1. The Engineer-Certified Earth Fill has been placed to a standard equal to or better than the requirements of NZS 4431:1989, the NZ Standard Code of Practice for Earth Fill for Residential Development.

2. While work was in progress, I carried out the function of Inspecting Geotechnical Engineer.

3. During the work, my staff and I, made periodic visits of inspection to the site, as detailed in my report dated 27 May 2021, a copy of which is attached.

4. Fill is present in the following lots:

   Engineer-Certified Fill: Lots 42 to 49 and 51 to 64

5. In the opinion of the Inspecting Engineer, the limitations as set out in our 26 May, 2021 report should be observed when constructing dwellings over, or in the vicinity of Filled ground.

6. This Certification, that the Controlled Earth Fills have been placed equal to or to a better standard than the requirements of NZS 4431, does not remove the necessity for the normal inspection and design of foundations as would be made in natural ground.

Mark T Mitchell Ltd

Signed . . . . . .
Mark T Mitchell, BE(Civil), MS, MIPENZ
(Member ACENZ, IPENZ, ASCE)

Date: 27 May, 2021