Appendix 1A

DIAMOND CREEK FARM LTD

STATE HIGHWAY 23, TE UKU, WAIKATO

GEOTECHNICAL FEASIBILITY ASSESSMENT FOR A PROPOSED SUBDIVISION

REF: R7089-1A
DATE: 12 APRIL 2021

GCL
Ground Consulting Ltd

REPORT QUALITY CONTROL

REPORT PREPARED BY: **GROUND CONSULTING LIMITED (GCL)**

PUKEKOHE OFFICE
LEVEL 2, CAMPBELL TYSON BUSINESS
CENTRE, 1 WESLEY STREET, PUKEKOHE
POST: PO BOX 1019, PUKEKOHE, 2120
EMAIL: pukekohe@gcltech.co.nz
TEL: 09 239 2229

QUEENSTOWN OFFICE
157 GLENDA DRIVE, FRANKTON
POST: PO BOX 2963, QUEENSTOWN 9349
EMAIL: queenstown@gcltech.co.nz
TEL: 03 442 5700

AUCKLAND CENTRAL OFFICE
LEVEL 1, KAURI TIMBER BUILDING
104 FANSHAWE STREET, AUCKLAND, 1010
EMAIL: auckland@gcltech.co.nz
TEL: 09 379 0777

GREAT BARRIER IS. OFFICE
6 MOANA VIEW ROAD, OKUPU
POST: PO BOX 1019, PUKEKOHE, 2120
EMAIL: auckland@gcltech.co.nz
TEL: 09 379 0777

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REPORT TITLE		GEOTECHNICAL FEASIBILITY ASSESSMENT FOR A PROPOSED SUBDIVISION		
REPORT REFERENCE		R7089-1A	PROJECT NUMBER	7089
CLIENT		DIAMOND CREEK FARM LTD		
REV	DATE	REVISION STATUS	AUTHOR	REVIEWER
A	12 APRIL 2021	ISSUED TO CLIENT	KEVIN HIHA	FRASER WALSH
APPROVAL				
AUTHOR SIGNATURE			REVIEWER SIGNATURE	
NAME		KEVIN HIHA	NAME	FRASER WALSH CMEngNZ (PEngGeol)
TITLE		ENGINEERING GEOLOGIST	TITLE	DIRECTOR

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1 INTRODUCTION

1.1 PROJECT BRIEF

GCL has been requested by the client, Diamond Creek Farm Ltd, to provide a geotechnical feasibility assessment for a proposed subdivision at Lot 1 State Highway 23, Te Uku. This geotechnical report has been prepared as a supporting document for a proposed plan change and geotechnical guidance for interested parties.

This report includes a summary of the investigations undertaken and provides a feasibility assessment of:

- Ground conditions.
- Groundwater conditions.
- Building platform stability.
- Foundation conditions.
- Surface water management.
- On-site effluent disposal.
- Other pertinent constraints and issues identified with the site.

2 SITE CONDITIONS

2.1 SITE DETAILS

The site comprises Lot 1 DP23893 at State Highway 23, Te Uku, Waikato.

The site is situated directly east in the close vicinity to Te Uku Primary School. The site is located approximately 8km south east of Raglan Township. The site is accessible off State Highway 23.

The site is currently surrounded by farmland and rural lifestyle development.

A site location map is presented on Drawing 001.

2.2 SITE TOPOGRAPHY

The site contains three main topographic features, a low-lying area labelled Zone A, an upper terrain labelled Zone B and interconnecting slopes labelled Zone C.

Zone A

Zone A comprises low-lying flats and undulating topography which is located principally within the northern half of the site. Zone A contains multiple low points in the topography which act as overland flow paths. The topography typically runs down towards the north of the site.

Zone B

Zone B contains elevated gently sloping topography which is located principally within the southern half of the site. The slopes are largely grassed and contain a number of fenced paddocks. The topography typically falls to the north of the site with measured slope angles of less than 15^0.

Zone C

Zone C contains typically moderately steep slopes located between Zone A and Zone B. The slopes are typically grassed and contain a series of swampy gullies holding overland flow paths.

2.3 SITE SURFACE WATER FEATURES

The site contains numerous surface water features associated with freshwater springs which run down the gullies formed within the abovementioned slopes (Zone B). The gullies all descend through to the low-lying area of the site (Zone A).

The surface water within Zone A is channelled along a series of swampy and grass lined overland flow paths to a stream running along the northern boundary, as depicted on Drawing 002. We are unsure of flood levels associated with the stream.

The majority of the overland flow path features appears to be ephemeral in nature.

2.4 SLOPE INSTABILITY FEATURES

Zone A and Zone B do not contain any slope instability features.

Zone C is associated with moderately steep slopes which contain terracettes associated with soil creep to an observed depth of between 0.50 to 1.0m in some places, especially within the head of the gully features. These features appear to have been exacerbated by stock use.

No deep-seated and/or large-scale slope instability features were noted.

3 GROUND CONDITIONS

3.1 PUBLISHED GEOLOGY

The Geological Map of New Zealand, Sheet 3, at a scale of 1:250,000 maps the zones denoted in Drawing 002 as being underlain by two geological groups. Zone A is located within the Tauranga Group and consists of locally derived pumiceous clays, sandy clays and gravels. Zones B & C are underlain by Hamilton Ash which consists of strongly weathered, clay-textured, multiple rhyolitic tephra deposits and associated paleosols.

3.2 FIELD INVESTIGATIONS

A scatter of sub-surface investigations has been undertaken within the property. The sub-surface investigations have comprised of 12 hand auger bores to a maximum depth of 3.25m. The hand auger bores were constructed within Zones A & B in order to assess the general sub-surface conditions. In addition, seven Scala penetrometer tests were undertaken from the base of all but one hand auger bore within Zone A. The investigations were undertaken by an engineering geologist from GCL. The hand auger bore locations were determined with the use of topographic survey plans provided to GCL by the client.

The approximate locations of the sub-surface investigations are shown on Drawing 002.

3.3 INVESTIGATION LOGGING

Core recovered from the hand auger bores has been logged and is presented in Appendix A. Logging of the core has been undertaken in accordance with NZ Geotechnical Society Guidelines for the Field Classification and Description of Soil and Rock for Engineering Purposes.

Down-hole strength testing with a Pilcon shear vane has been undertaken within the hand auger bores at approximately 0.5m intervals. The readings provided on the logs are "shear vane strengths" which have been factored in accordance with NZ Geotechnical Society Guidelines for Handheld Shear Vane Tests. The logs are presented in Appendix A.

3.3.1 Topsoil

Topsoil mantles the site and was recorded to some measured depths between 0.15 to 0.20m.

3.3.2 Alluvial Soils

Zone A is underlain by alluvial soil to a measured depth of between 1.6m and 3.1m.

The soil typically consists of clayey SILT, SILT and silty CLAY which is generally very stiff to hard, moist with moderate plasticity and insensitive.

Down-hole shear strength testing undertaken provided an undrained shear strength of between 67kPa and UTP with the majority of shear strengths 150kPa.

Scala penetrometer testing undertaken from the base of the hand auger bores provided a blow count of typically between 4 and >20 with effective refusal met within 0.5m. Refusal appears to be on highly weathered rock.

Recent alluvial soil, mostly organic based, appears to underlie the overland flow paths and base of site gullies. The soil is likely to be weak and mostly saturated.

3.3.3 Weathered Volcanic Ash

Residual soil associated with the Hamilton Ash underlies Zone B (and assumed Zone C) to a depth of at least 2.0m.

The soil typically consists of an upper (1 – 1.5m) horizon of clayey SILT, which is generally very stiff to hard, moist to wet with moderate plasticity and insensitive. The clayey SILT mantled a silty CLAY layer at depth, which was mostly wet with moderate to high plasticity and insensitive.

Down-hole shear strength testing undertaken provided an undrained shear strength of between 96kPa and 201kPa.

3.4 GROUNDWATER CONDITIONS

Groundwater was not encountered within any of the hand auger bores undertaken indicating a coherent and perched groundwater depth of at least 2.0m from existing ground level within the property.

Groundwater is susceptible to seasonal variations and it should be noted that the current measured groundwater during this investigation is indicative of early spring conditions (Zone B investigations) and autumn (Zone A investigations).

4 GEOTECHNICAL FEASIBILITY

4.1 PROPOSED SUBDIVISION

The proposed subdivision development is shown on Drawing 002 and consists of a series of lifestyle type properties accessed via. roads which extend off State Highway 23. Given the orientation of the roads, earthworks are expected to provide gentle grades from Zone B down to Zone A and in-fill some of the site gullies principally located within Zone C. An esplanade strip is provided along the edge of the property stream located on the northern boundary.

The lifestyle blocks require on-site wastewater disposal and stormwater disposal, and this is likely to be achieved by the use of home "package plant" systems for wastewater disposal and the site surface water features for stormwater disposal.

4.2 MAPPED LANDFORMS

The three mapped landforms, as previously described are shown on Drawing 002. The landforms are considered to provide the following geotechnical constraints and limitations on subdivision development:

4.2.1 ZONE A

Zone A is located within the low-lying northern portion of the site. Zone A is underlain by alluvial soils of the Tauranga Group and contains a number of overland swampy flow paths. This area provides competent ground conditions (outside of the swampy zones) including shallow weathered rock.

Given the competent ground conditions, Zone A should provide safe and stable conditions for subdivision development without requiring significant subdivision development constraints, including site earthworks, building platform stability and foundation conditions.

Zone A may include relatively shallow groundwater levels during the winter month and this is addressed later in this report.

4.2.2 ZONE B

Zone B is located within the upper southern portion of the site. Zone B is underlain by weathered volcanic ash which provides competent ground conditions.

Given the competent ground conditions, Zone B should provide safe and stable conditions for subdivision development without requiring significant subdivision development constraints, including site earthworks, building platform stability and foundation conditions.

4.3 ZONE C

Zone C is located on moderately sloping topography which generally contains shallow slope instability features (terracettes/soil creep). Zone C is not considered to be suitable for subdivision development/infrustructure in its current form and will require re-grading, undercutting and drainage works in order to provide suitable conditions for subdivision development.

Should Zone C remain undeveloped, suitable building platform set-backs and constraints on earthworks will be required for some fringe areas within Zone B.

5 STORMWATER MANAGEMENT FEASIBILITY

5.1 GENERAL

Controls on stormwater derived from the subdivision will likely incorporate provision of overland flow paths, permanent watercourse/s, culverts and detention ponds. This is considered to be feasible given the competent nature of the soil identified within the property.

In general, stormwater disposal should be in compliance with the operative District & Regional Plans and the Building Code. In summary this will require the following:

- Hydrogeological neutrality should be provided on the property boundary and within receiving environments (such as overland flow paths) with the addition of impervious surfaces. In addition, the disposal of stormwater should not provide a nuisance to neighbouring properties and public infrastructure.
- Stormwater should be managed in such a way as to avoid slope erosion, earthworks batters, retaining walls, building structures and effluent disposal areas.
- Stormwater should be managed in such a way as to have no significant effect on overall slope stability conditions.
- Stormwater should be directed to a public reticulated stormwater system where possible.
- Site development should be mindful of existing surface water features including overland flow paths and appropriate remedial measures should be provided where required.

5.2 SITE FLOODING

GCL has no data on existing flood levels (if any) for the site, especially associated the stream on the northern boundary. This may provide a constraint on subdivision development within Zone A.

6 EFFLUENT DISPOSAL FEASIBILITY

6.1 ZONE A

Effluent disposal within Zone A is considered to be feasible and will likely feature package plant type effluent disposal systems with the shallow disposal or secondary treated effluent via PCDI irrigation lines. Surface dripper line type disposal is also expected to provide a groundwater table clearance of 1m given the lower lying nature of Zone A.

Set-backs from surface water features, including the site overland flow paths will be required. Given the frequency of the overland flow paths, some of these features may drainage and in-filling which is considered to be feasible.

6.1.1 ZONE B

Effluent disposal within Zone B is considered to be feasible and will likely feature package plant type effluent disposal systems with the shallow disposal or secondary treated effluent via PCDI irrigation lines. Set-backs from surface water features, including the site overland flow paths which extend into Zone B, will be required but given the size of the lots, this is considered to be feasible.

6.2 ZONE C

Zone C contains moderately steep gullies which are not considered to provide suitable conditions for on-site effluent disposal. Given Zone C is not extensive, this is not considered to provide a significant constraint for subdivision development.

7 SUBDIVISION DEVELOPMENT EARTHWORKS AND INFRASTRUCTURE

Earthworks are expected within the subdivision to provide gentle grades from Zone B down to Zone A and in-fill some of the site gullies principally located within Zone C. Given the competent ground conditions which have been identified within Zones A & B, this is considered to be feasible and is not expected to provide a significant constraint to subdivision development.

The site earthworks are expected to provide gentle gradients for roads and services, and given the competent nature of Zones A & B, no significant constraints are expected for the proposed subdivision infrastructure.

8 LIMITATIONS & SUBDIVISION CONSENT

8.1 GENERAL

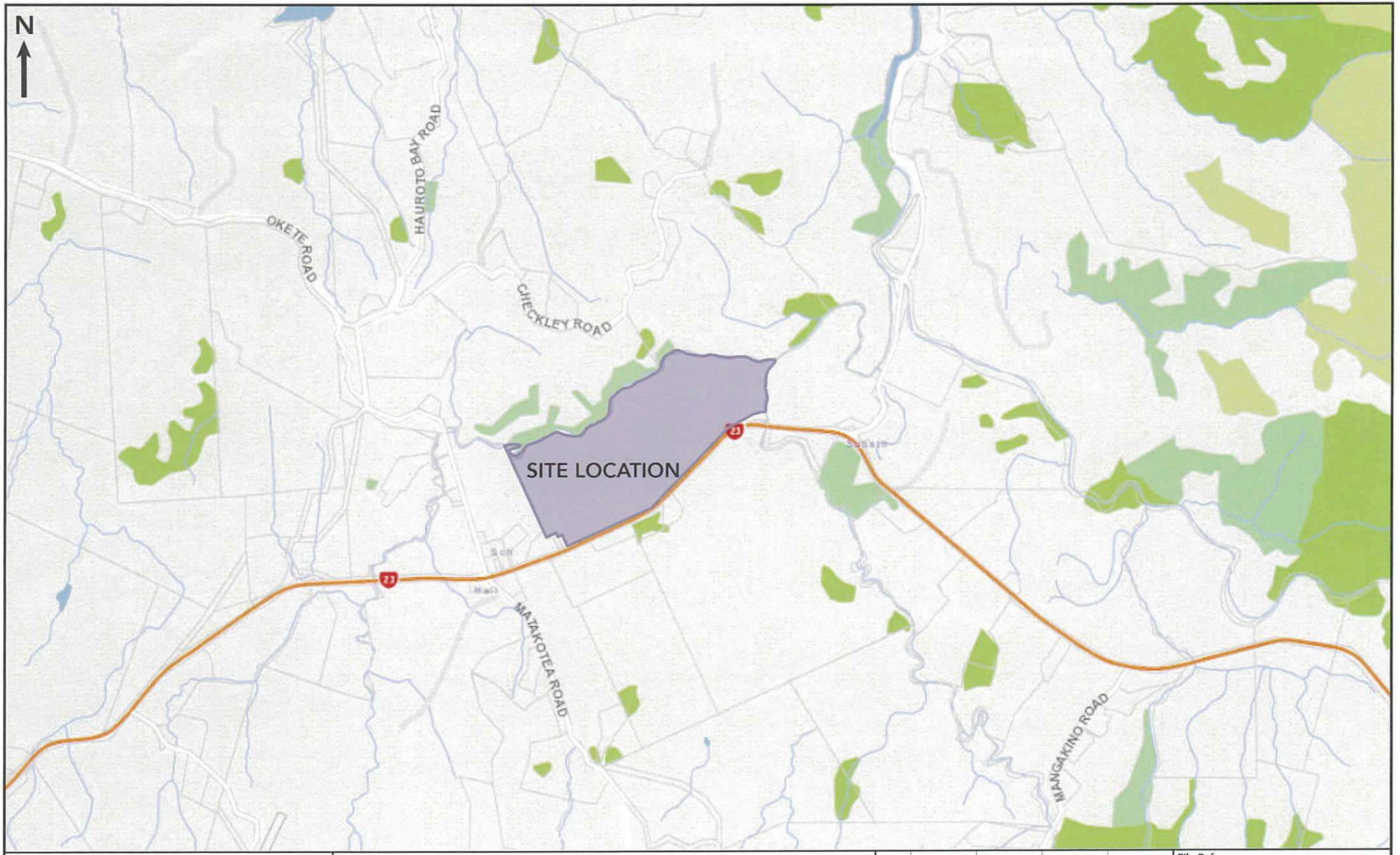
Ground Consulting Ltd has undertaken this assessment in accordance with the brief as provided, based on the site location as shown on Drawing 002. This report has been provided for the benefit of our client and for the authoritative council. No liability is accepted by this firm or any of its directors, servants or agents, in respect of its use by any other person, and any other person who relies upon information contained herein does so entirely at their own risk.

The sub-surface conditions have been extrapolated between the investigations undertaken. Whilst care has been taken to provide sufficient sub-surface information following best practice, no guarantee can be given on the validity of the inference made and it must be appreciated that actual conditions could vary from the assumed model.

8.2 FURTHER INVESTIGATIONS REQUIRED

Whilst this is considered to be sufficient to identify significant issues which may control or constrain subdivision development, a comprehensive geotechnical assessment should be undertaken for subdivision consent purposes.

DRAWINGS



GCL Ground Consulting Ltd

Diamond Creek Farm Ltd

State Highway 23, Te Uku, Waikato

Site Location Plan

Rev	Date	Status	Drafted	Reviewer
A	26/09/2019	Issued	KH	FW

File Ref. MAC://Projects_5000/5213/R5213-1A/R35213-1A-DRW001.ai

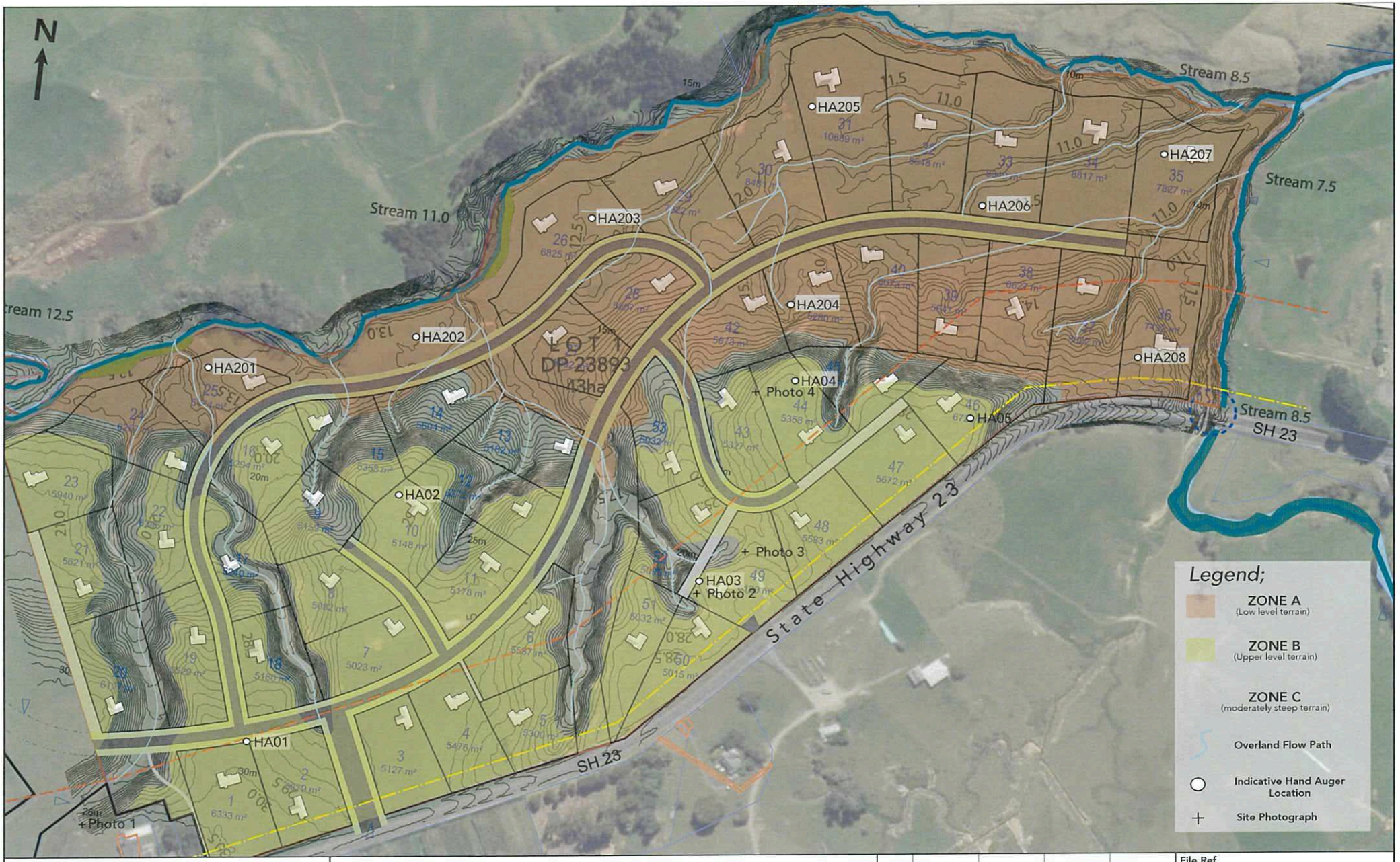
Scale (A4) 1:20,000

0 80 400 800m

Project No. 5213

Report Ref. R5213-1A

Drawing No. 001



GCL Ground Consulting Ltd

Diamond Creek Farm Ltd

State Highway 23, Te Uku, Waikato

Investigation Location Plan

Rev	Date	Status	Drafted	Reviewer
A	23/03/2021	Issued	K.H	F.W

File Ref. MAC //Projects_7000/7089/R7089-1A/R7089-1A-DRW002.ai

Scale (A3) 1:3,000

0 12 60 120m

Project No. 7089

Report Ref. R7089-1A

Drawing No. 002

APPENDIX A: INVESTIGATION LOGS

INVESTIGATION LOG

HA201

Report Ref: R7089-1A

Client	Coordinates (NZTM2000)	Elevation	Location Method (±2m)
Diamond Creek Farm Ltd			MAP

Location

State Highway 23, Te Uku State Highway 23, Te Uku

Geology	Geological Interpretation (refer to separate Geotechnical and Geological Information sheet for further information)	Depth (m)
Topsoil	TOPSOIL.	
Weathered Ash	Clayey SILT. Very stiff to stiff; moist; light brownish grey mottled brownish orange; moderate plasticity; insensitive.	
	0.9m: Becomes moist to wet.	1
	Clayey SILT, with trace sand. Very stiff; high plasticity; wet; light brown; insensitive.	
	1.3m: Becomes minor Sand (fine to coarse).	
	Silty CLAY. Very stiff; high plasticity; wet; grey; insensitive.	
	1.9m: Becomes moist.	2
	End of Investigation: 2.05m Effective refusal	3

Samples | Legend | Vane Shear Strength (Vane No:2088, Vane Size: 19mm; 50 100 150 200) | Values (kPa): 116, 62, 67, 33, 152, 110, UTP, - | Scala Penetrometer (Blows / 100mm; 2 4 6 8 10 12 14 16 18; 20) | Groundwater

Investigation Information

Depth	2.05m	**Logged By**	V.L	**Start Date**	09/04/21
Termination	ffective refus	**Checked By**	V.L	**End Date**	09/04/21
Machine Used		**Test Pit Dimensions**		**Logged Date**	12/04/21

Investigation Type

- [x] Hand Auger (50mm)
- [ ] Test Pit
- [ ] Scala Penetrometer

Water Legend

- Standing Water Level
- Out flow
- In flow

Log ref: R7089-1A HA204

INVESTIGATION LOG

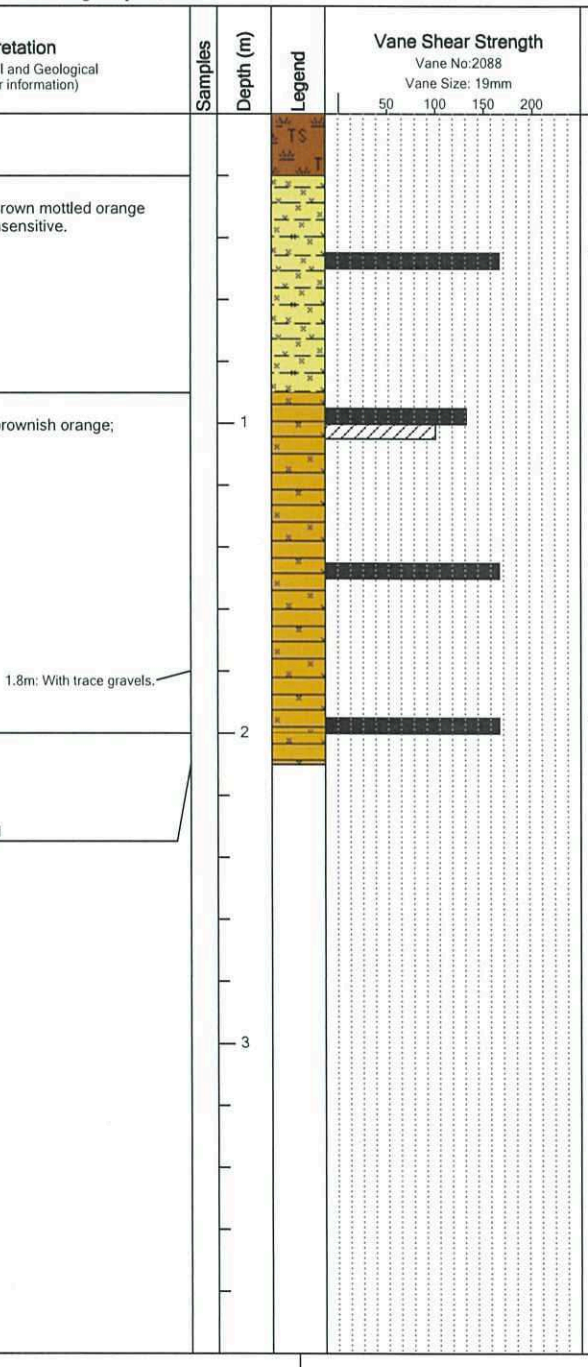
HA202

Report Ref: R7089-1A

Client	Coordinates (NZTM2000)	Elevation	Location Method (±2m)
Diamond Creek Farm Ltd			MAP

Location: State Highway 23, Te Uku State Highway 23, Te Uku

Geology	Geological Interpretation (refer to separate Geotechnical and Geological Information sheet for further information)	Depth (m)
Topsoil	TOPSOIL.	
Weathered Ash	Clayey SILT. Very stiff to hard; dry to moist; light brown mottled orange and light grey; moderate plasticity; insensitive.	
	Silty CLAY. Hard; moist; light grey mottled light brownish orange; insensitive; moderate plasticity.	1
	1.8m: With trace gravels.	
	Silty CLAY, with some gravel. Hard; high plasticity; wet; grey.	2
	End of Investigation: 2.15m Effective refusal	3



Investigation Information

Depth	2.15m	Logged By	V.L	Start Date	09/04/21
Termination	ffective refus.	Checked By	V.L	End Date	09/04/21
Machine Used		Test Pit Dimensions		Logged Date	12/04/21

Investigation Type

- [x] Hand Auger (50mm)
- [ ] Test Pit
- [ ] Scala Penetrometer

Water Legend

- Standing Water Level
- Out flow
- In flow

INVESTIGATION LOG

HA203

Report Ref: R7089-1A

Client	Coordinates (NZTM2000)	Elevation	Location Method (±2m)
Diamond Creek Farm Ltd			MAP

Location
State Highway 23, Te Uku State Highway 23, Te Uku

Geology	Geological Interpretation (refer to separate Geotechnical and Geological Information sheet for further information)	Depth (m)
Topsoil	TOPSOIL.	
Weathered Ash	Clayey SILT. Very stiff to hard; moist; light brown mottled light grey; moderate plasticity.	
	1.5m: With trace gravels and sand.	
	Silty, with some clay. Hard; low plasticity; moist; brown.	
	End of Investigation: 2.15m Effective refusal	

Vane Shear Strength — Vane No:2088, Vane Size: 19mm (50, 100, 150, 200)

Values (kPa): >186, 141, 87, UTP, >186

Scala Penetrometer (Blows / 100mm) (2, 4, 6, 8, 10, 12, 14, 16, 18): 20

Groundwater

Investigation Information

Depth	2.15m	**Logged By**	V.L	**Start Date**	09/04/21
Termination	ffective refus.	**Checked By**	V.L	**End Date**	09/04/21
Machine Used		**Test Pit Dimensions**		**Logged Date**	12/04/21

Investigation Type

- [x] Hand Auger (50mm)
- [ ] Test Pit
- [ ] Scala Penetrometer

Water Legend

- Standing Water Level
- Out flow
- In flow

Log ref: R7089-1A HA203

INVESTIGATION LOG

HA204

Report Ref: R7089-1A

Client	Coordinates (NZTM2000)	Elevation	Location Method (±2m)
Diamond Creek Farm Ltd			MAP

Location: State Highway 23, Te Uku State Highway 23, Te Uku

Geology	Geological Interpretation (refer to separate Geotechnical and Geological Information sheet for further information)	Depth (m)
Topsoil	TOPSOIL.	
Weathered Ash	Clayey SILT. Very stiff to hard; moist; light brownish orange; moderate plasticity.	
	Silty CLAY. Very stiff to hard; high plasticity; wet; light grey mottled light brownish orange.	1
	Silty CLAY. Hard; moist; dark grey; moderate to high plasticity.	2
	End of Investigation: 3.15m Effective refusal	3

Vane Shear Strength (Vane No:2088, Vane Size: 19mm) — 50, 100, 150, 200

Values (kPa): 181, 109, 143, 75, >186, -, >186, -

Scala Penetrometer (Blows / 100mm) — 2 4 6 8 10 12 14 16 18

Scala values: 11, 15, 10, 8, 9, 7, 7, 16, 19, 10

Groundwater: SWL 1.30m

Investigation Information

Depth	3.15m	Logged By	V.L	Start Date	09/04/21
Termination	ffective refus	Checked By	V.L	End Date	09/04/21
Machine Used		Test Pit Dimensions		Logged Date	12/04/21

Investigation Type

- [x] Hand Auger (50mm)
- [ ] Test Pit
- [ ] Scala Penetrometer

Water Legend

- Standing Water Level
- Out flow
- In flow

Log ref: R7089-1A HA204

INVESTIGATION LOG

HA205

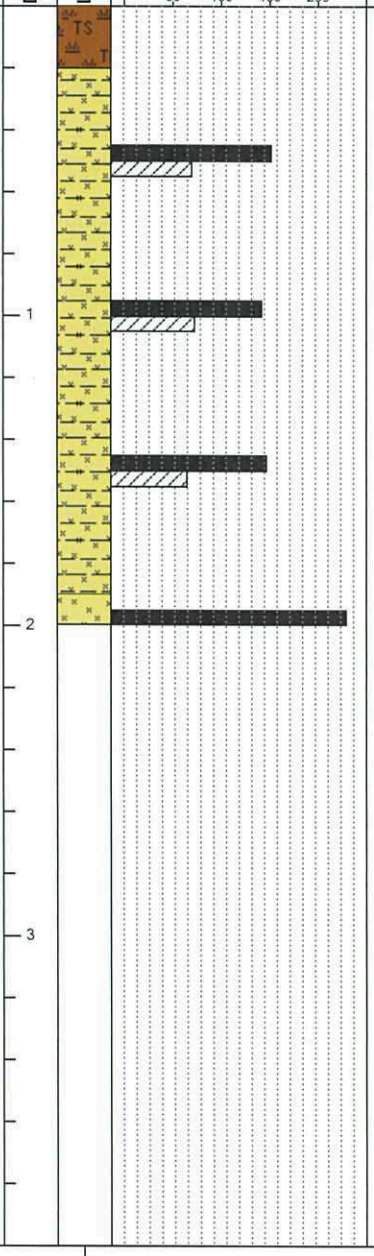
Report Ref: R7089-1A

Client	Coordinates (NZTM2000)	Elevation	Location Method (±2m)
Diamond Creek Farm Ltd			MAP

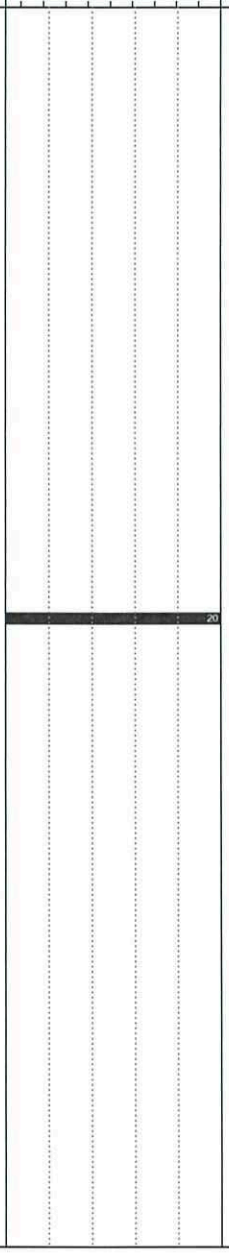
Location

State Highway 23, Te Uku State Highway 23, Te Uku

Geology	Geological Interpretation (refer to separate Geotechnical and Geological Information sheet for further information)	Depth (m)
Topsoil	TOPSOIL.	
Weathered Ash	Clayey SILT. Very stiff; moist; light brownish orange mottled light grey; moderate plasticity.	1
	SILT, with some clay. Very stiff; low plasticity; moist; light grey.	2
	End of Investigation: 2m Effective refusal	3



Values (kPa)
170
86
160
89
165
81
UTP
-



Groundwater

Investigation Information

Depth	2m	Logged By	V.L	Start Date	09/04/21
Termination	ffective refus.	Checked By	V.L	End Date	09/04/21
Machine Used		Test Pit Dimensions		Logged Date	12/04/21

Investigation Type

- [x] Hand Auger (50mm)
- [ ] Test Pit
- [ ] Scala Penetrometer

Water Legend

- Standing Water Level
- Out flow
- In flow

Log ref: R7089-1A HA205

INVESTIGATION LOG

HA206

Report Ref: R7089-1A

Client	Coordinates (NZTM2000)	Elevation	Location Method (±2m)
Diamond Creek Farm Ltd			MAP

Location: State Highway 23, Te Uku State Highway 23, Te Uku

Geology	Geological Interpretation (refer to separate Geotechnical and Geological Information sheet for further information)	Depth (m)
Topsoil	TOPSOIL.	
Weathered Ash	Clayey SILT. Very stiff; moist; light grey mottled brownish orange; moderate plasticity.	
	1.4m: With trace sand	
	Clayey SILT. Hard; dry to moist; light brownish orange.	
	Clayey SILT. Dry to moist; grey; low to moderate plasticity.	
	End of Investigation: 2m Effective refusal	2

Samples | Legend | Vane Shear Strength (Vane No:2088, Vane Size: 19mm; 50 100 150 200) | Values (kPa) | Scala Penetrometer (Blows / 100mm; 2 4 6 8 10 12 14 16 18) | Groundwater

Vane Shear Strength values (kPa): 163, 118, 149, 94, >186, -, UTP, -

Investigation Information

Depth	2m	Logged By	V.L	Start Date	09/04/21
Termination	ffective refus.	Checked By	V.L	End Date	09/04/21
Machine Used		Test Pit Dimensions		Logged Date	12/04/21

Investigation Type

- [x] Hand Auger (50mm)
- [ ] Test Pit
- [ ] Scala Penetrometer

Water Legend

- Standing Water Level
- Out flow
- In flow

Log ref: R7089-1A HA206

INVESTIGATION LOG

HA207

Report Ref: R7089-1A

Client	Coordinates (NZTM2000)	Elevation	Location Method (±2m)
Diamond Creek Farm Ltd			MAP

Location

State Highway 23, Te Uku State Highway 23, Te Uku

Geology	Geological Interpretation (refer to separate Geotechnical and Geological Information sheet for further information)	Depth (m)
Topsoil	TOPSOIL.	
Weathered Ash	Clayey SILT. Hard; moist; light brownish orange; moderate plasticity.	
Weathered Ash	Clayey SILT. Moist; light grey mottled brownish orange; moderate plasticity.	
	End of Investigation: 2m Effective refusal	

Samples: TS

Legend

Vane Shear Strength
Vane No:2088
Vane Size: 19mm
50 100 150 200

Values (kPa): >186 >186 >186

Scala Penetrometer
(Blows / 100mm)
2 4 6 8 10 12 14 16 18
5 5 8 27 >>

Groundwater

Investigation Information

Depth	2m	**Logged By**	V.L	**Start Date**	09/04/21
Termination	ffective refus	**Checked By**	V.L	**End Date**	09/04/21
Machine Used		**Test Pit Dimensions**		**Logged Date**	12/04/21

Investigation Type

- [x] Hand Auger (50mm)
- [ ] Test Pit
- [ ] Scala Penetrometer

Water Legend

- Standing Water Level
- Out flow
- In flow

Log ref: R7089-1A HA207

INVESTIGATION LOG

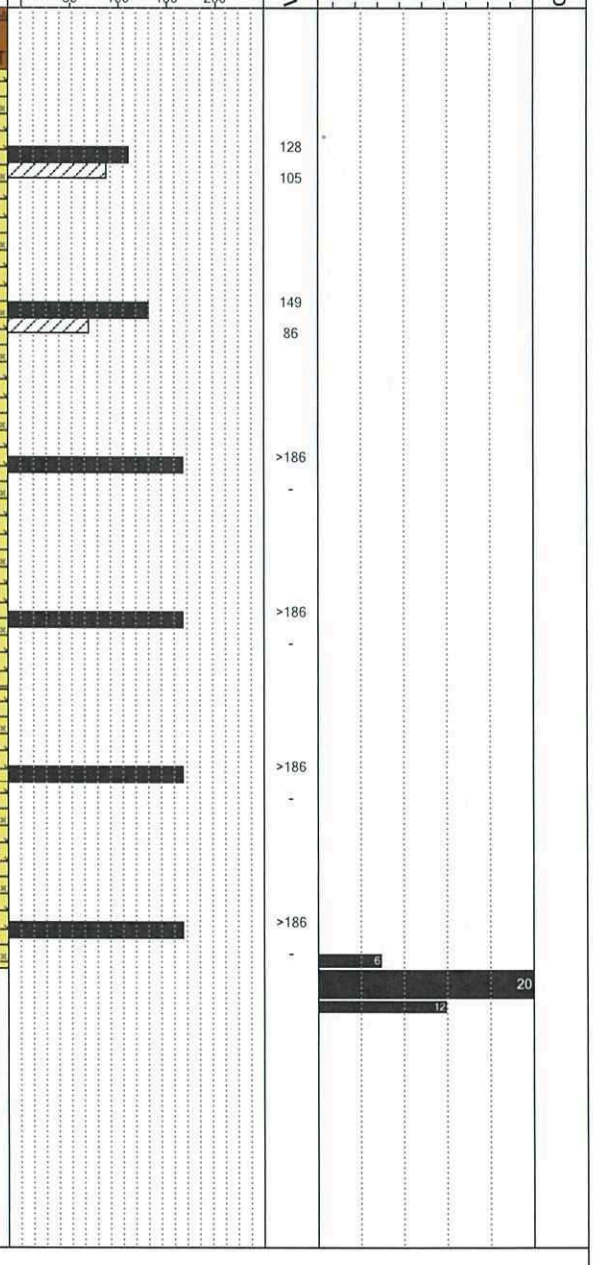
HA208

Report Ref: R7089-1A

Client	Coordinates (NZTM2000)	Elevation	Location Method (±2m)
Diamond Creek Farm Ltd			MAP

Location: State Highway 23, Te Uku — State Highway 23, Te Uku

Geology	Geological Interpretation (refer to separate Geotechnical and Geological Information sheet for further information)	Depth (m)
Topsoil	TOPSOIL.	
Weathered Ash	Clayey SILT. Very stiff; moist; light brownish orange and light grey; low to moderate plasticity. 0.8m: Becomes moderate plasticity.	
	Clayey SILT. Hard; wet; light grey mottled brownish orange; moderate plasticity.	1
	Clayey SILT. Hard; moist; brownish orange; moderate plasticity. 2.3m: Becomes reddish orange.	2
	Clayey SILT. Hard; moist; grey; low to moderate plasticity.	3
	End of Investigation: 3.25m Effective refusal	



Investigation Information

Depth	3.25m	Logged By	V.L	Start Date	09/04/21
Termination	ffective refus	Checked By	V.L	End Date	09/04/21
Machine Used		Test Pit Dimensions		Logged Date	12/04/21

Investigation Type

- [x] Hand Auger (50mm)
- [ ] Test Pit
- [ ] Scala Penetrometer

Water Legend

- Standing Water Level
- Out flow
- In flow

Log ref: R7089-1A HA208

INVESTIGATION LOG

HA201

Report Ref: R7089-1A

Client	Coordinates (NZTM2000)	Elevation	Location Method (±2m)
Diamond Creek Farm Ltd			MAP

Location

State Highway 23, Te Uku State Highway 23, Te Uku

Geology	Geological Interpretation (refer to separate Geotechnical and Geological Information sheet for further information)	Depth (m)
Topsoil	TOPSOIL.	
Tauranga Group	Clayey SILT. Very stiff to stiff; moist; light brownish grey mottled brownish orange; moderate plasticity; insensitive.	
	0.9m: Becomes moist to wet.	1
	Clayey SILT, with trace sand. Very stiff; high plasticity; wet; light brown; insensitive.	
	1.3m: Becomes minor Sand (fine to coarse).	
	Silty CLAY. Very stiff; high plasticity; wet; grey; insensitive.	
	1.9m: Becomes moist.	2
	End of Investigation: 2.05m Effective refusal	3

Samples | Legend | Vane Shear Strength (Vane No:2088, Vane Size: 19mm; 50 100 150 200) | Values (kPa): 116, 62, 67, 33, 152, 110, UTP, - | Scala Penetrometer (Blows / 100mm; 2 4 6 8 10 12 14 16 18; 20) | Groundwater

Investigation Information

Depth	2.05m	**Logged By**	V.L	**Start Date**	09/04/21
Termination	ffective refus.	**Checked By**	V.L	**End Date**	09/04/21
Machine Used		**Test Pit Dimensions**		**Logged Date**	12/04/21

Investigation Type

- [x] Hand Auger (50mm)
- [ ] Test Pit
- [ ] Scala Penetrometer

Water Legend

- Standing Water Level
- Out flow
- In flow

INVESTIGATION LOG

HA202

Report Ref: R7089-1A

Client	Coordinates (NZTM2000)	Elevation	Location Method (±2m)
Diamond Creek Farm Ltd			MAP

Location: State Highway 23, Te Uku State Highway 23, Te Uku

Geology	Geological Interpretation (refer to separate Geotechnical and Geological Information sheet for further information)	Depth (m)
Topsoil	TOPSOIL.	
Tauranga Group	Clayey SILT. Very stiff to hard; dry to moist; light brown mottled orange and light grey; moderate plasticity; insensitive.	
Tauranga Group	Silty CLAY. Hard; moist; light grey mottled light brownish orange; insensitive; moderate plasticity.	1
Tauranga Group	1.8m: With trace gravels.	
Tauranga Group	Silty CLAY, with some gravel. Hard; high plasticity; wet; grey.	2
	End of Investigation: 2.15m Effective refusal	
		3

Samples | Legend | Vane Shear Strength (Vane No:2088, Vane Size: 19mm; 50 100 150 200) | Values (kPa) | Scala Penetrometer (Blows / 100mm; 2 4 6 8 10 12 14 16 18) | Groundwater

Vane Shear Values (kPa): >186, 151, 118, >186, >186

Scala Penetrometer: 20

Investigation Information

Depth	2.15m	**Logged By**	V.L	**Start Date**	09/04/21
Termination	ffective refus	**Checked By**	V.L	**End Date**	09/04/21
Machine Used		**Test Pit Dimensions**		**Logged Date**	12/04/21

Investigation Type

- [x] Hand Auger (50mm)
- [ ] Test Pit
- [ ] Scala Penetrometer

Water Legend

- Standing Water Level
- Out flow
- In flow

Log ref: R7089-1A HA202

INVESTIGATION LOG

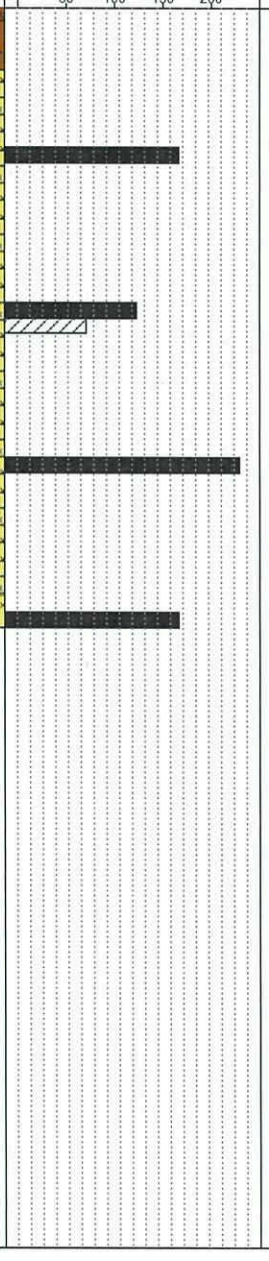
HA203

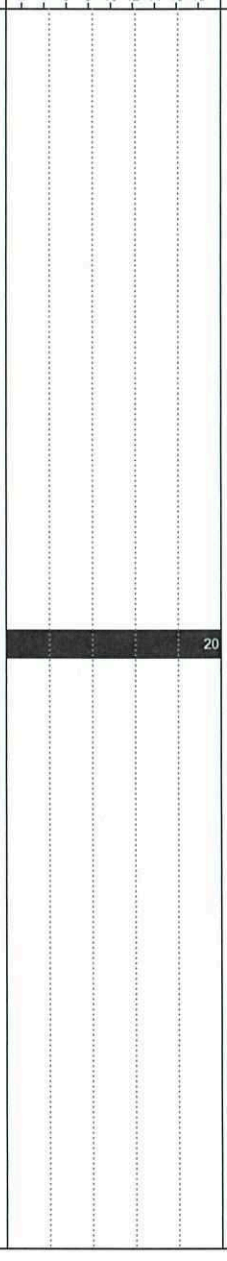
Report Ref: R7089-1A

Client	Coordinates (NZTM2000)	Elevation	Location Method (±2m)
Diamond Creek Farm Ltd			MAP

Location: State Highway 23, Te Uku — State Highway 23, Te Uku

Geology	Geological Interpretation (refer to separate Geotechnical and Geological Information sheet for further information)	Depth (m)
Topsoil	TOPSOIL.	
Tauranga Group	Clayey SILT. Very stiff to hard; moist; light brown mottled light grey; moderate plasticity.	1
	1.5m: With trace gravels and sand.	
	Silty, with some clay. Hard; low plasticity; moist; brown.	2
	End of Investigation: 2.15m Effective refusal	3





Groundwater

Investigation Information

Depth	2.15m	**Logged By**	V.L	**Start Date**	09/04/21
Termination	ffective refus.	**Checked By**	V.L	**End Date**	09/04/21
Machine Used		**Test Pit Dimensions**		**Logged Date**	12/04/21

Investigation Type

- [x] Hand Auger (50mm)
- [ ] Test Pit
- [ ] Scala Penetrometer

Water Legend

- Standing Water Level
- Out flow
- In flow

Log ref: R7089-1A HA203

INVESTIGATION LOG

HA204

Report Ref: R7089-1A

Client	Coordinates (NZTM2000)	Elevation	Location Method (±2m)
Diamond Creek Farm Ltd			MAP

Location: State Highway 23, Te Uku

State Highway 23, Te Uku

Geology	Geological Interpretation (refer to separate Geotechnical and Geological Information sheet for further information)	Depth (m)
Topsoil	TOPSOIL.	
Tauranga Group	Clayey SILT. Very stiff to hard; moist; light brownish orange; moderate plasticity.	
	Silty CLAY. Very stiff to hard; high plasticity; wet; light grey mottled light brownish orange.	1
	Silty CLAY. Hard; moist; dark grey; moderate to high plasticity.	2
	End of Investigation: 3.15m Effective refusal	3

Samples | Legend

Vane Shear Strength
Vane No:2088
Vane Size: 19mm
50 100 150 200

Values (kPa): 181, 109, 143, 75, >186, -, >186, -

Scala Penetrometer
(Blows / 100mm)
2 4 6 8 10 12 14 16 18

Scala values: 11, 15, 10, 8, 9, 7, 7, 16, 19, 10

Groundwater: SWL 1.30m

Investigation Information

Depth	3.15m	**Logged By**	V.L	**Start Date**	09/04/21
Termination	ffective refus.	**Checked By**	V.L	**End Date**	09/04/21
Machine Used		**Test Pit Dimensions**		**Logged Date**	12/04/21

Investigation Type

- [x] Hand Auger (50mm)
- [ ] Test Pit
- [ ] Scala Penetrometer

Water Legend

- Standing Water Level
- Out flow
- In flow

INVESTIGATION LOG

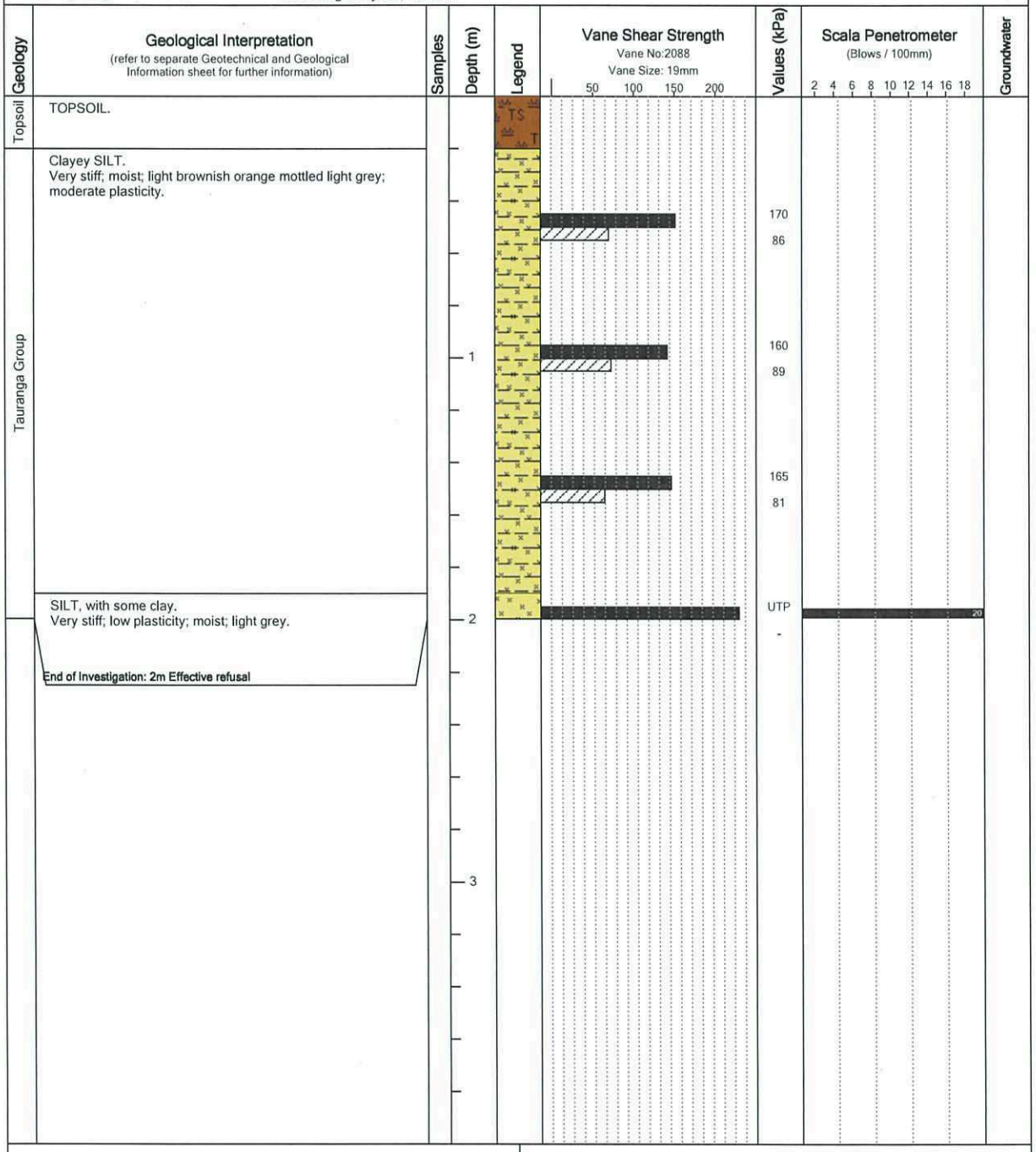
HA205

Report Ref: R7089-1A

Client	Coordinates (NZTM2000)	Elevation	Location Method (±2m)
Diamond Creek Farm Ltd			MAP

Location: State Highway 23, Te Uku State Highway 23, Te Uku

Geology	Geological Interpretation (refer to separate Geotechnical and Geological Information sheet for further information)	Depth (m)
Topsoil	TOPSOIL.	
Tauranga Group	Clayey SILT. Very stiff; moist; light brownish orange mottled light grey; moderate plasticity.	1
	SILT, with some clay. Very stiff; low plasticity; moist; light grey.	2
	End of Investigation: 2m Effective refusal	3



Investigation Information

Depth	2m	Logged By	V.L	Start Date	09/04/21
Termination	ffective refus.	Checked By	V.L	End Date	09/04/21
Machine Used		Test Pit Dimensions		Logged Date	12/04/21

Investigation Type

- [x] Hand Auger (50mm)
- [ ] Test Pit
- [ ] Scala Penetrometer

Water Legend

- Standing Water Level
- Out flow
- In flow

INVESTIGATION LOG

HA206

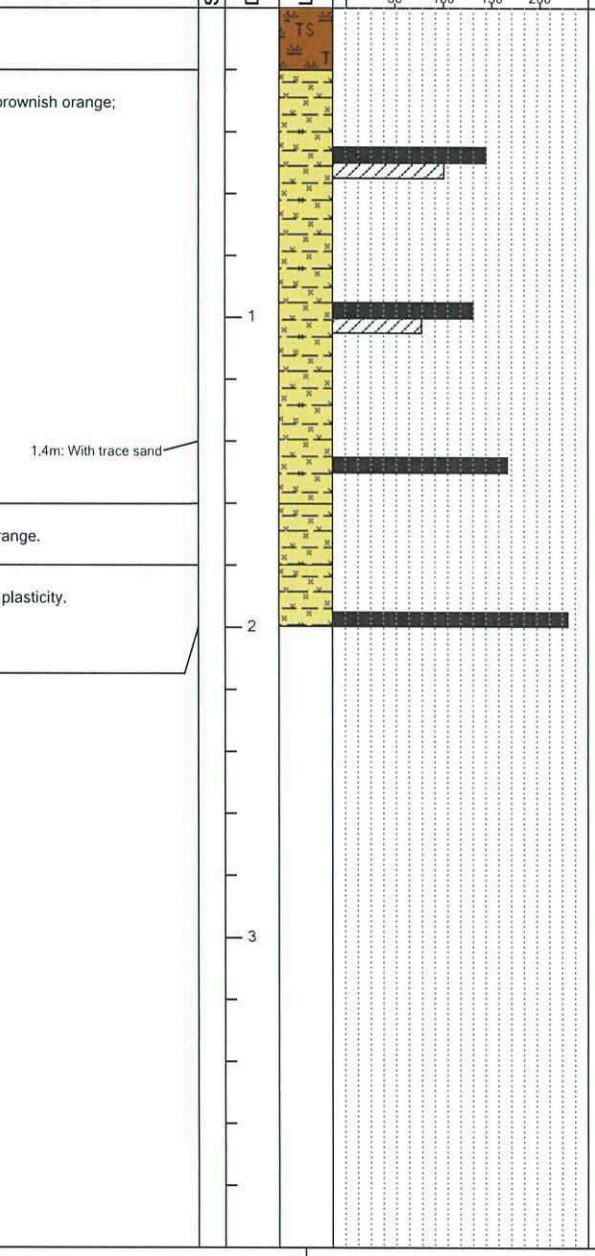
Report Ref: R7089-1A

Client	Coordinates (NZTM2000)	Elevation	Location Method (±2m)
Diamond Creek Farm Ltd			MAP

Location: State Highway 23, Te Uku

State Highway 23, Te Uku

Geology	Geological Interpretation (refer to separate Geotechnical and Geological Information sheet for further information)	Depth (m)
Topsoil	TOPSOIL.	
Tauranga Group	Clayey SILT. Very stiff; moist; light grey mottled brownish orange; moderate plasticity.	
	1.4m: With trace sand	
	Clayey SILT. Hard; dry to moist; light brownish orange.	
	Clayey SILT. Dry to moist; grey; low to moderate plasticity.	
	End of Investigation: 2m Effective refusal	



Investigation Information

Depth	2m	Logged By	V.L	Start Date	09/04/21
Termination	ffective refus.	Checked By	V.L	End Date	09/04/21
Machine Used		Test Pit Dimensions		Logged Date	12/04/21

Investigation Type

- [x] Hand Auger (50mm)
- [ ] Test Pit
- [ ] Scala Penetrometer

Water Legend

- Standing Water Level
- Out flow
- In flow

Log ref: R7089-1A HA206

INVESTIGATION LOG

HA207

Report Ref: R7089-1A

Client	Coordinates (NZTM2000)	Elevation	Location Method (±2m)
Diamond Creek Farm Ltd			MAP

Location: State Highway 23, Te Uku State Highway 23, Te Uku

Geology	Geological Interpretation (refer to separate Geotechnical and Geological Information sheet for further information)	Depth (m)
Topsoil	TOPSOIL.	
Tauranga Group	Clayey SILT. Hard; moist; light brownish orange; moderate plasticity.	0
	Clayey SILT. Moist; light grey mottled brownish orange; moderate plasticity.	1
	End of Investigation: 2m Effective refusal	2
		3

Samples: TS

Legend

Vane Shear Strength
Vane No:2088
Vane Size: 19mm
50 100 150 200

Values (kPa): >186 - >186 - >186 -

Scala Penetrometer
(Blows / 100mm)
2 4 6 8 10 12 14 16 18
5 5 8 27 >>

Groundwater

Investigation Information

Depth	2m	**Logged By**	V.L	**Start Date**	09/04/21
Termination	ffective refus.	**Checked By**	V.L	**End Date**	09/04/21
Machine Used		**Test Pit Dimensions**		**Logged Date**	12/04/21

Investigation Type

- [x] Hand Auger (50mm)
- [ ] Test Pit
- [ ] Scala Penetrometer

Water Legend

- Standing Water Level
- Out flow
- In flow

Log ref: R7089-1A HA207

INVESTIGATION LOG

HA208

Report Ref: R7089-1A

Client	Coordinates (NZTM2000)	Elevation	Location Method (±2m)
Diamond Creek Farm Ltd			MAP

Location: State Highway 23, Te Uku — State Highway 23, Te Uku

Geology	Geological Interpretation (refer to separate Geotechnical and Geological Information sheet for further information)	Depth (m)
Topsoil	TOPSOIL.	
Tauranga Group	Clayey SILT. Very stiff; moist; light brownish orange and light grey; low to moderate plasticity.	
	0.8m: Becomes moderate plasticity.	
	Clayey SILT. Hard; wet; light grey mottled brownish orange; moderate plasticity.	1
	Clayey SILT. Hard; moist; brownish orange; moderate plasticity.	2
	2.3m: Becomes reddish orange.	
	Clayey SILT. Hard; moist; grey; low to moderate plasticity.	3
	End of Investigation: 3.25m Effective refusal	

Samples | Legend | Vane Shear Strength (Vane No:2088, Vane Size: 19mm; 50 100 150 200) | Values (kPa): 128, 105, 149, 86, >186, -, >186, -, >186, -, >186, - | Scala Penetrometer (Blows / 100mm; 2 4 6 8 10 12 14 16 18): 6, 20, 12 | Groundwater

Investigation Information

Depth	3.25m	Logged By	V.L	Start Date	09/04/21
Termination	ffective refus.	Checked By	V.L	End Date	09/04/21
Machine Used		Test Pit Dimensions		Logged Date	12/04/21

Investigation Type

- [x] Hand Auger (50mm)
- [ ] Test Pit
- [ ] Scala Penetrometer

Water Legend

- Standing Water Level
- Out flow
- In flow

Log ref: R7089-1A HA208

INVESTIGATION LOG

HA01

Report Ref: R5213-1A

Client	Coordinates (NZTM2000)	Elevation	Location Method (±2m)
Diamon Creek Farm Ltd			MAP

Location
State Highway 23, Te Uku, Waikato

Geology	Geological Interpretation (refer to separate Geotechnical and Geological Information sheet for further information)	Depth (m)	Vane Shear Strength (Vane No:2553, Vane Size: 19mm)	Values (kPa)	Scala Penetrometer (Blows / 100mm)	Groundwater
Topsoil	TOPSOIL.					
Weathered Ash	SILT, with minor clay. Brownish orange mottled orange. Very stiff; dry to moist; low plasticity; insensitive.			134 92		
	Clayey SILT. Light brown mottled light grey. Very stiff; moist; moderate plasticity; moderately sensitive.	1		201 89		
	Silty CLAY. Lightb grey mottled brownish orange. Stiff; moist to wet; moderate to high plasticity; moderately sensitive.			96 39		
	Silty CLAY. Light brown becoming greyish brown mottled orange. Very stiff; moist to wet; low to moderate plasticity; insensitive.					
	End of Investigation: 2m Target depth	2		109 51		

Investigation Information

Depth	2m	**Logged By**	KH	**Start Date**	19/09/19
Termination	Target depth	**Checked By**	FW	**End Date**	19/09/19
Machine Used		**Test Pit Dimensions**		**Logged Date**	19/09/19

Investigation Type

- [x] Hand Auger (50mm)
- [ ] Test Pit
- [ ] Scala Penetrometer

Water Legend

- Standing Water Level
- Out flow
- In flow

Log ref: R5213-1A HA01

INVESTIGATION LOG

HA02

GCL Ground Consulting Ltd

Client	Coordinates (NZTM2000)	Elevation	Report Ref / Location Method (±2m)
Diamon Creek Farm Ltd			R5213-1A / MAP

Location
State Highway 23, Te Uku, Waikato

Geology	Geological Interpretation (refer to separate Geotechnical and Geological Information sheet for further information)	Depth (m)	Vane Shear Strength (Vane No:2553, Vane Size: 19mm)	Values (kPa)	Scala Penetrometer (Blows / 100mm)	Groundwater
Topsoil	TOPSOIL.					
Weathered Ash	Clayey SILT. Brown mottled grey. Very stiff; moist; moderate plasticity; moderately sensitive to insensitive.			144 / 89		
	Silty, with some clay. Brownish orange mottled orange and light brown. Very stiff; moist to wet; low to moderate plasticity; moderately sensitive.	1		192 / 80		
	End of Investigation: 2m Target depth	2		172 / 62 / 162 / 65		

Investigation Information

Depth	2m	**Logged By**	KH	**Start Date**	19/09/19
Termination	Target depth	**Checked By**	FW	**End Date**	19/09/19
Machine Used		**Test Pit Dimensions**		**Logged Date**	19/09/19

Investigation Type

- [x] Hand Auger (50mm)
- [ ] Test Pit
- [ ] Scala Penetrometer

Water Legend

- Standing Water Level
- Out flow
- In flow

INVESTIGATION LOG

HA03

Report Ref: R5213-1A

Client	Coordinates (NZTM2000)	Elevation	Location Method (±2m)
Diamon Creek Farm Ltd			MAP

Location: State Highway 23, Te Uku, Waikato

Geology	Geological Interpretation (refer to separate Geotechnical and Geological Information sheet for further information)	Depth (m)	Vane Shear Strength (Vane No:2553, Vane Size: 19mm) Values (kPa)	Scala Penetrometer (Blows / 100mm)	Groundwater
Topsoil	TOPSOIL.				
Weathered Ash	Clayey SILT. Light brownish orange mottled light grey. Very stiff; moist; moderate plasticity; insensitive.	1	147, 76, 172, 111		
Weathered Ash	Silty CLAY. White mottled brownish orange. Stiff to very stiff; moist to wet; moderate to high plasticity; insensitive.	2	106, 74, 110, 77		
	End of Investigation: 2m Target depth				

Investigation Information

Depth	2m	**Logged By**	KH	**Start Date**	19/09/19
Termination	Target depth	**Checked By**	FW	**End Date**	19/09/19
Machine Used		**Test Pit Dimensions**		**Logged Date**	19/09/19

Investigation Type

- [x] Hand Auger (50mm)
- [ ] Test Pit
- [ ] Scala Penetrometer

Water Legend

- Standing Water Level
- Out flow
- In flow

Log ref: R5213-1A HA03

INVESTIGATION LOG

HA04

GCL Ground Consulting Ltd

Report Ref	
R5213-1A	

Client	Coordinates (NZTM2000)	Elevation	Location Method (±2m)
Diamon Creek Farm Ltd			MAP

Location
State Highway 23, Te Uku, Waikato

Geology	Geological Interpretation (refer to separate Geotechnical and Geological Information sheet for further information)	Depth (m)
Topsoil	TOPSOIL.	
Weathered Ash	Clayey SILT. Light brown orange mottled light grey. Very stiff; moist; moderate plasticity; moderately sensitive.	
	Silty, with minor clay, with trace gravel. Gravel, mineralisation; dark brownish orange. Very stiff; moist to wet; low plasticity; insensitive.	
	SILT, with some clay. Light brown mottled orange and white. Very stiff; moist to wet; low to moderate plasticity; insensitive.	
	End of Investigation: 2m Target depth	2

Samples | Legend | Vane Shear Strength (Vane No:2553, Vane Size: 19mm; 50 100 150 200) | Values (kPa) | Scala Penetrometer (Blows / 100mm; 2 4 6 8 10 12 14 16 18) | Groundwater

Depth (m)	Values (kPa)
1	150
	59
	186
	114
	136
	62
2	139
	74

Investigation Information

Depth	2m	**Logged By**	KH	**Start Date**	19/09/19
Termination	Target depth	**Checked By**	FW	**End Date**	19/09/19
Machine Used		**Test Pit Dimensions**		**Logged Date**	19/09/19

Investigation Type

- [x] Hand Auger (50mm)
- [ ] Test Pit
- [ ] Scala Penetrometer

Water Legend

- Standing Water Level
- Out flow
- In flow

Log ref: R5213-1A HA04

INVESTIGATION LOG

HA05

Report Ref: R5213-1A

Client	Coordinates (NZTM2000)	Elevation	Location Method (±2m)
Diamon Creek Farm Ltd			MAP

Location
State Highway 23, Te Uku, Waikato

Geology	Geological Interpretation (refer to separate Geotechnical and Geological Information sheet for further information)	Samples	Depth (m)	Legend	Vane Shear Strength (Vane No:2553, Vane Size: 19mm)	Values (kPa)	Scala Penetrometer (Blows / 100mm)	Groundwater
Topsoil	TOPSOIL.			TS T				
Weathered Ash	SILT, with some clay. Brown. Very stiff; moist; low to moderate plasticity; insensitive.							
	Clayey SILT. Brownish orange. Very stiff; moist to wet; moderate plasticity; insensitive.					136 62		
	Clayey SILT. Light brownish orange mottled light grey. Very stiff; moist to wet; moderate plasticity; insensitive.		1			104 56		
	Silty CLAY. Light grey mottled brownish orange. Very stiff; moist to wet; moderate to high plasticity; insensitive.					171 76		
	End of Investigation: 2m Target depth		2			113 71		

Vane Shear Strength: 50 100 150 200
Scala Penetrometer: 2 4 6 8 10 12 14 16 18

Investigation Information

Depth	2m	**Logged By**	KH	**Start Date**	19/09/19
Termination	Target depth	**Checked By**	FW	**End Date**	19/09/19
Machine Used		**Test Pit Dimensions**		**Logged Date**	19/09/19

Investigation Type

- [x] Hand Auger (50mm)
- [ ] Test Pit
- [ ] Scala Penetrometer

Water Legend

- Standing Water Level
- Out flow
- In flow

Log ref: R5213-1A HA05

APPENDIX B: SITE PHOTOGRAPHS

PHOTO 1

PHOTO 2

PHOTO 3

PHOTO 4

PUKEKOHE OFFICE
LEVEL 2, CAMPBELL TYSON BUSINESS CENTRE, 1 WESLEY STREET, PUKEKOHE
POST: PO BOX 1019, PUKEKOHE, 2120
EMAIL: pukekohe@gcltech.co.nz
TEL: 09 239 2229

QUEENSTOWN OFFICE
157 GLENDA DRIVE, FRANKTON
POST: PO BOX 2963, QUEENSTOWN 9349
EMAIL: queenstown@gcltech.co.nz
TEL: 03 442 5700

AUCKLAND CENTRAL OFFICE
LEVEL 1, KAURI TIMBER BUILDING
104 FANSHAWE STREET, AUCKLAND, 1010
EMAIL: auckland@gcltech.co.nz
TEL: 09 379 0777

GREAT BARRIER IS. OFFICE
6 MOANA VIEW ROAD, OKUPU
POST: PO BOX 1019, PUKEKOHE, 2120
EMAIL: auckland@gcltech.co.nz
TEL: 09 379 0777

GCL
Ground Consulting Ltd