



ENGEO

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Geotechnical Investigation

15 - 17 Amaru Road

Onehunga

Auckland

Submitted to:

Budock Property Limited

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Greenlane

Auckland 1051

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01.04.2020

17137.000.000_01



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ENGEO Document Control:

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Date	Revision Details/Status	WP	Author	Reviewer
01/04/2020	Issued to Client	JT	HP	DT

1 Introduction

ENGEO Ltd was requested by Budock Property Limited to undertake a geotechnical investigation of the property at 15 - 17 Amaru Road, Onehunga, Auckland (herein referred to as 'the site'). This work has been carried out in accordance with our signed agreement dated 21 February 2020 (reference: P2020.000.264_02). The purpose of the assessment is to support Resource and Building consent applications as well as inform the design for new terraced residential units. ENGEO's scope of work includes the following:

- Review of available published geotechnical and geologic information relevant to the site.
- Site assessment by an experienced ground engineering professional, drilling of up to four hand auger boreholes and completion of four Dynamic Cone (Scala) penetrometer tests undertaken within the general vicinity of the proposed development footprint.
- Preparation of a geotechnical investigation report summarising the findings of our desktop and on-site investigation, including recommendations for residential site development, soakage rates and foundation options.

Our scope of work does not include detailed design of foundations and retaining or anchored solutions.

2 Site Description

The site comprises a 1,793 m² rectangular section located across two property titles at 15 and 17 Amaru Road (legal description, Lot 2 DP 18387 and Lot 1 DP 18387). The site is bound to the east, south and west by residential dwellings and Amaru Road to the north.

The site is located on an isolated knoll with the apex of the knoll situated centrally in the site. The site gently slopes down to the northwest and southeast from the apex with slope angles between 7 and 12 degrees to the horizontal. Several isolated basalt rock or boulder outcrops were observed across the central and south-eastern portions of the site.

Two existing dwellings and associated concrete driveways are located within the north-western half of the site. We understand that these dwellings will be demolished / removed from site as a part of the development. The south-eastern half of the site is predominantly grassed and contains a series of basalt boulder and brick retaining walls up to approximately 0.80 m in height.

3 Proposed Development

ENGEO has been provided with the TT Architects Limited bulk and location plan dated, 12 February 2020 (reference: 220001) as attached in Appendix 1. The drawing indicates that the proposed development comprises the construction of four residential units within the north-western half of the site fronted to Amaru Road, seven residential units within the south-eastern portion of the site fronted to 13 Amaru Road via an access way / driveway along the western property boundary.

Detailed plans of the proposed residential units have not yet been supplied to ENGEO, however, we anticipate that these units will comprise of light weight, timber framed, two to three storey structures.

We have also not been provided with any proposed cut fill earthworks plans, however, the initial concept plan indicates that cuts of up to 2.0 m are proposed for the block of seven units located within the south-eastern portion of the site in order to achieve desired design levels. In addition, fills in excess of 1.0 m may be required within the south-eastern portion of the site subject to final finished floor levels.

Review of available contour data indicates that it is likely only minor earthworks will be required within the north-western portion of the site to achieve desired levels for the block of four residential units.

4 Geology

Based on published geological mapping, GNS (Institute of Geological and Nuclear Sciences) map the site as being underlain by Auckland Basalts tuff (Kerikeri Volcanic Group) of the Auckland Volcanic Field. The Kerikeri Volcanic Group generally comprises lithic tuff, comprising comminuted pre-volcanic materials with basaltic fragments, and unconsolidated ash and lapilli deposits.

5 Site Investigation

5.1 General

ENGEO attended site on 9 March 2020 and completed a site walkover and subsurface ground investigation. The subsurface investigation comprised of five hand auger boreholes drilled to refusal encountered at depths between 0.3 m below ground level (bgl) and 1.9 m bgl and four dynamic cone (Scala) penetrometers test to 0.9 m bgl. These investigations were completed within the general footprint of the proposed development and the location of the testing undertaken has been presented on the Investigation Location Plan (Appendix 2).

Full hand auger borehole investigation records are presented in Appendix 3. Logs have been prepared in general accordance with the New Zealand Geotechnical Society field classification guidelines (NZGS, 2005). The full results from our Scala penetrometer testing are also presented in Appendix 4.

Intorock Drilling Ltd have previously completed soakage testing at the site on 5 February 2008 within BH1 and BH2 located within the north-western portion of the site as presented on the Investigation Location Plan (Appendix 2). Intorock Drilling Ltd re-visited site on 9 March 2020 to re-test the soakage rates within BH1 and BH2 to confirm that soakage test results are consistent with those previously obtained in 2008. Soakage tests results from 2008 and 2020 are presented within Table 2 of this report and the full borehole and soakage results from the above testing are presented in Appendix 5.

5.2 Borehole Data

The subsurface ground conditions encountered across the site typically consisted of:

- Topsoil mantles the site to measured depths between 0.25 m bgl and 0.45 m depth.
- Underlying the topsoil within hand auger boreholes HA01, HA02, HA04 and HA05 were volcanic tuff soils associated with the Kerikeri Volcanic Group of the Auckland Volcanic Field.

These soils generally comprised of very stiff to hard, inorganic, clayey silt deposits with variable sand and gravel inclusions. Vane shear strengths recorded within these soils were between 128 kPa and greater than 200 kPa.

- All hand auger boreholes refused at depths between 0.30 m bgl and 1.90 m bgl. Refusal was encountered deepest within the north-western and south-eastern portions of the site and shallowest towards the apex of the knoll. Hand auger refusal is inferred to be upon basalt rock of the Kerikeri Volcanic Group, and is supported by the soakage borehole logs undertaken within the front (roadside portion of the site). Due to only being able to complete shallow hand auger borehole testing the properties of the basalt rock are unknown.
- Groundwater was not encountered within any of the hand auger borehole investigations.

6 Geotechnical Recommendations

Based on our desktop review and site investigation, we consider the subject site is generally suitable for the proposed development as indicated on the TT Architects Limited drawings (Appendix 1) provided works are carried out in accordance with the following site specific recommendations, Auckland Council's Code of Practice and other appropriate standards.

We make the following site specific geotechnical recommendations.

6.1 Building Foundations

A preliminary geotechnical ultimate bearing capacity of 300 kPa should be adopted for all shallow strip and pad foundations up to 1 m wide constructed on identified competent native volcanic tuff soils, basalt rock or engineered certified fill. This value should be confirmed once percussion borehole testing is carried out over the rear of the site.

Due to the density of the weathered volcanic tuff soils encountered across the site a laboratory sample for shrink-swell testing was unable to be obtained. However, from visual and tactile assessment we consider adopting a conservative AS 2870 expansive site class of M (moderate) is appropriate for foundations constructed within the native volcanic tuff soils.

The characteristic surface ground movement within Class M (moderate) expansive soils is up to 40 mm. On this basis, we recommend a minimum foundation depth below cleared ground level following topsoil removal and benching of building platform areas of 600 mm for foundations founded within volcanic tuff soils.

Where the proposed building foundations are founded directly upon basalt rock no minimum foundation depth will apply from a geotechnical perspective, however, this should be confirmed by structural engineers as a minimum thickness may be required from a structural perspective.

As required by Section B1/VM4 of the New Zealand Building Code Handbook, a strength reduction factor of 0.50 should be applied to all recommended geotechnical ultimate soil capacities in conjunction with their use in factored design load cases for static and earthquake overload conditions.

6.2 Retaining Wall Design

Based on the supplied drawings, it is understood that excavations of up to 2.0 m height will be undertaken in the central portions of the site and retaining along the eastern and western property boundaries will be required to support these excavations. Our investigations indicate that the proposed excavations will expose basalt rock; as such timber piled retaining walls will likely not be economically feasible and block walls will likely be preferred.

The final levels of the neighbouring dwelling at 19 Amaru Road should be compared to retaining wall excavation levels. Depending on the offset of the dwelling from the wall and the difference between its foundations and the proposed excavation temporary support measures may be required to protect the dwelling and long term loading of the wall may need to be considered.

The design parameters presented in Table 1 may be adopted for retaining wall design, assuming competent natural ground and/or engineer certified filled ground prevails

Table 1: Retaining Wall Design Parameters

Material	Unit Weight (kN/m ³)	Friction Angle degrees (°)	Undrained Shear Strength (Su) - (kPa)
Non-Cohesive Engineered Fill (Hardfill)	20	38	-
Cohesive Engineered Fill	18	32	100
Volcanic Tuff Soil (Kerikeri Volcanic Group)	18	28	80
Basalt Rock (Kerikeri Volcanic Group)	20	40	1,000

The retaining wall designer should consider all appropriate surcharge loadings, back and toe slope angles. They should also determine whether deflections of the wall are acceptable and therefore whether 'active' (Ka) or 'at rest' (Ko) lateral earth pressure design can be used.

6.3 Pavement Design

Based on our site investigation and the proposed development levels, we consider that a conservative subgrade design CBR value of 5% within areas underlain by volcanic tuff soils and 10% within areas of exposed basalt rock can be adopted for pavement design.

It should be noted that actual CBR values can be highly affected by moisture content (i.e. exposure to the elements) and trafficking and we therefore recommend that the subgrade is only trimmed to final level immediately prior to placing basecourse. A programme of Scala Penetrometer testing can also be carried out during construction to confirm actual values.

6.4 Site Works

6.4.1 Demolition

It is essential that all foundations and building debris from demolition of the existing dwelling are completely removed prior to earthworks commencing. Where foundations are removed below final ground level they will need to be backfilled with approved hardfill materials (i.e. GAP65 or similar approved product) compacted in 250 mm layers to ensure a consistent subgrade.

If any existing services are to be decommissioned the abandoned lines should be fully removed or backfilled with grout to avoid creating preferential groundwater flow paths. All trench backfill will also need to be removed and replaced with engineer certified fill in the vicinity of the proposed dwellings in order to avoid the need for pipe bridging piles.

6.4.2 Existing Fill

Uncontrolled fill was not observed at our investigation locations, however, it may be present beneath the existing buildings on-site to be demolished and / or behind the landscape retaining walls located within the south-eastern portions of the site.

If uncontrolled fill is encountered during construction, we recommend the materials are undercut to native ground over the building improvement footprint as recommended by a geotechnical engineer.

6.4.3 General Earthworks

The subsurface investigations and visual observations indicate that basalt rock may be encountered at the near surface within the central portions of the site. To achieve desired design levels excavations of up to 2.0 m may be required within basalt rock.

Deep machine borehole testing was not completed as a part of this investigation, therefore the strength, quality and ripability of the basalt rock is unknown. It is recommended that further testing be carried out prior to construction to determine this. However at this stage it is envisaged that significant rock breaking will be required through the majority of the proposed cuts.

Topsoil should be stripped from all cut and fill areas prior to earthworks commencing. Stockpiles of topsoil and unsuitable materials should be sited well clear of the works on suitable, approved areas of natural ground.

Fill should comprise clean clay or hardfill and should be approved by the Engineer prior to use. Compaction should be carried out to certified standards (NZS 4431) with conventional plant and under engineering control. The Geotechnical Engineer should be given every opportunity to observe materials prior to placement and during compaction to carry out QA testing as required.

6.5 Groundwater

Initial development plans indicate that cuts of up to 2.0 m will be required to achieve design levels of the proposed development as shown on Cross-Section A presented on the TT Architects Ltd plan (Appendix 1).

Based on our investigations it is likely that these cuts will expose basalt rock, with refusal encountered within all hand auger borehole locations across the site (between 0.3 m bgl and 1.9 m bgl). The Intorock borehole logs describe the basalt rock as weathered basalt rock, with areas of broken rock and cavities and soakage results indicate significant soakage in this material (i.e. unlikely to have a standing groundwater level).

Due to the shallow nature of the basalt rock within the proposed area of greatest cut, basalt rock incompressibility and the likely fractured nature of the rock we consider that the groundwater level beneath the site will be depressed and the proposed cuts of up to 2.0 m bgl will not intercept the natural groundwater levels. As such, we consider that an assessment against the Auckland Unitary Plan will not be required for the proposed development.

6.6 Soakage Testing

As discussed within Section 5.1 of this report, Intorock Drilling Limited has previously undertaken soakage testing on 5 February 2008 within BH1 and BH2 (presented on the attached Investigation Location Plan) and re-visited site on 9 March 2020 to re-test the soakage rates within BH1 and BH2. The soakage test results from the testing completed in 2008 and 2020 are presented below within Table 2.

Table 2: Soakage Test Results

Date	Soakage Results (L/sec)	
	BH1	BH2
05/02/2008	14.8	15.1
09/03/2020	21.3	22.5

6.7 Further Work

We recommend that further percussion borehole testing is completed following the demolition / removal of the existing dwellings on-site as detailed within our initial scope of works presented within our signed agreement dated 21 February 2020 (reference: P2020.000.264_02). The percussion borehole testing will allow us to assess the quality of the basalt rock, supplement earthwork recommendations and to confirm recommended bearing capacities.

Additional soakage testing within the central and southern portions of the site should be carried out in unison with the percussion borehole testing above to confirm that soakage rates are consistent across the site to further support stormwater disposal design.

If significant changes are proposed to be made to the drawings reviewed to date, we must be given the opportunity to review these changes prior to application for building consent to ensure the assumptions underlying this report are still valid and that our recommendations have been interpreted as intended. We reserve the right to revisit and modify our recommendations when these plans are made available.

It is also essential that we are given every opportunity to attend a pre-start meeting on-site prior to works commencing and then to observe site works, including site stripping, earthworks operations and ground conditions in foundation and retaining wall excavations (prior to pouring concrete) to confirm works are carried out in accordance with the recommendations of this report and that ground conditions are as assumed.

Upon successful completion of the works we would then be in a position to provide a Producer Statement – Construction Review (PS4).

7 Limitations

- i. We have prepared this report in accordance with the brief as provided. This report has been prepared for the use of our client, Budock Property Limited, their professional advisers and the relevant Territorial Authorities in relation to the specified project brief described in this report. No liability is accepted for the use of any part of the report for any other purpose or by any other person or entity.
- ii. The recommendations in this report are based on the ground conditions indicated from published sources, site assessments and subsurface investigations described in this report based on accepted normal methods of site investigations. Only a limited amount of information has been collected to meet the specific financial and technical requirements of the client's brief and this report does not purport to completely describe all the site characteristics and properties. The nature and continuity of the ground between test locations has been inferred using experience and judgement and it should be appreciated that actual conditions could vary from the assumed model.
- iii. Subsurface conditions relevant to construction works should be assessed by contractors who can make their own interpretation of the factual data provided. They should perform any additional tests as necessary for their own purposes.
- iv. This Limitation should be read in conjunction with the Engineering NZ/ACENZ Standard Terms of Engagement.
- v. This report is not to be reproduced either wholly or in part without our prior written permission.

We trust that this information meets your current requirements. Please do not hesitate to contact the undersigned on (09) 972 2205 if you require any further information.

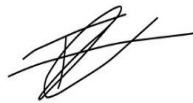
Report prepared by



Harrison Palmer

Engineering Geologist

Report reviewed by

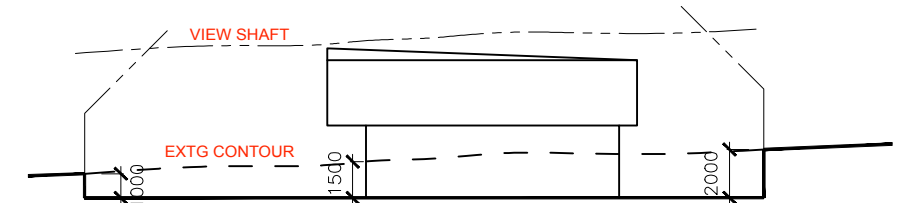
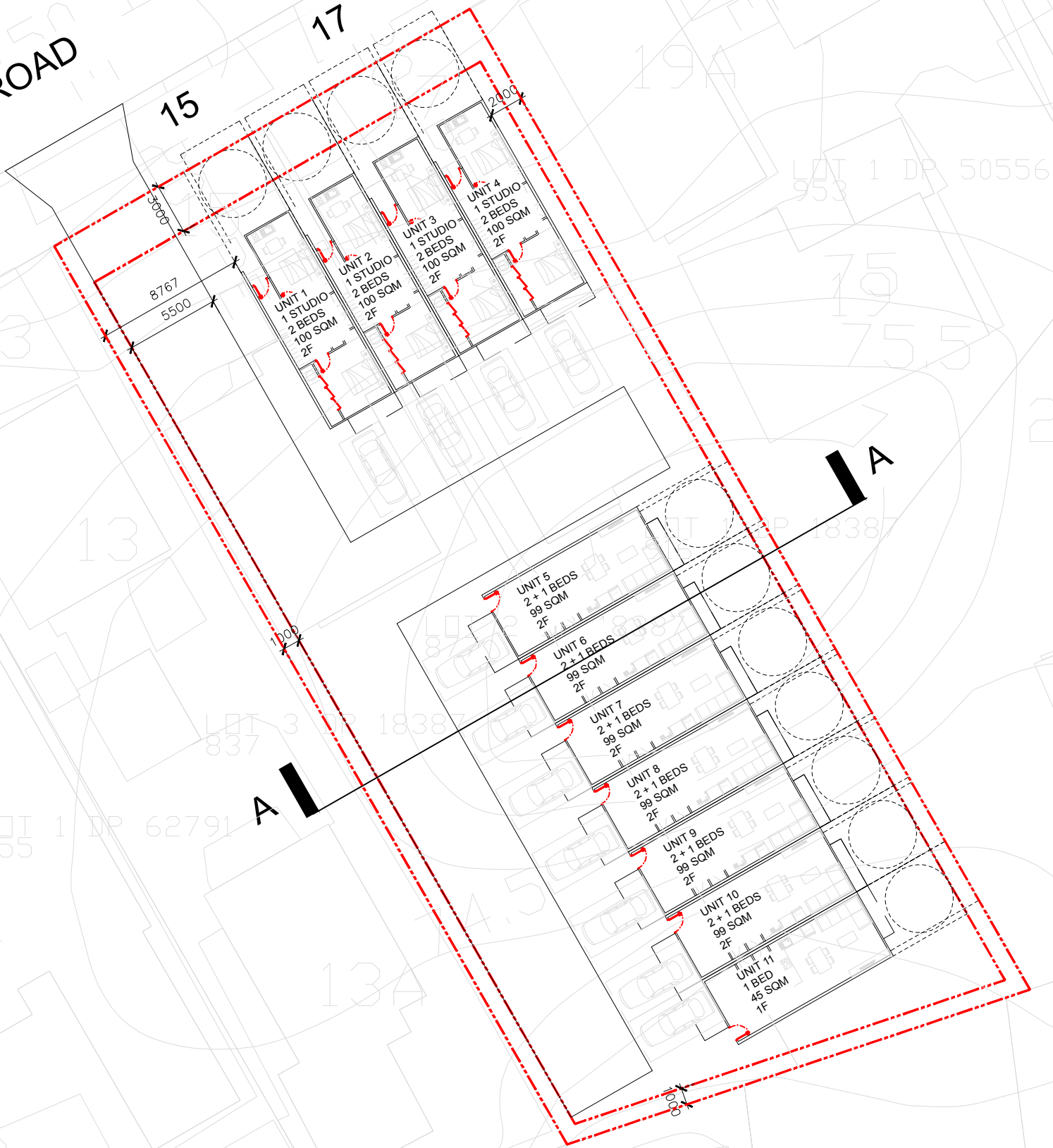


Dustin Tookey, CMEngNZ (CPEng)

Senior Geotechnical Engineer

APPENDIX 1:
TT Architects Plan

AMARU ROAD



2 1:300 Section
Initial Design Test

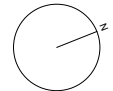
1 1:300 Plan
Initial Design Test

ZONING: MHS
SITE AREA: 1,793 SQM (2 SITES)
UNIT NUMBER: 11
CAR PARK: 11

NO	AMENDMENTS
-	-

NOTES
 1. DO NOT SCALE DRAWINGS. WRITTEN DIMENSIONS GOVERN.
 2. ALL DIMENSIONS ARE IN MILLIMETRES UNLESS NOTED OTHERWISE.
 3. ALL DIMENSIONS SHALL BE VERIFIED ON SITE BEFORE PROCEEDING WITH THE WORK. TT ARCHITECTS SHALL BE NOTIFIED IN WRITING OF ANY DISCREPANCIES.
 4. THIS DRAWING MUST BE READ IN CONJUNCTION WITH ALL RELEVANT CONTRACTS, SPECIFICATIONS, REPORTS AND DRAWINGS.
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PROJECT TITLE
15 - 17 AMARU ROAD



TTA TT ARCHITECTS LIMITED
 PLANNER --
 STRUCTURAL ENGINEER --
 LAND SURVEYOR --
 EMAIL: INFO@TTA.CO.NZ
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SHEET TITLE				DRW NO.
IDT				A000
DES BY	RT	JOB NO.	220001	SCALE AT A3 1:300 SERIES OF
DRW BY	BX	CLIENT	PP	
CHK BY	RT	DATE	12/02/2020	

APPENDIX 2:
Investigation Location Plan

DATE PLOTTED: 27 March 2020 3:59 p.m. BY: DOUG FINLAY

Rev	Date	Description	Drwn	Chkd
-	25.3.20	Issue	DF	HP



ENGEO
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 8 Greydene Place, Takapuna 0622, Auckland
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Title: **INVESTIGATION LOCATION PLAN**

Client: Budock Property Limited	Designed: HP Drawn: DF Checked: HP Date: 25.3.20
Proj: 15 - 17 Amaru Road Onehunga AUCKLAND	
Proj No: 17137.000.000	
Scale: 1:400	

Appendix:
1
Size: A4
Revision: -

APPENDIX 3:
Hand Auger Borehole Logs



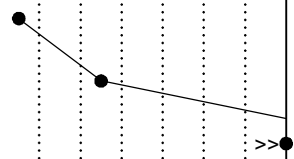
LOG OF AUGER HA01

Geotechnical Investigation
15-17 Amaru Road
Onehunga, Auckland

Client : Bubdock Property Limited
Client Ref. : 17137.000.000
Date : 09/03/2020
Hole Depth : 1.9 m
Hole Diameter : 50 mm

Shear Vane No : 2093
Logged By : HP
Reviewed By :
Latitude : -36.909148
Longitude : 174.785768

Depth (m BGL)	Material	USCS Symbol	DESCRIPTION	Graphic Symbol	Elevation (mRL)	Water Level	Moisture Cond.	Consistency/ Density Index	Shear Vane Undrained Shear Strength (kPa) Peak/Remoulded	Scala Penetrometer							
										Blows per 100mm							
										2	4	6	8	10	12		
	TOPSOIL	OL	TOPSOIL				D	N/A									
0.5	AUCKLAND VOLCANIC FIELD	ML	Clayey SILT; dark brown orange with dark grey streaks. Low plasticity.		73			H	200+								
1.0		ML	Trace sand encountered from 1 m depth, and becomes grey brown with occasional orange and dark orange streaks.			M		H	200+								
1.5		ML	SILT with minor clay and trace sand; dark brown orange. Low plasticity.					H	200+								
1.5		ML	Clayey SILT with trace sand; light brown grey with occasional orange streaks. Low plasticity.		72			VSt	128/58								
1.6		ML	Becomes dark orange brown from 1.6 m depth.					VSt	142/86								
2.0	End of Hole Depth: 1.9 m Termination Condition: Practical refusal																



GEOTECH HAND AUGER HA_LA.GPJ NZ DATA TEMPLATE 2.GDT 20/3/20

Hand auger met practical refusal at 1.9 m depth on inferred basalt rock.
Standing groundwater was not encountered
N/A = Not Assessed

Surface elevation data from Auckland Council GIS



LOG OF AUGER HA02

Geotechnical Investigation
15-17 Amaru Road
Onehunga, Auckland

Client : Bubdock Property Limited
Client Ref. : 17137.000.000
Date : 09/03/2020
Hole Depth : 0.9 m
Hole Diameter : 50 mm

Shear Vane No : 2093
Logged By : HP
Reviewed By :
Latitude : -36.909212
Longitude : 174.78569

Depth (m BGL)	Material	USCS Symbol	DESCRIPTION	Graphic Symbol	Elevation (mRL)	Water Level	Moisture Cond.	Consistency/ Density Index	Shear Vane Undrained Shear Strength (kPa) Peak/Remoulded	Scala Penetrometer						
										Blows per 100mm						
										2	4	6	8	10	12	
0.0 - 0.5	TOPSOIL	OL	TOPSOIL					D	VSt	154/49						
0.5 - 0.8	AVF	ML	Clayey SILT; light grey brown with occasional dark orange and red streaks. Low plasticity. Becomes intermixed brown and grey brown from 0.8 m depth.		74			M	H	200+						
0.8 - 0.9	End of Hole Depth: 0.9 m Termination Condition: Practical refusal									200+						
0.9 - 1.0																
1.0 - 1.5																
1.5 - 2.0																

GEOTECH HAND AUGER HA_LA.GPJ NZ DATA TEMPLATE 2.GDT 20/3/20

Hand auger met practical refusal at 0.9 m depth on inferred basalt rock.
Standing groundwater was not encountered
AVF = Auckland Volcanic Field

Surface elevation data from Auckland Council GIS



LOG OF AUGER HA03

Geotechnical Investigation
15-17 Amaru Road
Onehunga, Auckland

Client : Bubdock Property Limited
Client Ref. : 17137.000.000
Date : 09/03/2020
Hole Depth : 0.3 m
Hole Diameter : 50 mm

Shear Vane No : 2093
Logged By : HP
Reviewed By :
Latitude : -36.909357
Longitude : 174.785887

Depth (m BGL)	Material	USCS Symbol	DESCRIPTION	Graphic Symbol	Elevation (mRL)	Water Level	Moisture Cond.	Consistency/ Density Index	Shear Vane Undrained Shear Strength (kPa) Peak/Remoulded	Scala Penetrometer					
										Blows per 100mm					
										2	4	6	8	10	12
	TOPSOIL	OL	TOPSOIL				D	H							
0.5	End of Hole Depth: 0.3 m Termination Condition: Practical refusal								UTP						
1.0															
1.5															
2.0															

GEOTECH HAND AUGER HA_LA.GPJ NZ DATA TEMPLATE 2.GDT 20/3/20

Hand auger met practical refusal at 0.3 m depth on inferred basalt rock.
Standing groundwater was not encountered
UTP = Unable to Penetrate

Surface elevation data from Auckland Council GIS



LOG OF AUGER HA04

Geotechnical Investigation
15-17 Amaru Road
Onehunga, Auckland

Client : Bubdock Property Limited
Client Ref. : 17137.000.000
Date : 09/03/2020
Hole Depth : 1.3 m
Hole Diameter : 50 mm

Shear Vane No : 2093
Logged By : HP
Reviewed By :
Latitude : -36.909514
Longitude : 174.785978

Depth (m BGL)	Material	USCS Symbol	DESCRIPTION	Graphic Symbol	Elevation (mRL)	Water Level	Moisture Cond.	Consistency/ Density Index	Shear Vane Undrained Shear Strength (kPa) Peak/Remoulded	Scala Penetrometer							
										Blows per 100mm							
										2	4	6	8	10	12		
0.0 - 0.5	TOPSOIL	OL	TOPSOIL					D	H	UTP							
0.5 - 0.8	AUCKLAND VOLCANIC FIELD	ML	Clayey SILT with minor fine to medium sand; light grey brown with occasional orange, red and brown streaks. Low plasticity.		74					200+							
0.8 - 1.0		ML	Trace fine to medium sand encountered from 0.8 m depth, and becomes intermixed with red, orange, grey and brown.				M			200+							
1.0 - 1.3		ML	Clayey SILT with trace sand; brown with occasional orange streaks. Low plasticity. Trace fine to medium basalt gravel encountered from 1.2 m depth.						H	200+							
1.3 - 1.5	End of Hole Depth: 1.3 m Termination Condition: Practical refusal																>>
1.5 - 2.0																	>>

GEOTECH HAND AUGER HA_LA.GPJ NZ DATA TEMPLATE 2.GDT 20/3/20

Hand auger met practical refusal at 1.3 m depth on inferred basalt rock.
Standing groundwater was not encountered
UTP = Unable to Penetrate

Surface elevation data from Auckland Council GIS



LOG OF AUGER HA05

Geotechnical Investigation
15-17 Amaru Road
Onehunga, Auckland

Client : Bubdock Property Limited Shear Vane No : 2093
 Client Ref. : 17137.000.000 Logged By : HP
 Date : 09/03/2020 Reviewed By :
 Hole Depth : 0.7 m Latitude : -36.909413
 Hole Diameter : 50 mm Longitude : 174.785927

Depth (m BGL)	Material	USCS Symbol	DESCRIPTION	Graphic Symbol	Elevation (mRL)	Water Level	Moisture Cond.	Consistency/ Density Index	Shear Vane Undrained Shear Strength (kPa) Peak/Remoulded	Scala Penetrometer					
										Blows per 100mm					
										2	4	6	8	10	12
	TOPSOIL	OL	TOPSOIL					D	H	200+					
0.5	AVF	ML	Clayey SILT with trace sand; brown orange and dark brown grey. Low plasticity.		73			M	H	200+					
End of Hole Depth: 0.7 m Termination Condition: Practical refusal															

GEOTECH HAND AUGER HA_LA.GPJ NZ DATA TEMPLATE 2.GDT 20/3/20

Hand auger met practical refusal at 0.7 m depth on inferred basalt rock. Surface elevation data from Auckland Council GIS
 Standing groundwater was not encountered
 AVF = Auckland Volcanic Field
 UTP = Unable to Penetrate

APPENDIX 4:
Dynamic Cone (Scala) Penetrometer Results

This report may only be reproduced in full.

Dynamic Cone (Scala) Penetrometer Results												
NZS 4402:1988 TEST 6.5.2												
Equivalent CBR Values using AUSTROADS Correlation												
PROJECT	15 - 17 Amaru Road, Onehunga, Auckland											
JOB NO	17137.000.000											
CLIENT	Bubdock Property Limited											
MATERIAL / LAYER	Clayey SILT											
DATE TESTED	9-Mar-20											
Test No	1		2		3		4					
Test Location	See ILP		See ILP		See ILP		See ILP					
Depth Range mm	No of Blows	Equiv CBR	No of Blows	Equiv CBR	No of Blows	Equiv CBR	No of Blows	Equiv CBR	No of Blows	Equiv CBR	No of Blows	Equiv CBR
0 - 100	2	4	3	6	3	6	3	6				
100 - 200	5	10	4	8	3	6	6	13				
200 - 300	6	13	5	10	4	8	20	20+				
300 - 400	7	15	5	10	6	13						
400 - 500	8	17	6	13	9	20						
500 - 600	8	17	6	13	8	17						
600 - 700	9	20	5	10	7	15						
700 - 800	8	17	5	10	6	13						
800 - 900	8	17	8	17	4	8						
900 - 1000												

Test No												
Test Location												
Depth Range mm	No of Blows	Equiv CBR	No of Blows	Equiv CBR	No of Blows	Equiv CBR	No of Blows	Equiv CBR	No of Blows	Equiv CBR	No of Blows	Equiv CBR
0 - 100												
100 - 200												
200 - 300												
300 - 400												
400 - 500												
500 - 600												
600 - 700												
700 - 800												
800 - 900												
900 - 1000												

Field Staff: HP
Checked by: DT

APPENDIX 5:
Intorock Soakage Test Results

Existing Borehole Retest



CLIENT: Engeo

DATE: 9/03/2020

LOCATION: 15 Amaru Rd, Onehunga

BOREHOLE NO: BH2

BOREHOLE LOCATION: #17, 9.3m from left boundary & 2.8m from front footpath

TESTED BY: Hydrant

PRE-SOAK: 10 MINS

METRE START: 139,704.00

METRE FINISH: 139,839.00

TOTAL LITRES: 13,500L **OVER 10 MINS:** 22.5L/sec
Full Hydrant Flow

Flow test result is only relevant to the actual time of testing.