HAIGH WORKMAN LTD
Civil & Structural Engineers

Geotechnical Investigation Report

Proposed New Shed

Koutu Loop Road, Opononi

Lot 2, Deposited Plan 519375

For

Tony Rouse

Haigh Workman reference 20 038

March 2020

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Revision History

Revision №	Issued By	Description	Date
A	Okona Teu	First Issue	March 2020

Prepared By	Reviewed By	Approved By
Okona Teu Engineering Technician	Wayne Thorburn Senior Geotechnical Engineer CPEng, CMEngNZ	John Papesch Director CPEng, CMEngNZ

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Executive Summary

Haigh Workman Ltd (Haigh Workman) has been commissioned by Tony Rouse (the Client) to undertake a geotechnical investigation for a proposed new shed at Koutu Loop Road, Opononi. This report presents the information gathered during the site investigation, interpretation of data obtained and site-specific geotechnical recommendations relevant to the site. This report should be read in full in order to understand the site constraints and foundation recommendations.

Based on the results of the geotechnical investigation conducted by Haigh Workman and review of published geological maps, it is considered that the subsoils comprise Karioitahi Group soils, comprising fine sandy silt with trace clay soils. A 'hard pan' layer was encountered across the site and was difficult to penetrate due to the layer being slightly cemented, which is likely as a result of the soils being podzolized. Podzol soils are strongly acidic soils and can be identified by a bleached horizon immediately below the topsoil. An organic rich layer was encountered within BH01, underlying the hard pan layer.

Based on the encountered ground conditions and observations made during the site investigation, we consider the subsoils do not meet the definition of 'good ground' as contained in NZS3604:2011. 'Footing Type B' as shown on the plans provided by Versatile is considered suitable foundation option for this site.

Firm soils (vane shear strength less than 50 kPa) were encountered 2.5 m below existing ground level, provided 'Footing Type B' does not exceed 1.2 m depth and earthworks are minimal, i.e. filling across the site is less than 600 mm and excavations less than 1.0 m, then 'Footing Type B' will remain suitable without further analysis. Foundation design recommendations are provided in Section 4 and construction recommendations are provided in Section 5.

Specific engineering inspections of building platform preparation and/or foundation construction with certification by a Producer Statement, PS4, are often required by Council and outlined in the Building Consent. These observations are generally required to ensure that the foundation soils exposed at the time of construction are consistent with the assumptions made in this geotechnical report. We consider the following specific items will need to be observed at the time of construction to ensure the foundation soils are consistent with the assumptions made in this geotechnical report:

1. Observe ground conditions exposed on any prepared building platform and observe foundation excavations to confirm exposed soils are suitable for foundations;
2. Observe foundation excavations for any proposed structure and other consented structures prior to steel being placed and foundations being poured.

Provision should be allowed for modifying the foundation solution at this time, should unforeseen ground conditions be encountered

1 Introduction

1.1 Project Brief and Scope

Haigh Workman Ltd. (Haigh Workman) has been commissioned by Tony Rouse (the Client) to undertake a geotechnical investigation for a proposed new shed at Koutu Loop Road, Opononi. This report presents the information gathered during the site investigation, interpretation of data obtained and site-specific geotechnical recommendations relevant to the site.

A consent notice (11374098.3) is listed on the title which requires any building on the lot requires specifically designed foundations by a Chartered Professional Engineer.

The scope of this report encompasses the geotechnical suitability in the context of the proposed development as defined in the Short Form Agreement dated 2nd of March 2020. This appraisal has been designed to assess the subsoil conditions for foundation design and identify geotechnical constraints for the proposed development.

This report provides the following:

- A summary of the published geology with reference to the geotechnical investigations undertaken;
- Analysis of the data obtained from site investigations and a geological ground model;
- Foundation recommendations;
- Provide comment on ground stability and;
- Identification of any additional geotechnical risks and/or hazards.

1.2 Proposed Development

Concept foundation drawings for the proposed development have been provided to us and we understand that the Client intends to develop the site with the construction of a light weight single-story shed.

This geotechnical investigation and report consider the geotechnical aspects of the proposed development and the suitability of the ground for a light weight, single story structure with particular reference to the proposed shed location (refer to Figure 1 - Site Location and appended drawings).

Should the proposed development vary from the proposals described above and/or be relocated outside of the investigated area, further investigation and/or amendments to the recommendations made in this report may be required.

Figure 1 - Site Location

1.3 Site Description

The property is legally described as Lot 2, Deposited Plan 519375 with a total land area of 8080 m^2. It is irregular in plan shape, elongated north to south. The proposed site location is flat to undulating with a slight angle of 1.2 degrees sloping down to the north-east. No evidence of instability was observed in the immediate area of the proposed development site.

The property is accessed at the south western corner via a newly developed right of way extending from Koutu Loop Road. The western boundary follows along the neighbouring undeveloped block of residential land, it meets the northern border that follows the crest of a moderately steep slope extending down to the Hokianga harbour shore line. The eastern boundary length adjoins a natural bush recreation reserve and is where a cut-out drain following the boundary directing flows north. The southern boundary is an established residential section.

Swale drains have been cut into the landscape to direct overland flows in a north easterly direction, they are approximately 15 to 20 m apart and repeat northward through the neighbouring empty residential sections. The swale and cut-out drains contained no water at the time of our site investigation and surface conditions at the proposed development location were dry.

The proposed development was set out on site with spray marks on the ground, the approximate property borders and proposed site location is shown in Figure 1.

2 Geology

2.1 Published Geology

Sources of Information:

- Institute of Geological & Nuclear Sciences 1:250,000 Geological Map 1, 1996: "*Geology of the Kaitaia*";
- NZMS 290 Sheet O 06/07, 1: 100,000 scale, 1982: *"Waipoua - Aranga" Rock Types;*
- NZMS 290 Sheet O 06/07, 1: 100,000 scale, 1980: *"Waipoua - Aranga" Soil Types.*

The site is within the bounds of the GNS Geological Map 1 "Geology of the Kaitaia area", 1:250,000 scale*. The published geology shows the site to be underlain by Karioitahi Group, comprising unconsolidated to poorly consolidated sand, peat, mud and shell deposits (estuarine, lacustrine, swamp, alluvial and colluvial), of late Pleistocene to Holocene age.

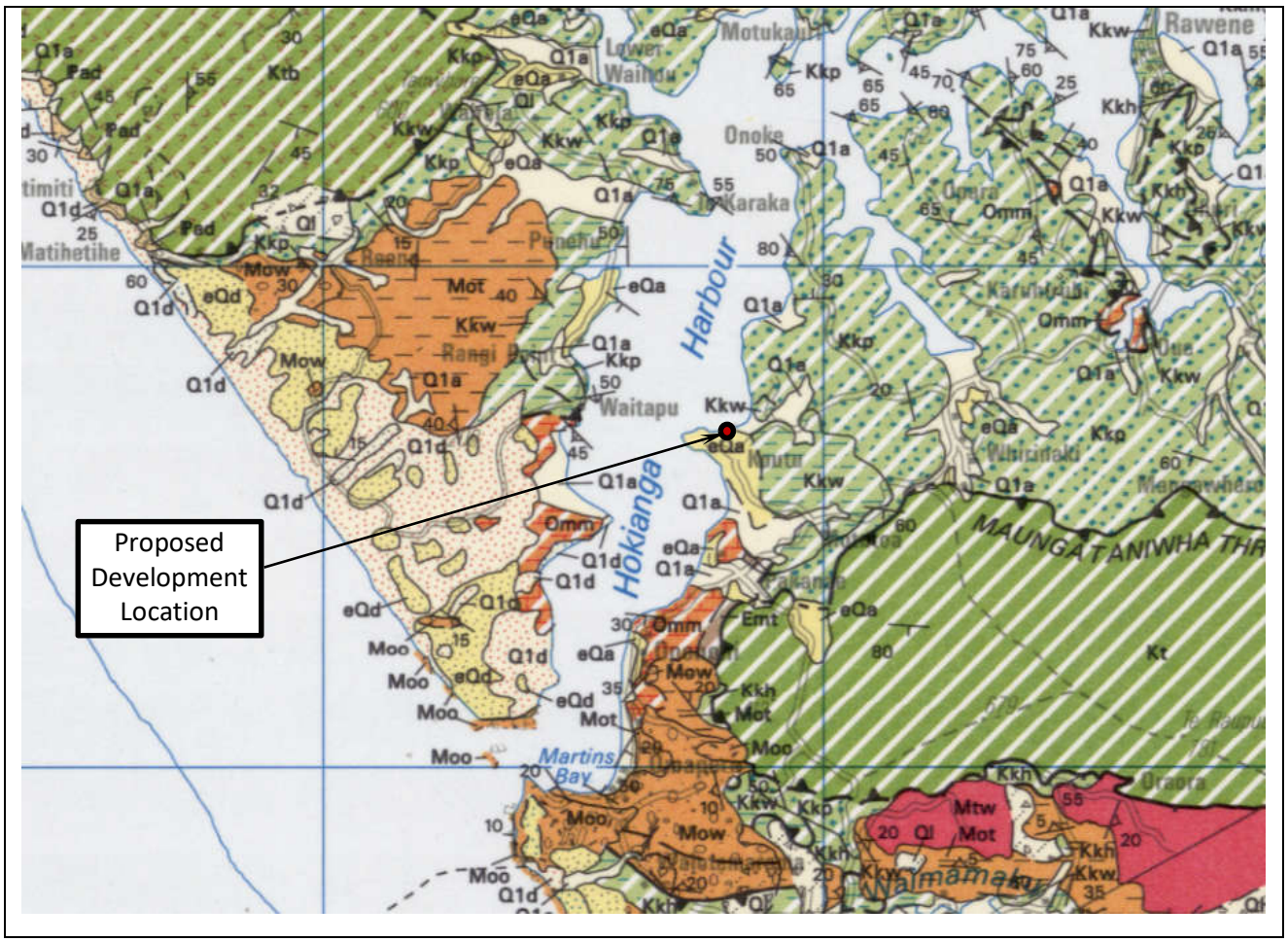

Figure 2 - Geotechnical Map Extract

* Isaac, M.J. (compiler) 1996. Geology of the Kaitaia area. Institute of Geological and Nuclear Sciences 1:250 000 geological map 1.

Table 1 - Geological Legend

Symbol	Unit Name	Description
eQa	Karioitahi Group	Partly consolidated sand, mud and peat or lignite of estuarine, lacustrine, swamp, alluvial and colluvial origins.
Q1a		Unconsolidated to poorly consolidated sand, mud, peat and shell deposits of estuarine, lacustrine, swamp, alluvial and colluvial origins.
Kkw	Mangakahia Complex (Whangai Formation)	Dark grey, white-weathering siliceous and calcareous mudstone. Minor thin-bedded micritic limestone. Minor black carbonaceous shale (Waipawa Black Shale)

Further reference to the published New Zealand land inventory maps (Waipoua - Aranga), indicates the site is underlain by; *"soils of the coastal sand dune complex – Pinaki and Whananaki sand, excessively to somewhat excessively drained"* and closely borders *"soils of the rolling and hilly land, imperfectly to very poorly drained - Arapohue clay"*. The underlying material weathers *"to brown-stained, very soft clayey sand to depths of 5 m"*.

3 Ground Investigations

3.1 Site Walkover

A site walkover was undertaken during our investigation visit. Purpose built overland flow paths or swale drains were observed across the site and the neighbouring sections, directing surface water toward the north east.

Excavation work being carried out for the construction of a cul-de-sac at the end of the right of way was also observed which clearly shows the effects of seasonal shrinkage on the soil condition, refer Figure 3. Cracking of the soils is often observed across northland during the summer months and foundations must be designed to accommodate the seasonal effects.

Figure 3 – Evidence of soil desiccation below ground surface and hard pan layer

3.2 Subsurface Investigations

Haigh Workman undertook geotechnical investigations on the 18th of March 2020. The investigations comprised the drilling of four hand auger boreholes located around the general area of the proposed shed as well as a Scala penetrometer. Hand augers were advanced to depths of between 2.2 to 3.0 metres below ground level (mbgl). Vane shear tests were undertaken at regular intervals during the advancement of the hand auger.

Investigations were logged in accordance with The New Zealand Geotechnical Society, "Guidelines for the Field Classification and Description of Soil and Rock for Engineering Purposes" (2005). Investigation locations are shown on the drawings in Appendix A and investigation hand auger logs and scala penetrometer testing are included in Appendix B.

3.3 Ground Conditions

Based on the results of the geotechnical investigation conducted by Haigh Workman and review of published geological maps, it is considered that the surface soils directly underlying the proposed building site comprise natural soils of the Karioitahi Group, further underlain by Northland Allochthon. For the purposes of this report, subsoil conditions on the site have been interpolated between the boreholes and some variation between borehole positions are likely. Detailed logs are presented within Appendix B.

Table 2 below summarises the materials encountered, with depth to base of each unit provided. Geological models have been developed based on the investigation and are presented in Appendix A.

Table 2 - Summary of Borehole Results

Borehole Number	Topsoil (mbgl)	Hard Pan Layer	Karioitahi Group Soils	Soil Moisture and Groundwater Observations
BH1	Not Encountered	0.5 mbgl	0.0 to 3.0mbgl	Dry at surface, increasing in moisture content with depth. Static groundwater not encountered.
BH2	Not Encountered	0.6 mbgl	0.0 to 3.0 mbgl	
BH3	Not Encountered	0.6 mbgl	0.0 to 2.2 mbgl	
BH4	Not Encountered	0.6 mbgl	0.0 to 2.2 mbgl	

3.3.1 *Karioitahi Group*

The natural ground conditions were generally consistent between boreholes BH1 to BH4, and are considered to comprise soils of the Karioitahi Group.

A 'hard pan' layer was encountered across the site to approximately 0.6 m and was difficult to penetrate due to the layer being slightly cemented, which is likely as a result of the soils being podzolized. Podzol soils are strongly acidic soils and can be identified by a bleached horizon immediately below the topsoil. An organic rich layer was encountered within BH01, underlying the hard pan layer.

Recovered soils were generally coloured greys and browns near surface, becoming grey below approximately 2.5 mbgl. Moisture content was typically dry at surface increasing to moist to wet with depth and displayed no to low plastic properties. Vane shear strength results within the fine-grained soils indicated very stiff soils with recorded vane shear strengths of greater than 100 kPa to approximately 2.0mbgl; soils then became firm to stiff to 3.0 mbgl with recorded strengths as low as 44 kPa.

3.3.2 *Groundwater*

Groundwater was not encountered during our site investigations. No evidence was observed of groundwater seepage during the drilling of the hand auger boreholes. During drilling, soil moisture observations were recorded with soils noted moist throughout. Groundwater levels can and do fluctuate and higher groundwater levels may be encountered following periods of prolonged or heavy rainfall.

4 Foundation Recommendations

4.1 General

Foundation plans provided by Versatile show a shallow foundation comprising a concrete slab on-grade foundation. Based on our findings, we consider the natural ground conditions are expected to be consistent across the proposed development area and are considered suitable for supporting foundations subject to ground verification during construction. It is considered that the natural in situ soils are able to provide an ultimate bearing capacity of 300kPa.

We recommend that prior to foundation construction, a subgrade inspection is undertaken to confirm that unsuitable material has been removed and that the ground conditions comply with those presented within this report.

4.2 Shrink Swell Soil Characteristics

Evidence of surface cracks in the soils above the hard pan layer was recorded during the site investigation. On this basis and based on experience of similar soils elsewhere, the near surface fine grained cohesive soils of the Karioitahi Group are considered as moderately susceptible to swelling and shrinking under seasonal variations of water content. For the purposes of design, the site may be designated as moderately reactive (Class M) in accordance with AS2870:2011.

We recommend 'Footing Type B' as shown on the Versatile plans.

4.3 Seismic Site Subsoil Category

In lieu of site-specific deep borehole testing, we recommend seismic subsoil Class C (shallow soil site) in accordance with NZS1170.5.

4.4 Shallow Foundations

Based on the encountered ground conditions and observations made during the site investigation, we consider the subsoils do not meet the definition of 'good ground' as contained in NZS3604:2011. We recommend that any proposed structure be founded on shallow foundations and are designed in accordance with AS 2870:2011 with an allowance for class *'M', 'moderately expansive'* soil, allowing for characteristic ground movement of between 20mm to 40mm. 'Footing Type B' as shown on the plans provided by Versatile are suitable.

Foundation excavations need to be inspected by a geotechnical engineer or Far North District Council to confirm that topsoil material has been removed below any proposed structure footprints and to confirm a suitable subgrade has been achieved. Firm soils (vane shear strength less than 50 kPa) were encountered 2.5 m below existing ground level, provided 'Footing Type B' does not exceed 1.2 m depth and earthworks are minimal, i.e. filling across the site is less than 600 mm and excavations less than 1.0 m, then 'Footing Type B' will remain suitable without further analysis. A summary of the recommendations is as follows:

- Ultimate Bearing Capacity of 300kPa;
- Geotechnical strength reduction factor – 0.5 for limit state design;
- Soil expansivity class – Site Class M (moderately reactive soils);
- Seismic class – Site Class C (shallow soil site).
- Earthworks shall not exceed 600 mm of filling and 1.0 m of excavation.

Bearing capacity values included in this report are for vertical loads only and do not take in to account horizontal shear or moment.

5 Construction

5.1 Earthworks

At the time of writing, no earthworks plans were available for the proposed development. However, minor earthworks including cut and fill can be expected as part of foundation preparation for any proposed development. Based on this, we envisage that only minor excavations across the site are expected as part of the site preparation for pouring of foundations and concrete slabs.

Considering the swale drains observed during our site walkover, as shown on the appended drawings; we recommend subsoil drains are installed to convey water away from the building platform. This could be achieved with a network of deep trench drains across the site.

5.1.1 *Filling*

Should filling be proposed as part of the site development, then we recommend that all grass coverings, topsoil layers and loose materials must be removed below any proposed areas of intended fill placement. We recommend that filling intended to elevate the existing ground level should be avoided and filling on or near sloping ground will require specific geotechnical analyses. Any fill placed more than 0.6m thick or any fill placed near or beneath any proposed shed or other structures, will need verification of compaction and confirmation by the engineer that settlement caused by filling will not adversely affect the proposed structures. Verification of compaction should be undertaken by a professional engineer at regular lifts. i.e. inspection at preplacement and every 250mm thereafter.

5.2 Construction Observations

Specific engineering inspections of retaining walls, building platform preparation and/or foundation construction with certification by a Producer Statement, PS4, are often required by Council and outlined in the Building Consent. These observations are generally required to ensure that the foundation soils exposed at the time of construction are consistent with the assumptions made in this geotechnical report.

We consider the following specific items will need to be observed at the time of construction to ensure the foundation soils are consistent with the assumptions made in this geotechnical report:

3. Observe ground conditions exposed on any prepared building platform and observe foundation excavations to confirm exposed soils are suitable for foundations;
4. Observe foundation excavations for any proposed structure and other consented structures prior to steel being placed and foundations being poured.

Provision should be allowed for modifying the foundation solution at this time, should unforeseen ground conditions be encountered

5.3 Services

It is our understanding that no underground services exist beneath the proposed building platform. It is the responsibility of the Contractor to satisfy themselves that no services exist or if they do exist to engage an engineer to assist with foundation design.

Where it is intended for the installation of underground services, we recommend that all services are installed prior to foundation excavations and construction and that all services are designed to be outside the influence of foundation excavations. We recommend that any new services are accurately located on site and the depth to invert be determined prior to the commencement of foundation excavations.

5.4 Stormwater Disposal

All stormwater shall be piped well away from any proposed building platform and away from any steep slopes to avoid over saturation of the subsoils and to maintain stability across the site. All stormwater overflow drainages should be channelled away from the development platform and discharged in a controlled manner into the existing swale drains downslope of the development site.

6 Limitations

This report has been prepared for the use of Tony Rouse with respect to the particular brief outlined to us. This report is to be used by our Client and their Consultants and may be relied upon when considering geotechnical advice. Furthermore, this report may be utilised in the preparation of building and/or resource consent applications with local authorities. The information and opinions contained within this report shall not be used in other context for any other purpose without prior review and agreement by Haigh Workman Ltd.

The recommendations given in this report are based on site data from discrete locations. Inferences about the subsoil conditions away from the test locations have been made but cannot be guaranteed. We have inferred an appropriate geotechnical model that can be applied for our analyses. However, variations in ground conditions from those described in this report could exist across the site. Should conditions encountered differ to those outlined in this report we ask that we be given the opportunity to review the continued applicability of our recommendations.

Appendix A – Drawings

Drawing No.	Title	Scale
20 038/01	Site Location Plan	1:10000
20 038/02	Borehole and Cross Section Location Plan	1:200

NOTES:

1. LOT BOUNDARIES AND AERIAL PHOTO INFORMATION TAKEN FROM LAND INFORMATION NEW ZEALAND (LINZ).

Issue	Date	Revision
A	01/01/2020	FIRST ISSUE

DWG Site Location Plan

Scale 1: 10000@A3 | Date 10/03/20

Drawn OT | Checked WT | Approved JP

File X:\20 JOBS\20 038 TONY ROUSE\ENGINEERING\DRAWINGS\20 038_GEODRAWINGS.DWG

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Project: Geotechnical Investigation
Koutu Loop Road, Opononi (Lot 2, Deposited Plan 519375)

Client: Tony Rouse

Project No. 20 038 | RC no. N/A

DWG No. 01

Sheet No. 1 of 2

Plotted By Wayne Thorburn at 27/03/2020 5:24:09 PM

NOTES:

1. LOT BOUNDARIES AND AERIAL PHOTO INFORMATION TAKEN FROM LAND INFORMATION NEW ZEALAND (LINZ).
2. LOCATIONS HAVE NOT BEEN SURVEYED AND ARE INDICATIVE ONLY.

Issue	Date	Revision
A	01/01/2020	FIRST ISSUE

DWG: Site Features, Borehole and Geological Cross Section Locations

Scale: 1: 1000 @A3 | Date: 10/03/20

Drawn: OT | Checked: WT | Approved: JP

File: X:\20 JOBS\20 038 TONY ROUSE\ENGINEERING\DRAWINGS\20 038_GEODRAWINGS.DWG

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Project: Geotechnical Investigation
Koutu Loop Road, Opononi (Lot 2, Deposited Plan 519375)

Client: Tony Rouse

Project No. 20 038 | RC no. N/A

DWG No. 02

Sheet No. 2 of 2

Plotted By Wayne Thorburn at 27/03/2020 5:24:10 PM

Appendix B – Hand Auger Logs

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Borehole Log - BH1

Hole Location: Refer to Site Plan

JOB No. 20 038

CLIENT:	Tony Rouse	**SITE:**	Koutu Loop Road, Koutu (Lot 2, Deposited Plan 519375)		
Date Started:	18/03/2020	**DRILLING METHOD:**	Hand Auger	**LOGGED BY:**	OT
Date Completed:	18/03/2020	**HOLE DIAMETER (mm)**	50mm	**CHECKED BY:**	WT

Soil Description (Based on NZGS Logging Guidelines 2005)	Depth (m)	Geology	Graphic Log	Water Level	Sensitivity	Vane Shear and Remoulded Vane Shear Strengths (kPa)	Scala Penetrometer (blows/100mm)
Fine sandy **SILT**; grey. Very stiff, dry, no plasticity. Rootlets. [Karioitahi Group]	0.0	KARIOITAHI GROUP		Groundwater Not Encountered		UTP	0 5 10 15 20
0.3m: becomes dry to moist. 0.4m: becomes moist.							
Fine sandy **SILT**, trace clay; dark brown, streaked black, speckled light orangish brown. Stiff to very stiff, moist, no to low plasticity. Trace fibrous organics, Rootlets.	0.5						
Fine sandy **SILT**, some clay; light greyish brown, speckled white, grey and orange. Stiff to very stiff, moist, no to low plasticity.	1.0				3	83 / 33	
	1.5				3	128 / 44	
2.0m: becomes moist to wet. 2.2m: some white to grey weakly cemented clasts ~20mm∅. 2.3 to 2.4m: white weakly cemented clasts layer.	2.0				3	83 / 30	
Fine sandy **SILT**, trace clay; grey, streaked dark and light grey, speckled light grey. Stiff, moist to wet, no plasticity. Trace fine gravel (weakly cemented clasts). 2.6m: becomes wet.	2.5				3	61 / 22	
					3	44 / 17	
End of hole at 3.0m (Target Depth)	3.0						
	3.5						
	4.0						
	4.5						

LEGEND

TOPSOIL | CLAY | SILT | SAND | GRAVEL | FILL

Corrected shear vane reading
Remoulded shear vane reading
Scala Penetrometer

Note: UTP = Unable to penetrate. T.S. = Topsoil.
Hand Held Shear Vane S/N: 2220
Scala penetrometer testing not undertaken.

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Borehole Log - BH2

Hole Location: Refer to Site Plan

JOB No. 20 038

CLIENT:	Tony Rouse	**SITE:**	Koutu Loop Road, Koutu (Lot 2, Deposited Plan 519375)		
Date Started:	18/03/2020	**DRILLING METHOD:**	Hand Auger	**LOGGED BY:**	OT
Date Completed:	18/03/2020	**HOLE DIAMETER (mm)**	50mm	**CHECKED BY:**	WT

Soil Description (Based on NZGS Logging Guidelines 2005)	Depth (m)	Geology	Graphic Log	Water Level	Sensitivity	Vane Shear and Remoulded Vane Shear Strengths (kPa)	Scala Penetrometer (blows/100mm)
Fine Sandy **SILT**; grey. Very stiff, dry, no plasticity. Rootlets. [Karioitahi Group]	0.0	KARIOITAHI GROUP		Groundwater Not Encountered		UTP	0 5 10 15 20
0.5m: becomes dry to moist.	0.5				9	128 / 14	
Fine sandy **SILT**, trace clay; light brown, mottled dark reddish brown, speckled light brown. Very stiff, dry to moist, no to low plasticity.							
1.1m: becomes no dark reddish brown mottle. Moist. 1.1 to 1.3m: trace fibrous organics.	1.0				3	183 / 69	
1.7m: becomes moist to wet.	1.5				2	103 / 44	
2.0m: becomes mottled light grey, light brown, speckled white and orangish brown.	2.0				4	147 / 42	
Fine sandy **SILT**, trace clay; grey, streaked dark and light grey, speckled light grey. Very stiff, moist, no plasticity. Trace fine gravel (weakly cemented clasts).	2.5				3	69 / 28	
2.9m: becomes stiff.							
End of hole at 3.0m (Target Depth)	3.0						
	3.5						
	4.0						
	4.5						

LEGEND

TOPSOIL | CLAY | SILT | SAND | GRAVEL | FILL

Corrected shear vane reading
Remoulded shear vane reading
Scala Penetrometer

Note: UTP = Unable to penetrate. T.S. = Topsoil.
Hand Held Shear Vane S/N: 2220
Scala penetrometer testing not undertaken.

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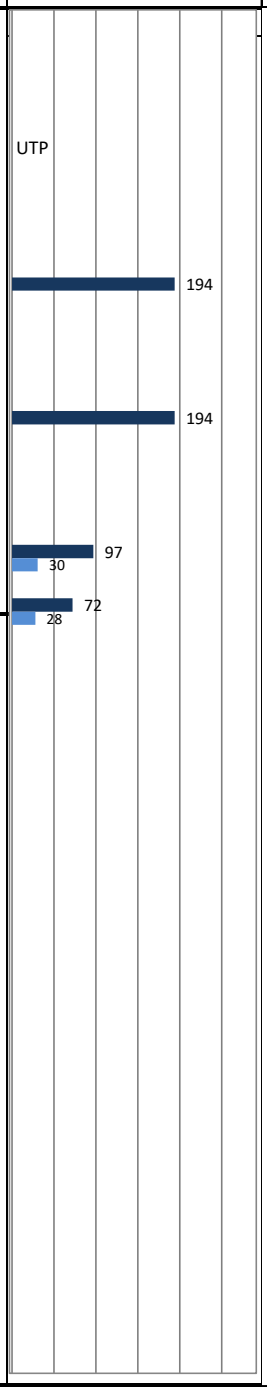
Borehole Log - BH3

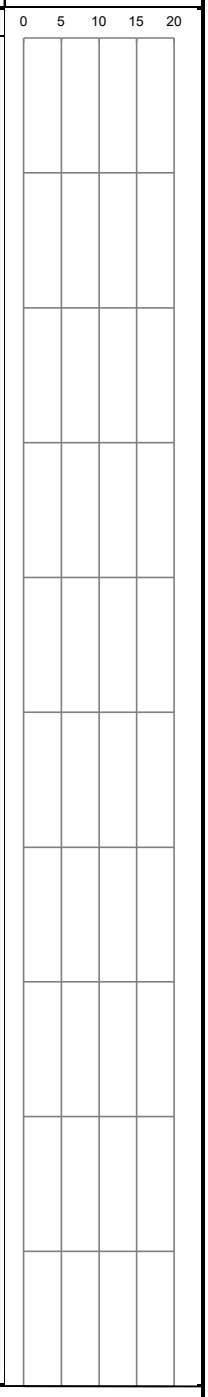
Hole Location: Refer to Site Plan

JOB No. 20 038

CLIENT:	Tony Rouse	**SITE:**	Koutu Loop Road, Koutu (Lot 2, Deposited Plan 519375)		
Date Started:	18/03/2020	**DRILLING METHOD:**	Hand Auger	**LOGGED BY:**	OT
Date Completed:	18/03/2020	**HOLE DIAMETER (mm)**	50mm	**CHECKED BY:**	WT

Soil Description (Based on NZGS Logging Guidelines 2005)	Depth (m)	Geology	Graphic Log	Water Level	Sensitivity
Fine Sandy **SILT**; grey. Very stiff, dry, no plasticity. Rootlets. [Karioitahi Group]	0.0	KARIOITAHI GROUP		Groundwater Not Encountered	
0.3m: becomes dry to moist.	0.5				
Fine sandy **SILT**, trace clay; dark brown, streaked dark reddish brown and black. Very stiff, dry to moist, no plasticity.					
0.9m: becomes moist.	1.0				
Fine sandy **SILT**, trace clay; light brown, streaked dark brown, speckled light brown and white. Very stiff, moist, no plasticity.					
1.5m: becomes some clay; light grey, speckled white and light grey. No to low plasticity.	1.5				3
2.1m: becomes grey, mottled dark grey. No plasticity. Pockets of fine sand.	2.0				3
End of hole at 2.2m (Target Depth)	2.5				
	3.0				
	3.5				
	4.0				
	4.5				





LEGEND

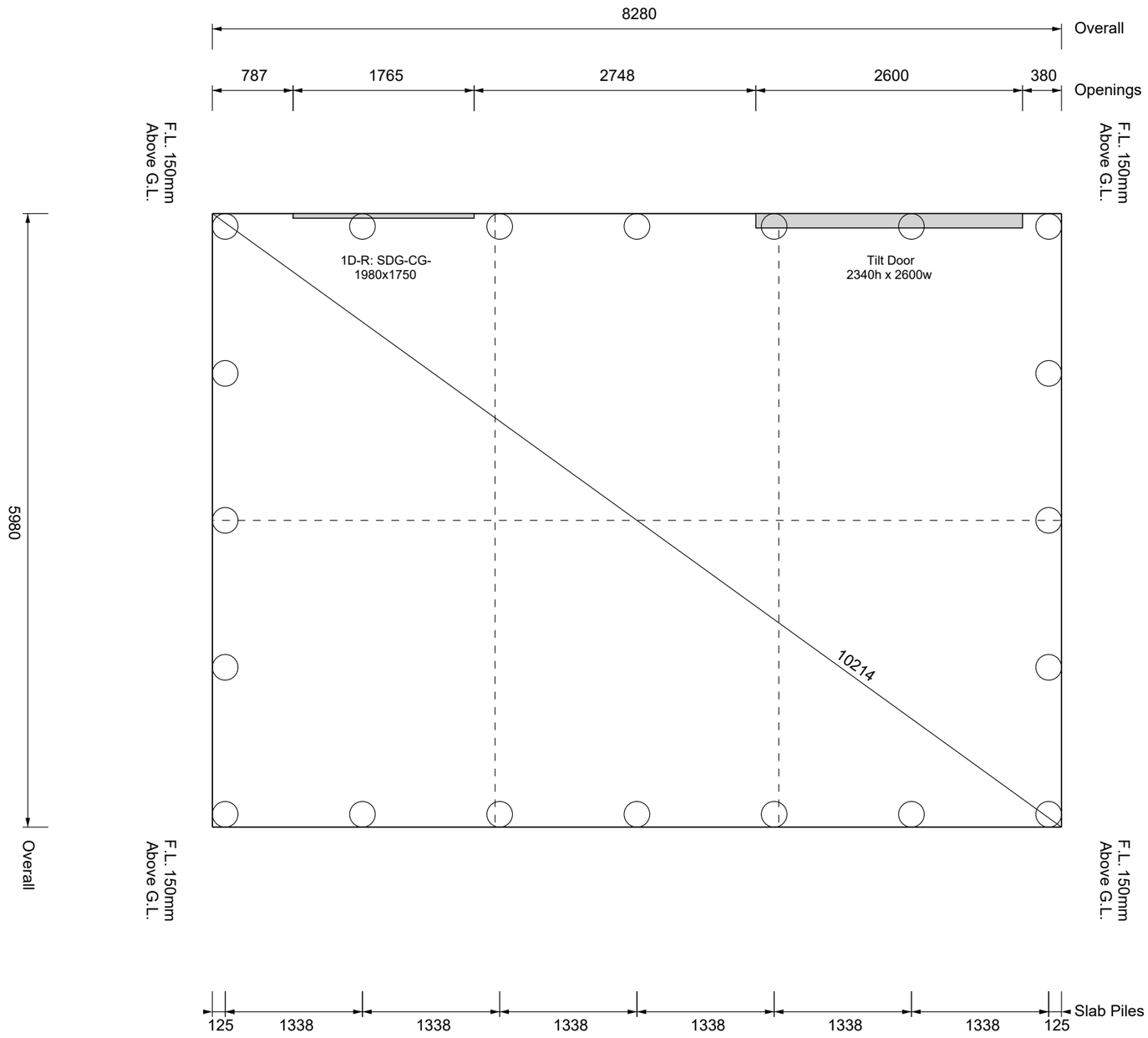
TOPSOIL | CLAY | SILT | SAND | GRAVEL | FILL

Corrected shear vane reading
Remoulded shear vane reading
Scala Penetrometer

Note: UTP = Unable to penetrate. T.S. = Topsoil.
Hand Held Shear Vane S/N: 2220
Scala penetrometer testing not undertaken.

Appendix C - Clients Supplied Information

DIMENSIONS IN mm UNLESS OTHERWISE STATED THIS IS A C.A.D. DRAWING AND MUST NOT BE ALTERED BY MANUAL METHODS



LEGEND	
	Diagonal: 10214
	Expansion Cut
	250mm dia pile
VOLUMES	Concrete: 0.0 m³ Sand: 0.0 m³ Fill: 0.0 m³

SCALE A3-1:50

Versatile™
Building Better

For: Tony Rouse
594 Koutu Loop road
Opononi
0473
021366470
Project Ref: 2089129

Concrete Floor

Concrete Floor Plan

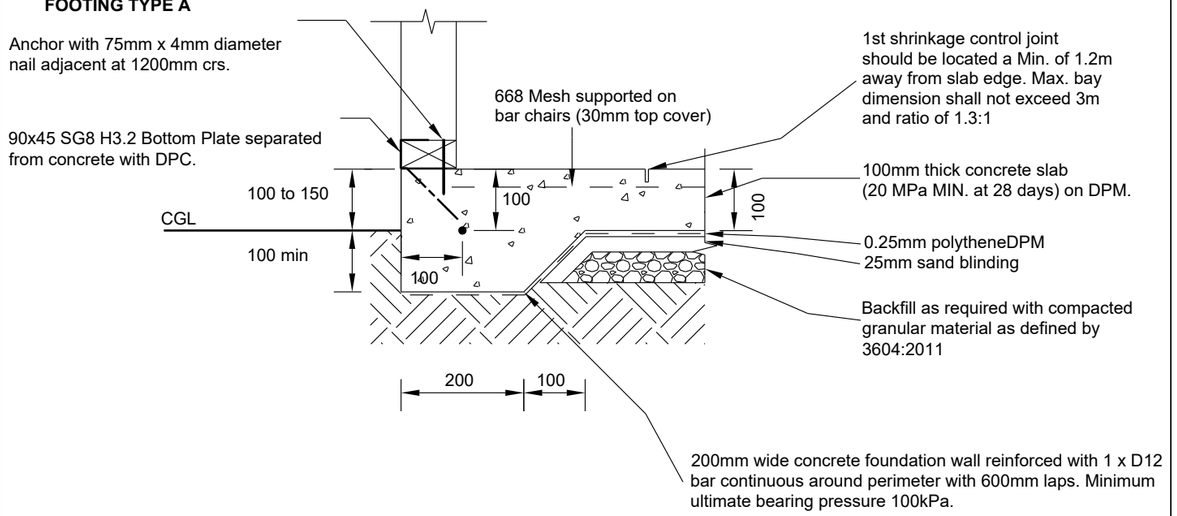
Sheet 1 of 2

GARAGE FOUNDATION DETAIL

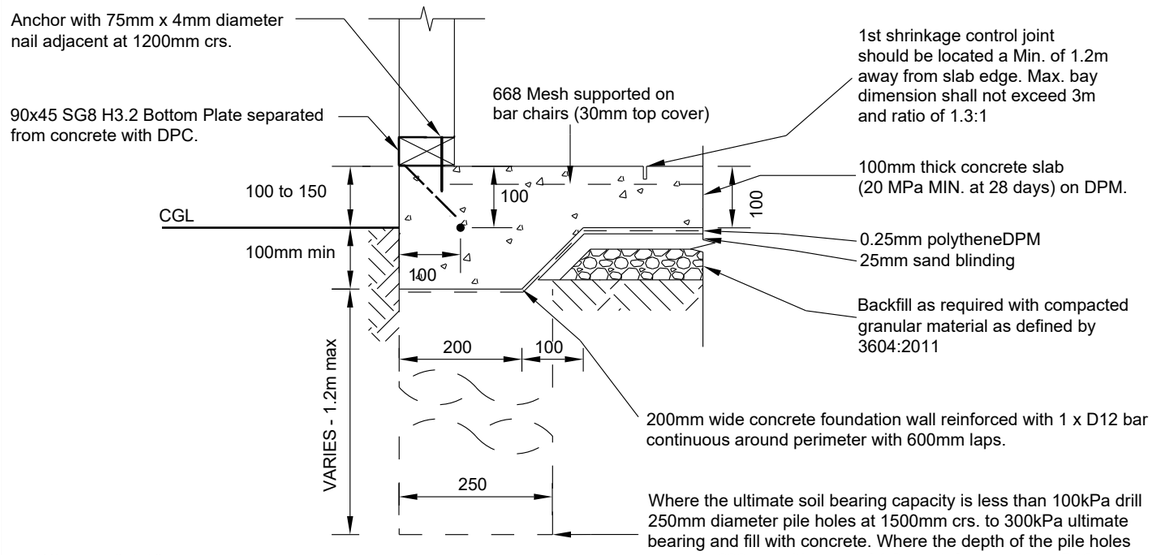
Notes:

1. **Concrete Covers have been selected in accordance with NZS 3101, Part 1 Section 3.**
2. **Strip the site, removing vegetation, turf, soils containing organic matter and any loose or soft material, trim to a firm subgrade. Backfill as required with compacted granular material as defined by 3604:2011.**
3. **Footing Type A shall be found in good ground defined by NZS 3604 but having a minimum ultimate bearing capacity of 100kPa.**
4. **Where the ultimate bearing capacity is less than 100kPa use Footing Type B.**
5. **For Type M and H Expansive Soils, use Footing Type B with 1200 deep pile reinforced with 1 vertical D12 400 mm return into slab.**
6. **28-Day concrete strenth to be 25 MPa for zone D as per figure 4 in NZS 3604**

FOOTING TYPE A



FOOTING TYPE B



SCALE: A3-1:10

Versatile™
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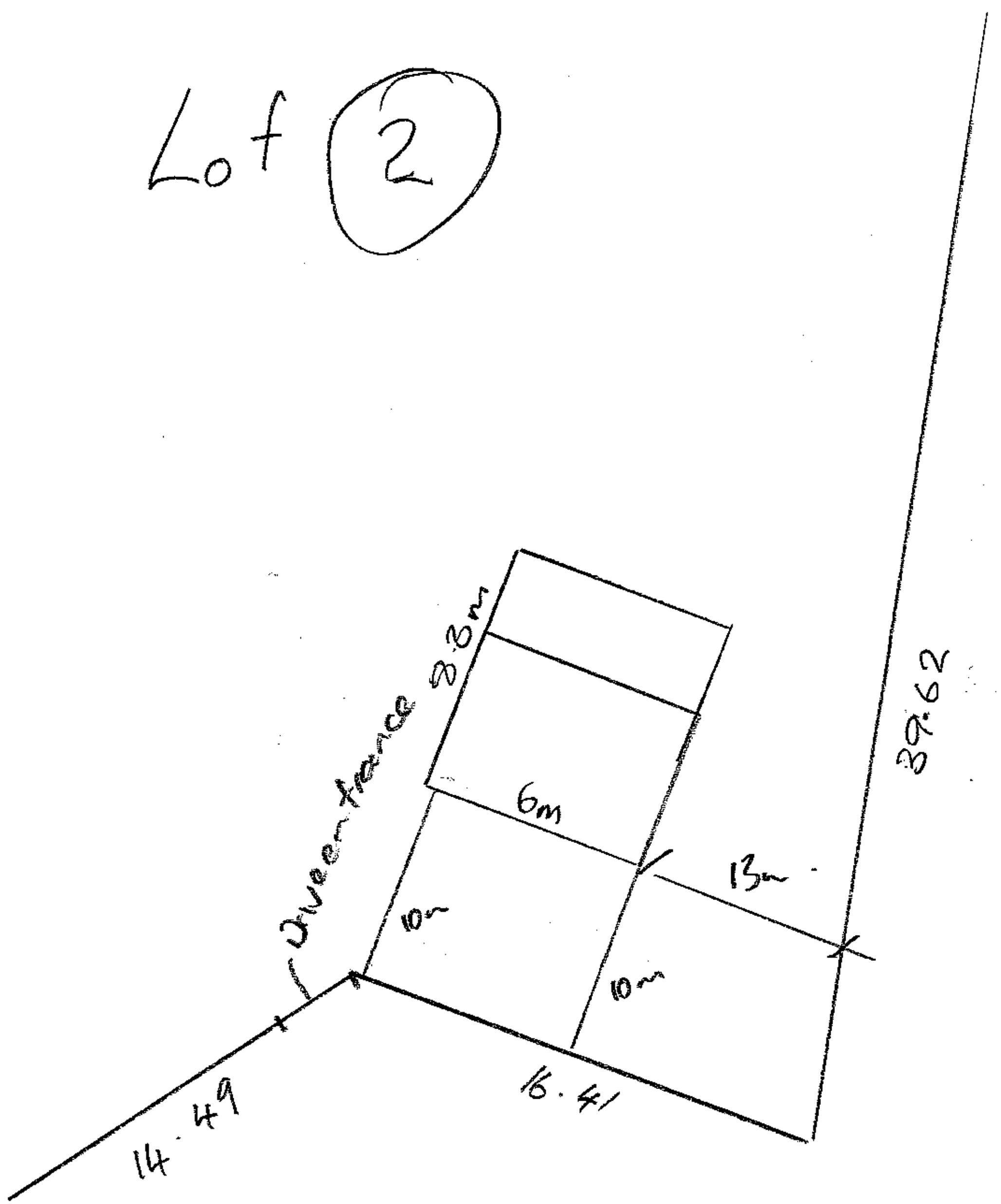
For: Tony Rouse
594 Koutu Loop road
Opononi
0473

Concrete Floor - IL1 Foundation

Foundation Details

Sheet 2 of 2



Appendix D - Producer Statement Advisory Note

HAIGH WORKMAN LTD
Civil & Structural Engineers

IMPORTANT ADVISORY NOTE

PRODUCER STATEMENT – CONSTRUCTION REVIEW (PS4)

The Building Consent Authority (BCA) frequently requires Producer Statements–Construction Review (PS4) to be submitted to the BCA in order for a Code of Compliance Certificate (CCC) to be issued. A PS4 is usually required for each specialist area. The requirement for a consultant to issue a PS4 related to their area of work will appear as a condition in the Building Consent documents.

It is the consent holder's responsibility to notify Haigh Workman Limited for geotechnical construction monitoring and testing required for subsequent issue of a PS4. An initial inspection of stripped or excavated ground must take place before any fill or blinding concrete is placed. Retrospective site monitoring of completed or partially completed geotechnical work is not possible and a PS4 will not be issued without all the required observations.

In order to secure our construction monitoring services and avoid delays on site, Haigh Workman Limited require at least 24 hours' notice prior to the time the site visit is required. Construction monitoring is limited to items that have been recommended, designed and detailed by Haigh Workman Limited. We are unable to inspect non-consented or unauthorised work. Haigh Workman Limited do not carry out construction monitoring or issue PS4's for work that has been recommended, designed or detailed by other consultants without prior approval from Haigh Workman Limited. Haigh Workman Limited will not issue a PS4 where construction monitoring and/or testing have been carried out by any other consultant. The PS4 must be sought from the consultant who carried out those inspections.

The full Building Consent, with stamped plans with consent numbers (or a legible copy of the same) including all amendments, shall be made available to us during inspections. We will not commence construction monitoring until the documentation is available or provided to us prior to our site visit.

Unless stated otherwise in our terms of engagement, the fees associated with construction monitoring and the issue of PS4's are separate from any work carried out prior to commencement of construction. We are able to provide a fee estimate for this work if required. We cannot provide a fixed quote because the quantum of work required frequently depends on the construction program and the performance of others. These things are not known to us in advance of construction. Our normal terms of trade require payment of fees monthly during the inspection period and full settlement prior to release of any PS4.