



Llandem Engineering Report

LLANDEM CONSULTING ENGINEERS
LTD

SUBDIVISION REPORT

8070 PAEROA KOPI-J ROAD
SH26 HIKUTAIA

PREPARED FOR:MRS J. HOCKING

PREPARED BY:LLANDEM CONSULTING ENGINEERS LTD

20 APRIL 2022

14 MAY 2022 - REVISIONS -1% AEP FLOOD LEVEL

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1.0 INTRODUCTION

1.1 Project Details

MRS. J HOCKING
C/o Kirsten Williamson
Kirstenwilliamson73@gmail.com

PHYSICAL 8070 STATE HIGHWAY 26 HIKUTAIA
LEGAL LOT 1 DPS 35017
AREA 5,368m2

Prepared For	Mrs J. Hocking	Owner
Prepared By	Derek Stewart	Llandem Consulting Engineers

1.2 Proposal

The owner intends to subdivide the existing rural property into 4 residential sections; two front and two rear Lots at the above address.

Llandem Consulting Engineers Ltd have been engaged to carry out a Geotechnical Investigation and desktop study in order to prepare a report to support the subdivision consent application. The Report will make comment and provide recommendations on the following items which apply to the proposed subdivision development:

- Assess building site suitability and foundation design criteria in terms of NZ Building Code requirements.
- Identify geotechnical restraints relating to the proposed building foundations. — Provide foundation options and design criteria. – Storm Water & Wastewater disposal options.
- Seismicity / Liquefaction Potential.
- Flood Hazard.
- Vehicle access.

(See Appendix A for the proposed Scheme Plan)

1.3 Site Conditions & Characteristics

The land is situated on a flat terrace on the western side of Hikutaia River which borders the rear eastern boundary. The front western boundary runs adjacent to the State Highway. The Land is topographically located on the low lying Hauraki Plains Terrace.

The site topography is best described as flat with a slight 2° slope from the western to the eastern boundary.

The sections will enjoy good exposure to sun and prevailing winds with extensive views of the surrounding plains. At the time of our Geotechnical Investigation the site was clear of buildings and is predominantly covered in pasture and mature exotic trees on the rear boundary.

Vehicle access to the building sites and Lots will be provided via a new concrete R.O.W and road crossing extending from Paeroa Kopu Highway.



(Site Location Plan)

2.0 DESKTOP STUDY

During my desktop study the Hauraki and W.R.C Web maps were researched to provide flood hazard details and reticulated services. The results and recommendations will be referenced where applicable in the following report.

3.0 GEOTECHNICAL INVESTIGATION

3.1 Geological setting

As part of my Desk Top Investigation reference has been made to the Geological Map 3 "Auckland" Scale 1: 250,000 and Sheet 40 with Pts N35, 36 & 39 "Northern Coromandel" Scale 1: 63,360 provided by the Institute of Geological and Nuclear Sciences.
The site lithology is defined as undifferentiated alluvium, fluvial and estuarine deposits formed during the Holocene period.

Beneath the subject site the alluvium deposits are overlaid with a silty ash with variable plasticity up to 1.2m in depth.

3.2 Site investigation

Our geotechnical investigation employed the following approaches to determine the geological lithology of the site, provide a soil strength profile and identify features that may affect the proposed subdivision,

- 6 x 50mm diameter hand bores
- 16 x Scala Penetrometer tests (S.P.T.) within the building area
- Site walkover to identify geological features

(See Appendix A for Building Site Layout, Test Location Plan, Bore Logs and Scala Penetrometer results)

3.3 Subsurface stratigraphy

The typical natural stratigraphy encountered throughout the proposed building sites are as follows.

Running Depth	Stratigraphy	Later Depth	Characteristics
0.00 - 0.2m	Topsoil	0.2m	
0.2- 1.5m	Orange, Brown gritty silty ash and/or alluvium	1.3m	qa 50 - 70kpa
1.5 - 2.5m	Loose medium dense silty sand	> 1.0m	qa 35 - 70kpa
2.5 —4.0m	Soft — very stiff clay	> 1.5m	qa = qu 250kPA

A ground water table was encountered at 3.0m in hand bore 6 and 3.7m in bore 5.

The boreholes encountered competent subsurface profile to 1.2m below the existing ground surface i.e $q_a > 100\text{kpa}$. However, the bores closest to the road boundary, 1 and 6 highlighted a weaker less competent strata between 1.5 — 2.5m with q_a values varying between 35 — 70kpa. Below the 2.5m depth the strata became a silt clay with q_a values increasing from 90 — 250kpa at 4.0m in depth.

The upper clayey silts were classified as moderately expansive (class M) as defined in Australia Standard AS2870-2011 and as a result a minimum foundation depth = 0.45m is required for non specific design options.

3.4 Walkover Survey

During the course of my walkover survey the following features were noted that may affect the proposed building sites;

- The rear lots run adjacent to the Hikutaia river which acts as a surface water runoff catchment for the surrounding Hikutaia area.

It was evident from my observation that flood protection had been previously undertaken which included:

- Rock armouring of the embankment batters.
- Benching of the western river embankment to provide vehicle access for construction machinery to carry out future remedial work and maintenance work on the river batters as and when required.
- Construction of a 0.9m high x 4.0m wide flood control earth bund approximately 15m back from the upper river batter. This is designed to provide 1 in 50 year flood control if the river embankment over tops.
- The site is located on State Highway 26 between Hikutaia township and the local school. Therefore the R.O.W road crossing will need to be designed to meet Transit New Zealand and T.C.D.C Specifications to minimise traffic hazards.

4.0 ENGINEERING CONSIDERATIONS

4.1 Site Stability

In general Councils require building sites to provide a 1.5 Factor of Safety (FOS) for dry slope and 1.2 for saturated slopes against building site instability as set out in NZ Building Code Documents B1 -VM4. Due to the sites following characteristics;

- Near level site topography
- Competent natural alluvium subsurface strata with underlying cohesive clays highlighted in Bores 3 and 4
- A minimum 15m foundation setback from the top of the river embankment can be provided for Lots 3 and 4

Therefore a slope stability analysis was deemed unnecessary to determine that the minimum F.O.S values comply with B1 VM4 specifications (i.e. >1.5 or 1.2).

4.2 Seismicity/ Liquefaction Potential

No major active faults are recorded in the vicinity of the site and accordingly, NZS 1170 Structural Design Actions Part 5 -Earthquake Action New Zealand indicates a basic value of 0.15g.

The ground conditions can be categorised as Subsoil Class C.

As the underlying soils are generally cohesive silts or cohesive clay of relatively high strength the potential for liquefaction during seismic shaking of the site is considered to be low.

4.3 Foundations and Slab on Grade Recommendations

The Scala penetrometer investigations revealed (See Appendix A for SPT results) the natural alluvium subsoils and residual clays between 1.2 — 2.0m in depth below the existing ground level recorded allowable end bearing values (q_a) <100kpa (70- 35kpa). As a result, the strata does not meet good ground specifications as set out in NZS 3604:2011 (i.e., $q_a > 100\text{kpa}$). Therefore the following design recommendations will need to be implemented.

4.5 Foundation Piles

4.5.1 Piles Located at least 15m from the Hikutaia River Bank

- Where shallow piles i.e. < 0.5m are required construction can be as per NZS 3604:2011 specifications for timber framed buildings.
- Where piles are > 0.45m (i.e. anchor piles) a specific engineer design is required to limit the allowable end bearing ground pressure q_a to 50kpa.

4.5.2 Foundation Piles closer than 15m from the Hikutaia River

Additional Geotechnical investigation and slope stability analysis will be required.

Foundation design will require specific engineering design with the structural capacity to resist lateral ground creep shear forces based on the following design parameters. The piles will also need to extend below critical slope failure surfaces where (F.O.S) Factor of Safety Values are <1.5 or 1.2 for dry and saturated slopes.

Foundation Design Parameters

Creep Zone

Minimum depth = 1.0m

$\phi = 22^\circ$

= Nil

$\gamma = 17.0 \text{ KN/m}^3$

$S_u = 40\text{kpa}$

K_0 = Lateral at rest ground pressure coefficient acting over 3 pile diameters

Foundation Layer

$\phi = 30^\circ$

$C_u = 8 \text{ kpa}$

$\gamma = 17.5 \text{ KN/m}^3$

$Q_a = 120\text{kpa}$

Note where site excavation reduces the creep zone depth the lateral at rest ground pressure depth can be reduced accordingly.

Note — see layout plan for foundation definition setback line in Appendix A.

4.6 Slabs on Grade and Shallow Foundations

Typically slabs on grade can be constructed on level excavated platforms or existing level ground. If concrete reinforced slabs are required, the following construction methodology will need to be implemented to comply with NZS 3604:2011 specifications.

- Excavate all topsoil and the weaker upper alluvium strata to the underlying competent silts i.e. 0.4m below the existing ground surface. Rotten rock hardfill can be utilised as a backfilling material compacted to a minimum $q_a = 100\text{kpa}$ to within 200mm of the slab.
- The final hardfill placement should consist of GAP40 hardfill compacted in 150mm thick layers to a minimum $q_a > 100\text{kpa}$.
- Based on the above being executed inclusive of being inspected and tested by a suitably experienced engineer, conventional slabs on grade and/or waffle slab construction can be designed to $q_a = 100\text{kpa}$ end bearing strength.

Note if slabs on grade are required in Lots 3 or 4 within 15 of the Hikutaia River site-specific geotechnical investigation and stability analysis will be required to determine:

- Critical failure surfaces
- Provide Foundation Design Parameters to enable specific design to isolate the proposed dwelling from possible downslope embankment failure and differential settlement.

Mitigation design could include:

- Design suspended concrete slabs on piles where slabs are constructed within the 15m setback.
- Design inground palisade walls between the slab and the top of the river embankment.
- Subsurface drainage and or horizontal bored drains to depress the ground water table

4.7 Engineer Designed Retaining Wall Construction

Where specific engineer designed retention structures are required the following design parameters should be applied:

Soil Parameters

Retained soil parameters

$\phi = 25^\circ$ - residual clays

$c_u = 5\text{kpa}$

$\gamma = 17.0\text{ KN/m}^3$

$K_a = (1 - \sin\phi) / (1 + \sin\phi)$ - 0.4- active soil pressure coefficient

Foundation Strata beneath residual clays and/ or creep zone i.e competent andesite

$$Y = 18.0 \text{ KN/m}^3$$

$$C_u = 5 \text{ kpa} \quad S_u =$$

$$150 \text{ kpa}$$

$$Q_a = 120 \text{ kpa}$$

$$K_P = \frac{1 + \sin 30}{1 - \sin 30}$$

$$= 3.0 \text{ passive soil pressure}$$

Each design must take into account all surcharge loadings i.e. slope above the wall, traffic loadings, downslope inclinations and superimposed house loadings where applicable.

Where walls are incorporated into the dwelling construction at Rest Ground Pressure (K_o) soil coefficient should be adopted. However, if the retention structures are separate from the dwelling active ground pressure coefficient (K_a) can be utilized.

4.8 Services

Note all foundations within a 45-degree zone of influence from service pipe inverts will require specific engineer design.

Backfilling of services is to be carried out to the standard that will not prevent settlement over time and meet the requirements of the overlying footprint e.g. if below a drive carriageway backfill compaction must= C.B.R of 7 at subgrade level.

4.9 Engineered Fill Quality Control

All earthwork activities, including topsoil stripping, the benching of subgrades and natural slopes, undercutting of unsuitable material and installation of subsoil drainage should be carried out in accordance with the TCDC and NZS 4431:1989 specifications and inspected/tested during the relevant phases of construction by the designated engineer.

Where engineered filling is carried out it is recommended inspection test plans are completed by the inspecting engineer in accordance with the recommendations herein and NZS 4431:1989. Ensure quality control processes are planned and understood by the contractor prior to commencement of the development.

4.9.1 Flood Risk

Note due to the flood water protection construction the property and proposed building sites are not susceptible to surface floodwater inundation as highlighted in the attached email from Duncan Grant of W.R.C i.e. (See Appendix A for copy of email).

However, I would recommend a minimum floor level height of 0.6m above existing ground level or 0.3m above crown of the State Highway, whichever is greater but not less than R.L 7.78m + 0.3= 8.1m based on the Tarau Datum 1952.

5.0 STORM WATER ASSESSMENT

As the lots are <2500m² s/w attenuation is a mandatory TCDC requirement. However, due to the favourable inground porosity within the upper 1.0m of sandy silty alluvium I would recommend designing an inground soakage pit at building consent stage for each Lot. Similarly the impervious

R.O.W catchment could also be discharged to ground via a cesspit and porous discharging directly into soakage pit beneath the R.O.W footprint.

Stormwater soakage should be designed based on the following design parameters.

Stormwater Design Parameters

I = Rainfall Event — 10yr/1hr HIRDS 4 Intensity Values

C = 0.9 — Impervious surfaces

0.35 - Grass

- Rock fill void ratio = 38%

- Climate Change 20%

Note if the storm intensity exceeds the design 10yr ARI excess s/w runoff will be discharged to the surrounding grassed surfaces via the down pipes & bubble up R.O.W cesspit. Therefore ensure the sites are graded to slope away from the dwellings rather than causing ponding adjacent to the houses.

6.0 WASTEWATER ASSESSMENT

Based on our geotechnical investigation results each Lot is capable of providing on site wastewater disposal via surface mounted dripper laterals on an evapotranspiration basis or inground disposal via beds.

Wastewater disposal needs to be designed in accordance with NZS 1547:2012 specifications inclusive of the following design parameters. Note providing the total treated effluent disposal volume < 3000 litres/day W.R.C rule 3.5.7.6 can be adopted as a permitted activity.

Surface Dripper Design Parameters

Install an advanced wastewater treatment system (A.W.W.T.S) to provide secondary wastewater treatment.

Category 4 subsoil

DIR=3.5mm/day — dripper design or D.L.R = 20mm/day for inground bed disposal.

Daily Rate/per person = 145 l/p/d based on rainwater reduction features;

- Dual Flush Toilets

- Aerated Faucets

- Water conserving dishwasher and washing machines.

- Slope factors do not apply

- Minimum installed A.W.W.T.S Treatment System capacity 1200 l/day and treatment quality

 - B.O.D 20 g/m³

 - S/S = 30g/m³

- 20m setback from Hikutaia River

7.0 VEHICLE ACCESS

Future vehicle access to site will be via a new road crossing. Currently site distances are acceptable. Beyond the crossing a new near level concrete or seal surfaced R.O.W will need to be designed and constructed in line with T.C.D.C Engineering Code of Practice. Typically, the gradients are <8%.

8.0 SEISMISCITY/LIQUEFACTION POTENTIAL

No major active faults are recorded in the vicinity of the site and accordingly, NZS 1170 Structural Design Actions Part 5 — Earthquake Action New Zealand indicates a basic value of 0.15g.

The ground conditions can be categorised as Subsoil Class C.

As the underlying soils are generally high strength and cohesive therefore the potential for liquefaction during seismic shaking of the site is considered to be low i.e. TCI Type foundation qu ultimate > 300kpa exceeds the liquefaction end bearing trigger point of 200kpa.

9.0 LIMITATIONS

This report has been prepared for Mrs J. Hocking in response to the brief and purposes requested within and therefore should not be relied upon in another context or be used without reference to LLANDEM CONSULTING ENGINEERS LTD without our prior agreement.

Inferences about the nature and continuity of subsoils away from the investigation points are made but cannot be guaranteed. No allowance has been made for flood events > 1 in 50 years or reactivity of the Hikutaia Seismic Fault. Specifically geotechnical investigation will be required for each Lot at the time of building consent.

Prepared By:



Derek Stewart CP Eng. MIPENZ
LLANDEM CONSULTING ENGINEERS LTD

APPENDIX A

- PROPOSED SCHEME PLAN
- SITE LAYOUT AND TEST LOCATION PLAN
- _ BORE LOGS
- S.P.T RESULTS
- DUNCAN GRANT FLOOD HAZARD EMAIL

Lot 2
P 511696

Lot 1
DP 511696

Lot 3
DPS 35017
Local Purpose (esplanade) Reserve

4%/90.

Lot 2
44986

nag

20m dia sha circle

Lot 4
1391m² (1243m² net?)

TCDC water nein
- from Council GIS

TCDC water n-ein
from Council GIS

Lot 3 concrete PP (1290m² net)

20m dia

Existing house to be removed

Lot 1
1304m2

Trees and auxiliary
buildings have been
removed from the site

7.06

20m dia shape circle

water meter

NJ ee

VAS
cross

Michal Falis

REGISTERED

CLIENT: MRJ. HOCKING LOCATION: 8070 STATE HIGHWAY 26, PAEROA KOPI-J ROAD, HIKUTAIA		Logged/ Checked:			Sheet 1 Of 1			Job #	
		Diameter: 50mm			Date: 28/03/2022			Borehole 1.	
		Weight						Probe#	
Stratigraphy	SOIL DESCRIPTION T = Topsoil, C = Clay, S= Sand, P = Peat,F = Fill, Si = Silt, G =Gravel, R = Rock		Depth (m) GL (m).	Water Level	Shear Vane Dial (kPa)	Residual Strength (kPa)	Sensitivity	Probe Blows	Comments Samples Other Tests
	Topsoil		0.10 0.20	-----	-----	-----	-----	-----	
	Stiff orange brown clayey silt carbonaceous streaks <								

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11/11/2019 11:11:11 AM
 11/11/2019 11:11:11 AM

[illegible]

Logged/
Chec ked:

Sheet 1 Of 1

Job #

Diameter: 50mm

Date: 28/03/2022

Borehole 2.

Weight

Probe#

Stratigraphy	SOIL DESCRIPTION		Depth (m) 0.10 0.20	Water Level	Shear Vane Dial (kPa)	Residual Strength (kPa)	Sensitivity	Probe Blows	Comments Samples Other Tests
	Topsoil								
	Stiff brown clayey silt		0.50						
	Becomes siltier with depth								
	Becomes light brown orange mottled -gritty		0.90 1.00						
	Becomes cohesive		1.50 1.60						
	Becomes gritty sandy silt		1.80						
		Si	2.00						
			2.50						
			3.00						
			3.50						

SOIL DESCRIPTION

T -Topsoil, S= Sand, P = Peat, F = Fill,
Si = Silt, G = Gravel, R = Rock

Topsoil

Stiff brown clayey silt

Becomes siltier with depth

Becomes light brown orange mottled -gritty

Becomes cohesive

Becomes gritty sandy silt

Si

Depth (m)
GL (m).....

Water Level

Shear Vane
Dial (kPa)

Residual Strength (kPa)

Sensitivity

rohe Blows

Comments	Samples
Other Tests	

[illegible]

CLIENT: MRJ. HOCKING LOCATION: 8070 STATE HIGHWAY 26, PAEROA KOPI-J ROAD, HIKUTAIA		Logged/ Checked:		Sheet 1 Of 1			Job #		
		Diameter: 50mm		Date: 28/03/2022			Borehole 3.		
		Weight					Probe#		
Stratigraphy	SOIL DESCRIPTION T = Topsoil, C = Clay, S = Sand, P = Peat,F = Fill, Si = Silt, G = Gravel, R = Rock		Depth (m) GL (m).	Water Level	Shear Vane Dial (kPa)	Residual Strength (kPa)	Sensitivity	Probe Blows	Comments Samples Other Tests
	Topsoil		0.10 0.20	-----	-----	-----	-----	-----	
	Firm orange brown clayey silt	S/Si	0.50 0.60						
	Becomes a dense sandy silt		-----	-----	-----	-----	-----	-----	
		C/Si	1.00						
	Becomes a grey orange mottled gritty slightly clayey silt - dry		1.40 1.50	-----	-----	-----	-----		
	Becomes very dense		1.80 2.00	-----	-----	-----	-----		
			2.50	-----	-----	-----	-----		
			3.00	-----	-----	-----	-----	-----	
			3.50	-----	-----	-----	-----		
			4.00	-----	-----	-----	-----		
	E.O.B-NoG.W.T				-----	-----	-----		

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CLIENT: MRJ. HOCKING LOCATION: 8070 STATE HIGHWAY 26, PAEROA KOPI-J ROAD, HIKUTAIA		Logged/ Checked:		Sheet 1 Of 1			Job #		
		Diameter: 50mm		Date: 28/03/2022			Borehole 4.		
		Weight					Probe#		
Stratigraphy	SOIL DESCRIPTION T = Topsoil, C = Clay, S = Sand, P = Peat,F = Fill, Si = Silt, G = Gravel, R = Rock		Depth (m) GL (m).	Water Level	Shear Vane Dial (kPa)	Residual Strength (kPa)	Sensitivity	Probe Blows	Comments Samples Other Tests
	Loose dry brown silt	Si	0.10 0.20	-----	-----	-----	-----	-----	
	Dense brown slightly clayey silt <								

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CLIENT: MRJ. HOCKING LOCATION: 8070 STATE HIGHWAY 26, PAEROA KOPI-J ROAD, HIKUTAIA		Logged/ Checked:			Sheet 1 Of 1			Job #	
		Diameter: 50mm			Date: 28/03/2022			Borehole 5.	
		Weight						Probe#	
Stratigraphy	SOIL DESCRIPTION T = Topsoil, C = Clay, S = Sand, P = Peat,F = Fill, Si = Silt, G = Gravel, R = Rock		Depth (m) GL (m).	Water Level	Shear Vane Dial (kPa)	Residual Strength (kPa)	Sensitivity	Probe Blows	Comments Samples Other Tests
	Topsoil		0.10 0.20	--	-----	-----	--	-----	
	Firm to stiff brown clayey silt	C/Si	0.50 0.60						
	Becomes silty with depth				-----	-----			
	Becomes grey/orange/brown mottled		0.90 1.00						
					-----	-----	-----	-----	
			1.50						
	Grey orange mottled, slightly cohesive gritty/silty sand	c/Si/S	1.80 2.00	--	-----	-----	-----	-----	
			2.50		-----	-----			
			2.80 3.00						

CLIENT: MRJ. HOCKING LOCATION: 8070 STATE HIGHWAY 26, "AEROA KOPI-I ROAD, HIKUTAIA		Logged/ Checked:		Sheet 1 Of 1			Job #		
		Diameter: 50mm		Date: 28/03/2022			Borehole 6.		
		Weight					Probe#		
Stratigraphy	SOIL DESCRIPTION T = Topsoil, , = Sand, P = Peat, F = Fill, Si = Silt, G = Gravel, R = Rock		Depth (m) GL (m).	Water Level	Shear Vane Dial (kPa)	Residual Strength (kPa)	Sensitivity	Probe Blows	Comments Samples Other Tests
	Topsoil		0.10	-----	-----	-----	-----	-----	
			0.30						
			0.50						
	Firm to stiff brown slightly clayey silt		0.80	-----	-----	-----	-----	-----	
			1.00						
	Light grey orange mottled								
			1.50	-----	-----	-----	-----	-----	
	Becomes grey/orange mottled clayey si It								
	Firm and damp		2.00	-----	-----	-----	-----	-----	
			2.50						

[illegible]

S.P.T BELOW
SCALA PENETROMETER TEST RESULTS

1. -0.1m GROUND LEVEL ADJACENT TO B.H.1

DEPTH	QA =
	KPA
0.1 -0.38	80
0.38 - 0.76	130
0.76 -0.98	90

S.P.T2. -0.1m BELOW GROUND LEVEL ADJACENT TO B.H.2

DEPTH	QA =
	KPA
0.1 — 0.44	80
0.44 — 1.0	160

DEPTH	QA = KPA
0.1 - 0.45	90

S.P.T BELOW
 0.45 - 0.98 100 S.P.T 3. -0.1m BELOW GROUND LEVEL
ADJACENT TO B.H.3

DEPTH	QA = KPA
0.1 -0.35	110
0.35 -0.6	120
0.6 - 0.85	220
0.85 -0.95	190

- 0.1m BELOW GROUND LEVEL ADJACENT TO B.H. 4

DEPTH	QA = KPA
0.1 -0.52	150
0.52 - 0.92	190

S.P.T 5. -0.1m BELOW GROUND LEVEL ADJACENT TO B.H.5

DEPTH	QA = KPA
0.1 —0.4	90
0.4 -0.7	100
0.7 0.96	120

S.P.T 6. -0.1m BELOW GROUND LEVEL ADJACENT TO B.H.6

-1.0m GROUND LEVEL IN B.H.I

DEPTH	QA = KPA
1.0 - 1.28	60
1.28 - 1.66	55
1.66 - 2.0	80

S.P.T 8. - 1.0m BELOW GROUND LEVEL IN B.H.2

DEPTH	QA = KPA
1.0 – 1.3	75
1.3 – 1.67	85
1.67 - 1.97	90

S.P.T 9. - 1.0m BELOW GROUND LEVEL IN B.H.3

DEPTH	QA = KPA
1.0 - 1.34	160
1.34 - 1.94	190

S.P.T BELOW

S.P.T 10. -1.0m BELOW GROUND LEVEL IN B.H.4

DEPTH	QA =
	KPA
1.0 - 1.58	190
1.58 - 1.9	200
1.9 - 2.0	230

S.P.T 11. - 1.0m BELOW GROUND LEVEL IN B.H.5

DEPTH	QA =
	KPA
1.0 – 1.4	160
1.4 - 1.96	100

S.P.T 12. - 1.0m BELOW GROUND LEVEL IN B.H. 6

DEPTH	QA = KPA
1.0 - 1.45	70
1.45 - 1.55	35
1.55 - 1.77	40
1.77 - 2.0	75
13. - 2.0m	GROUND LEVEL IN B.H.I

DEPTH	QA =
	KPA
2.0 - 2.34	70
2.34 - 2.64	160
2.64 - 2.9	230
2.9 – 3.1	250

S.P.T 14. -2.0m BELOW GROUND LEVEL IN B.H.2

DEPTH	QA =
	KPA
2.0 - 2.4	80
2.4 - 2.84	130
2.84 - 3.0	180

S.P.T 15. - 2.0m BELOW GROUND LEVEL IN B.H.5

DEPTH	QA =
	KPA
2.0 – 2.3	70
2.3 - 2.67	90
2.67 - 2.97	100

S.P.T	BELOW
2.97 - 3.1	70
3.1 - 3.4	98
3.4 - 3.7	180
3.7 - 4.1	160
4.1 - 4.3	250

S.P.T 16. - 2.0m BELOW GROUND LEVEL IN B.H.6

DEPTH	QA = KPA
2.0 - 2.3	85
2.3 - 2.46	130
2.46 - 2.72	160
2.72 - 3.0	150
3.0 - 3.43	160
3.43 - 3.65	190

5/12/22, 6:28 PM

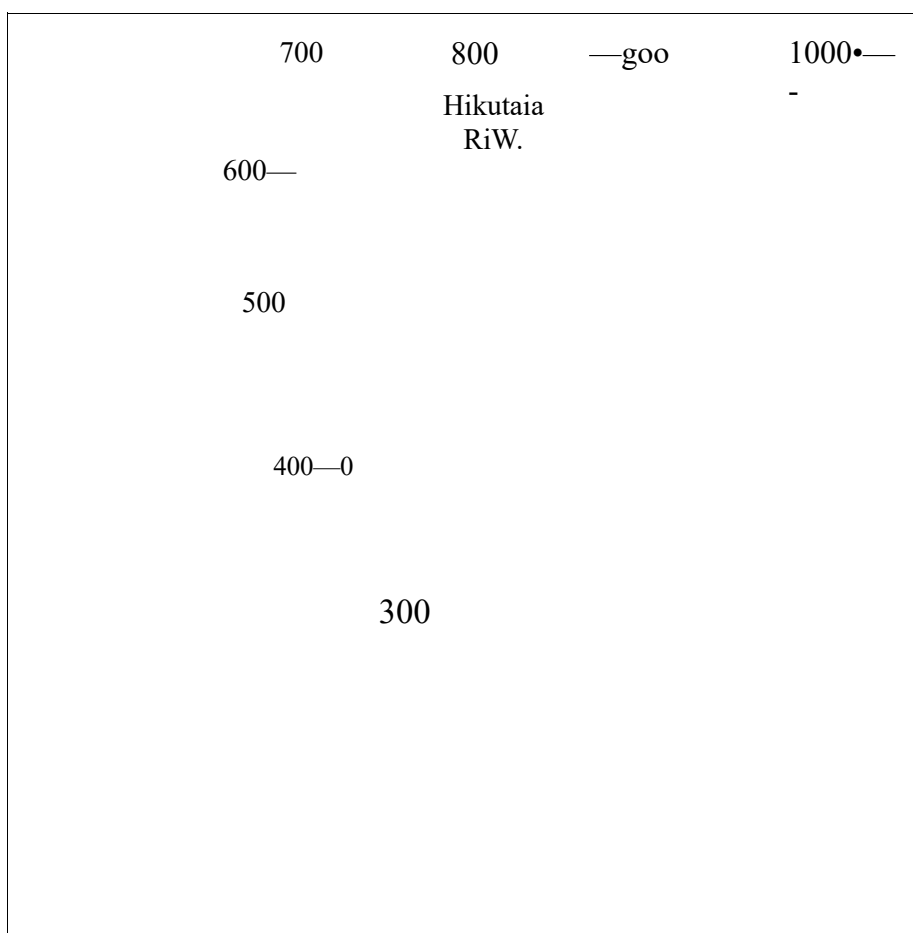
Gmail - REQ185335 - FHI 8070 Paeroa Kopu Road

I have previously provided (below) WRC's Hikutaia flood level estimates for a 50y ARI event at stopbank embankment point 400 and now also include the 100y ARI:

50y ARI	RL 7.45m (TVD-52)
100y ARI	RL 7.78m (TVD-52)

The modelling report for the above work can be found on page 35 onward of the link:

Public-Agenda-Package-Waihou-Piako-Catchment-Committee-18-February-2016.pdf (waikatoregion.govt.nz)



Duncan Grant I SENIOR ENGINEER I Regional Resilience, Integrated Catchment Management WAIKATO REGIONAL COUNCIL I Te Kaunihera ā Rohe o Waikato p: +6478592766

F: facebook.com/waikatoregion

Private Bag 3038, Waikato Mail Centre, Hamilton, 3204

From: Derek Stewart <llandemengineering@gmail.com>

Sent: Wednesday, 11 May 2022 19:31

To: Duncan Grant <Duncan.Grant@waikatoregion.govt.nz>

Cc: Cliff Gibson <Cliff.Gibson@waikatoregion.govt.nz>

Subject: Re: REQ185335 - FHI 8070 Paeroa Kopu Road



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Restricted Discretionary Assessment Matters

Section 38 Table 5 — Restricted Discretionary Activity Matters

Matter		Assessment Criteria		Comments
1.	Site stability for a building platform	a)	Whether lots will have a building platform free from inundation (including sea level rise), erosion, subsidence and slippage. The Council may require a report on the suitability of the lot (including any restrictions on development) from a Chartered Professional Engineer.	The Llandem Engineering Report confirms the suitability of all lots for a building platform. Refer to Appendix E for a copy of this report and its recommendations.
2.	Site and soil suitability for an onsite effluent treatment system (if wastewater reticulation is unavailable or not provided)	a)	Whether a site and soil evaluation assessment has been carried out in accordance with NZS 1547:2012 On-site Domestic Wastewater Management, and the results indicate that the site and soil can adequately cope with anticipated wastewater loads without leaching or ponding during wet seasons.	The Llandem Engineering Report confirms the suitability of all lots for on-site wastewater disposal. Refer to Appendix E for a copy of this report.
3.	Servicing of water, wastewater, electricity, telecommunications	a)	Whether all lots can be adequately serviced.	The only reticulated service available in this location is water. New underground connections will be provided to each lot if there is capacity in the system. Each lot will otherwise be independently serviced with onsite infrastructure with easements shown on the scheme plan to protect services which cross boundaries.
		b)	Whether adequate provision for a firefighting water supply can be made in accordance with the SNZ PAS 4509:2008 New Zealand Fire Service firefighting water supplies code of practice, particularly in non-reticulated areas. If this is not available or is impractical, whether consent notice requires all buildings used for residential purposes to have sprinkler systems installed.	Provision can be made for firefighting water supply. This can be addressed by a condition of consent.
		c)	Whether all lots can be serviced by electricity and a telecommunications service (reticulated or provided remotely).	Powerco have confirmed the ability to service the subdivision. Both land based and remote telecommunication options are available in this location.

		d)	The extent to which broadband internet capability should be provided to all lots, particularly in Residential, Commercial and Industrial Areas, taking into account the affordability per lot connection.	As above.
		e)	Whether any network utility required as part of the subdivision proposal (e.g. transformer, pump station) can be contained within the subdivision and their location is appropriate.	No network utilities are required.

		f)	Whether improvements to existing infrastructure, including extensions and upgrades, are required to service the subdivision and how the cost of these works will be met.	No upgrades are necessary to Council services. Powerco have confirmed that an upgrade will be necessary to service the subdivision at the Applicants expense.
		g)	Whether easements are required.	Refer Scheme Plan.
		h)	Whether a consent notice on the title is needed to make future property buyers aware of any limitations of telecommunication availability (e.g. no fibre-optic cable) to the lot.	Not applicable.
4.	Stormwater	a)	Whether stormwater is managed and appropriate stormwater management systems are established to ensure stormwater runoff from the subdivided area does not have any off-site adverse effects.	Management of stormwater is addressed in the Llandem Engineering Report which confirms site suitability for onsite disposal.
5.	Roads and access	a)	The extent to which any new roads being proposed provide the desired level of service based on road formation, convenience, traffic volumes, vehicle speed, public safety and amenity.	Not applicable.
		b)	Whether utility services are able to be located within the road reserve, including water and wastewater reticulation, stormwater and land drainage, electricity and street lighting, telecommunications and landscaping.	Only Council reticulated water is available in this location. Other services will be installed to each lot boundary via the Right of Way.
		c)	The extent to which suitable physical and legal access is provided to each lot, and where appropriate, whether that access meets New Zealand Transport Agency and SNZ PAS 4509:2008 New Zealand Fire Service firefighting water supplies code of practice requirements.	Access is provided to each lot via the proposed Right o Way.
		d)	Whether the subdivision has the potential to undermine the safe and efficient operation of the transport network.	Consultation has been undertaken with NZTA and they have provided written approval to the application.
		e)	Whether access to the coast is maintained or enhanced.	Not applicable.

		f)	Whether improvements to existing roads, including extensions and upgrades, are required to provide access and ensure connectivity and how the cost of these works will be met.	Not applicable.
		g)	The extent to which effects from additional traffic movements and any related nuisance factors affected shared users of an existing internal access or private way.	Not applicable.
		h)	The extent to which any recommendations/findings of an Integrated Transport Assessment or Traffic Impact Assessment are incorporated into the subdivision design.	Not applicable.
		i)	The extent to which the proposal minimises the number of vehicle access points to the regionally significant transport corridors, taking into account; i) Opportunities that exist for shared access with adjoining sites. ii) The hierarchy of the fronting transport corridor and opportunities that exist for access to transport corridors with a lower status (e.g. collector or local transport corridors or service lanes). iii) The siting of the access points with respect to adjacent access points visibility and flow. iv) The operational requirements of the proposal. v) Potential obstruction for access to network utilities. vi) The impact of multiple vehicle entrances (which break up berm, landscaping, footpath and cycleway continuity) on streetscape, amenity, retail frontage areas and pedestrian and cycle movements.	The Application is based on permanently closing the two authorised vehicle crossings and creating one crossing to service all lots. NZTA have provided written approval to this proposal with conditions relating to reinstatement and construction standards.
6.	Subdivision location and design, including Rural Subdivision Design Principles and Guidelines in Appendix 4	a)	The extent to which the proposal is consistent with the Rural Subdivision Design Principles and Guidelines in Appendix 4.	Not applicable (applies only in the Rural Area only).
		b)	The extent to which the subdivision has been designed to: facilitate transport networks (e.g. arterial roads, local roads, and cycle and pedestrian routes), provide opportunities for connections within the subdivision and to adjacent transport networks, and facilitates easy vehicle and pedestrian access to higher ground in case of tsunami.	Not applicable. The scale and design of the subdivision, does not lend itself to addressing these matters.

		c)	Whether the subdivision design has taken into account topography, vegetation and waterways.	The subdivision has been designed in consideration of all these factors, with particular consideration given to flood risk and proximity of future buildings to the riverbank.
		d)	The extent to which the activity avoids adversely affecting a community water supply.	Not applicable.
		e)	Whether there are sufficient setbacks from waterways, wetlands, forestry, and significant indigenous vegetation.	The site is separated from the River course by an existing reserve. The Llandem Engineering Report
				includes recommendations for building distances from the top of the riverbank.
		f)	The extent to which the area and volume of earthworks have been minimised. i) The design and layout of roads and lots should be in a manner that follows the natural contours and characteristics of the site. ii) The subdivision should retain the site's topsoil and avoid the need to dispose of large volumes of spoil to clean fill sites. iii) The design of the subdivision should be such that it avoids the need for significant post-development earthworks on each lot to construct buildings and access.	Minimal earthworks will be required to create the new vehicle crossing, Right of Way and to close the existing crossings and install services. All topsoil will be retained onsite.

		The extent to which subdivision has been designed to ensure the following: i) High levels of accessibility for residents. ii) Safe, efficient movement of vehicle and pedestrian traffic. iii) More efficient infrastructure provision. iv) A transport network layout (including cycleways and walkways) with multiple links to adjacent sites and surrounding roads. v) Spatial layout of roads, cycleways and walkways that allows for easy integration and direct access to and from bus stops, shops, schools, employment areas and other amenities based on how people logically seek to move through an area. vi) Integration with the existing settlement. g) vii) The long-term maintenance burden of all infrastructure in the subdivision is equitable to the existing community. viii) The subdivision reflects natural character and historic heritage values, landscape views and encourages energy efficiency. ix) Reserves and other amenities are located at prominent, highly visible locations which are well fronted by other activities. x) Lot sizes and densities have been based around the landform and urban amenities rather than a generic size indiscriminately laid over the land; and the configuration of lots, blocks, and activities have been designed to mitigate nuisances between users and activities. xi) Lots are of a practical, useable dimension and take into account co-location of compatible activities on adjoining sites.	These matters are best related to large scale development which is creating a new residential area and are not relevant to such a small-scale subdivision.
7.	Efficient use of mineral resources	a) Whether the subdivision design takes into account the effects of existing lawfully established quarries and ensures that future activities do not result in reverse sensitivity effects.	Not applicable.
8.	Staging of subdivision	a) Whether applications for staging sufficiently demonstrate the anticipated extent and order of the proposed stages. b) Whether staging is the most appropriate method to address provisional lack of infrastructure.	Not applicable.

9.	Cumulative effects on urban density and stormwater runoff	a)	Whether the subdivision does not add to a cumulative effect of urban intensification that is beyond that anticipated by the Plan.	Residential development in this area is anticipated in the Proposed Plan.
		b)	Whether the subdivision does not add to a cumulative effect of stormwater runoff beyond the capability of stormwater infrastructure.	The Llandem Engineering Report contained in Appendix E includes recommendations for managing stormwater.
10.	Code of Practice for Subdivision and Development (October 2013)	a)	The extent to which the works are designed and constructed in accordance with the Code of Practice for Subdivision and Development (October 2013).	All works will be undertaken in accordance with the Council's Code of Practice or as otherwise specified as conditions of consent.
11	Ecosystem restoration and enhancement		Not applicable (text removed due to volume)	Not applicable.
12.	Reverse sensitivity effects	a)	The extent to which reverse sensitivity effects are avoided or mitigated.	There will be no reverse sensitivity effect associated with this subdivision.
		b)	Whether the subdivision will result in new sites where noise sensitive activities could be established within 80 m of a state highway.	The site is within an existing residential area adjoining a State Highway. NZTA have been consulted and their written approval provided.
13.	Subdivision in the National Grid Subdivision Corridor	a)	The extent to which the subdivision layout and design will affect the operation, maintenance, upgrading, and development of the National Grid.	The site is not affected by the national grid.
		b)	The extent to which the subdivision layout and design demonstrates that resulting lot(s) can accommodate a building platform(s) for activities anticipated in the underlying zone that can be located wholly outside of the National Grid Yard.	
		c)	The extent to which the subdivision complies with NZECP 34:2001	
		d)	The extent to which the subdivision layout and design avoids risks of electrical hazards affecting public or private safety and property damage.	

			The nature and location of any vegetation to be planted in the vicinity of the National Grid Lines.	
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