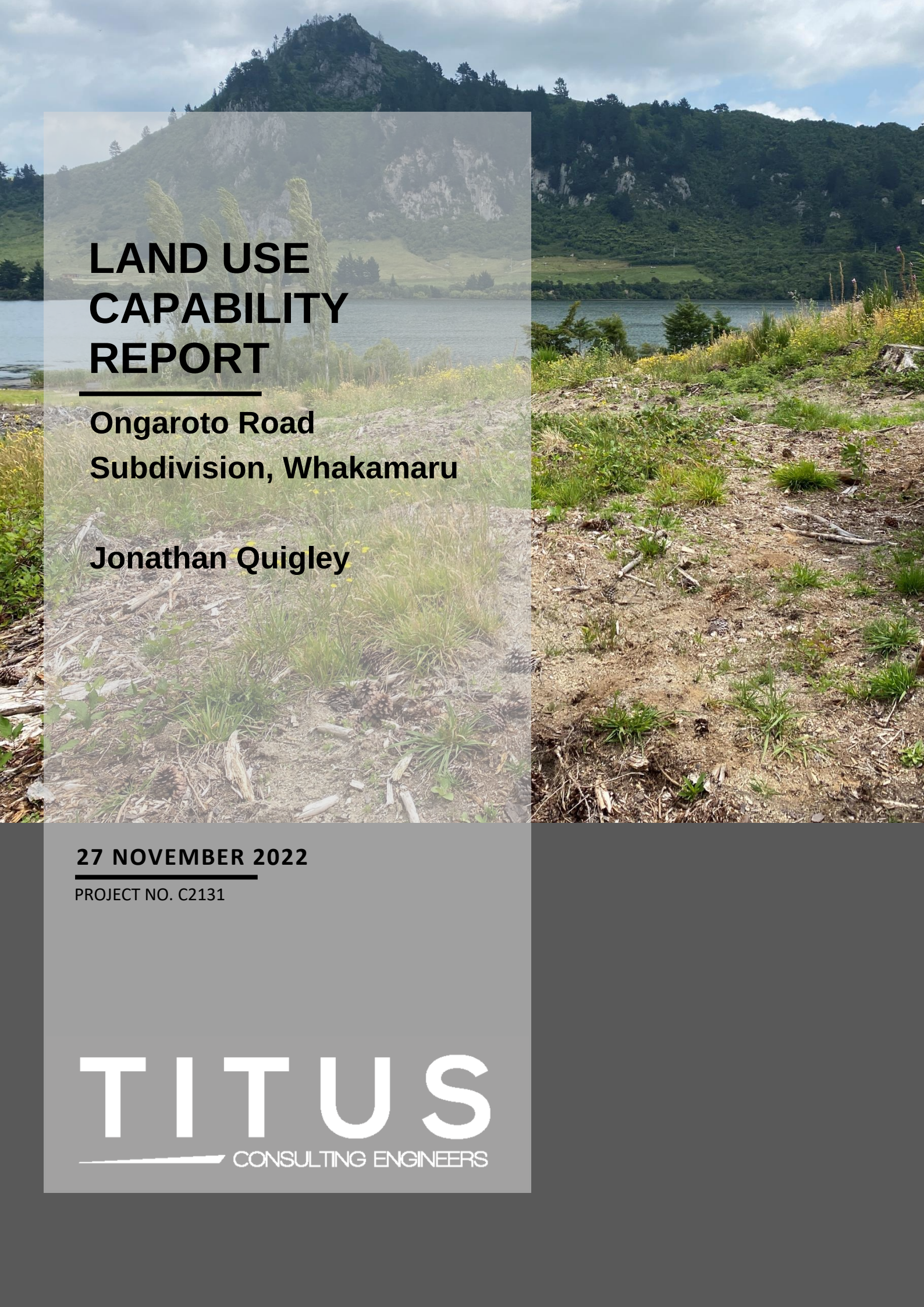




LAND USE CAPABILITY REPORT

Ongaroto Road
Subdivision, Whakamaru

Jonathan Quigley

27 NOVEMBER 2022

PROJECT NO. C2131

TITUS
CONSULTING ENGINEERS

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1 INTRODUCTION

TITUS Consulting Engineers has been engaged to perform a soil and land evaluation of the proposed Ongaroto Road Subdivision. This is to assess the Land Use Capability (LUC) classification in relation to proposed subdivision.

The current site area is ~35 ha.

This report details findings of a detailed Land Use Capability (LUC) classification of the above land.

In particular the investigation focussed on assessing:

- The type of soils found across the site,
- The usability of soils on site,
- Limitations on the soil on site,
- The topography of soils on site.

LUC classifications are used for assessing the usability of land in New Zealand. These classifications fall under the NZLRI which has been designed by the Water and Soil division of the Ministry of Works in the 1970's. There are 8 LUC classes with 1 to 4 being arable and 5 to 8 being non-arable. These are arranged in order of increasing hazard or restriction of use. Each class is also described using the main limitation for its use, for example, erosion, wetness, or soil limitations.

Existing LUC maps do exist, however, due to the scale of the survey undertaken they may be subject to change. For example, in the case of this report where a more in-depth investigation has been undertaken.

2 SITE DETAILS

The site is located on the northern bank of the Waikato River near Whakamaru, above the Whakamaru lake. The site is currently a forestry block that has been recently felled and replanted. The site is bordered by State Highway 30 to the northeast and Crown Land on the remaining side. The Waikato River encloses the Crown Land on its remaining boundaries. The site is predominantly gently to moderately sloping. Most of this slope is towards the lake with undulations from forestry earthworks near SH30. There are some steep to very steep sections of slope near the existing access way on the boundary nearest the lake. Much of the site is covered in stumps from the prior land usage. These have been removed from the eastern portion of the site.

It is noted that on a second site walkover on the 12th of October 2022 much of the site had been cleared and new pine saplings had been planted. The clearing of the site highlighted areas used as skids for forestry and showed the metal at the surface. It also showed that at the surface in some locations are boulders and rock outcrops. The lower south-eastern portion of the site directly adjacent to the lake and local reserve had shown areas of recontouring.



Figure 1: Site Photo

3 INVESTIGATIONS

The site assessment conducted on 21st of December, 2020 included the following:

- General site walkover
- Hand Auger Tests: 6

Soil conditions across the site were generally consistent across the site.

Topsoil ranged in thickness across the site, however was thoroughly mixed with pumice and was mainly organic due to the by products of the forestry in the area. Beneath this there was pumice parent material. Some volcanic rock was noted as being near surface in several locations.

3.1 Topography

The topography of the site is generally sloping, with only small areas nearer the river where steep slopes are encountered. Much of the site is easily transversable, with the steep sections being the only areas where walking was not possible easily.



Figure 2: Several images of the site showing the general topography of the site.

3.2 Soils

Soils found on site were relatively consistent across the field area. S-MAP online describes the soils on site as Taupo Soils (Taupo_35a.1). The description of this is a pumice order soil that readily drains. This is consistent with what was found in the field.

4 PREVIOUS LUC MAPPING

The existing LUC mapping of the area is displayed in Appendix B. This shows the site is classified as 4e26.

5 DETAILED LUC CLASSIFICATION MAP

The resulting LUC classification map is attached in Appendix D.

The subject site has been separated into several different LUC units described below.

6 LUC CLASSIFICATION KEY

6.1 LUC class 4e26

This LUC constitutes a majority of the site (~83%), classed as 4e26 (Table 1). These areas have slopes between 1 and 20 degrees and are made up of pumice stony soils. Soil is also noted as being shallow where volcanic rock is noted at the surface. The gentle slope and the characteristics of the soils makes them susceptible to erosion. This is due to the light weight, loose nature of the pumice material, often having little to no cover from more cohesive topsoil. In these areas grazing might be undertaken easily but cropping would have a severe erosion limitation, as well as a minor soil limitation. Currently they are being used for a forestry application. These are not considered High Class Soils.

Table 1: LUC 4e26 further information.

Soil	Topography	Geology	Slope Class	Erosion Potential	Vegetation
Taupo Soil, Pumice and Volcanic	Undulating to gently sloping	Pumice over volcanic rock	A-D	High When cultivated	Low to Medium Pasture Production

6.2 LUC class 6e

Soils within this class are the areas of the site which constitute steep slopes and have similar soil characteristics as the soil class noted above. These soils constitute the remaining ~17% of soils on the site and are classed as 6e (Table 2). These are not arable and ideal land use includes forestry. This is due to the erosion potential of the soils, as well as the shallow topsoil.

Table 2: LUC 6e further information.

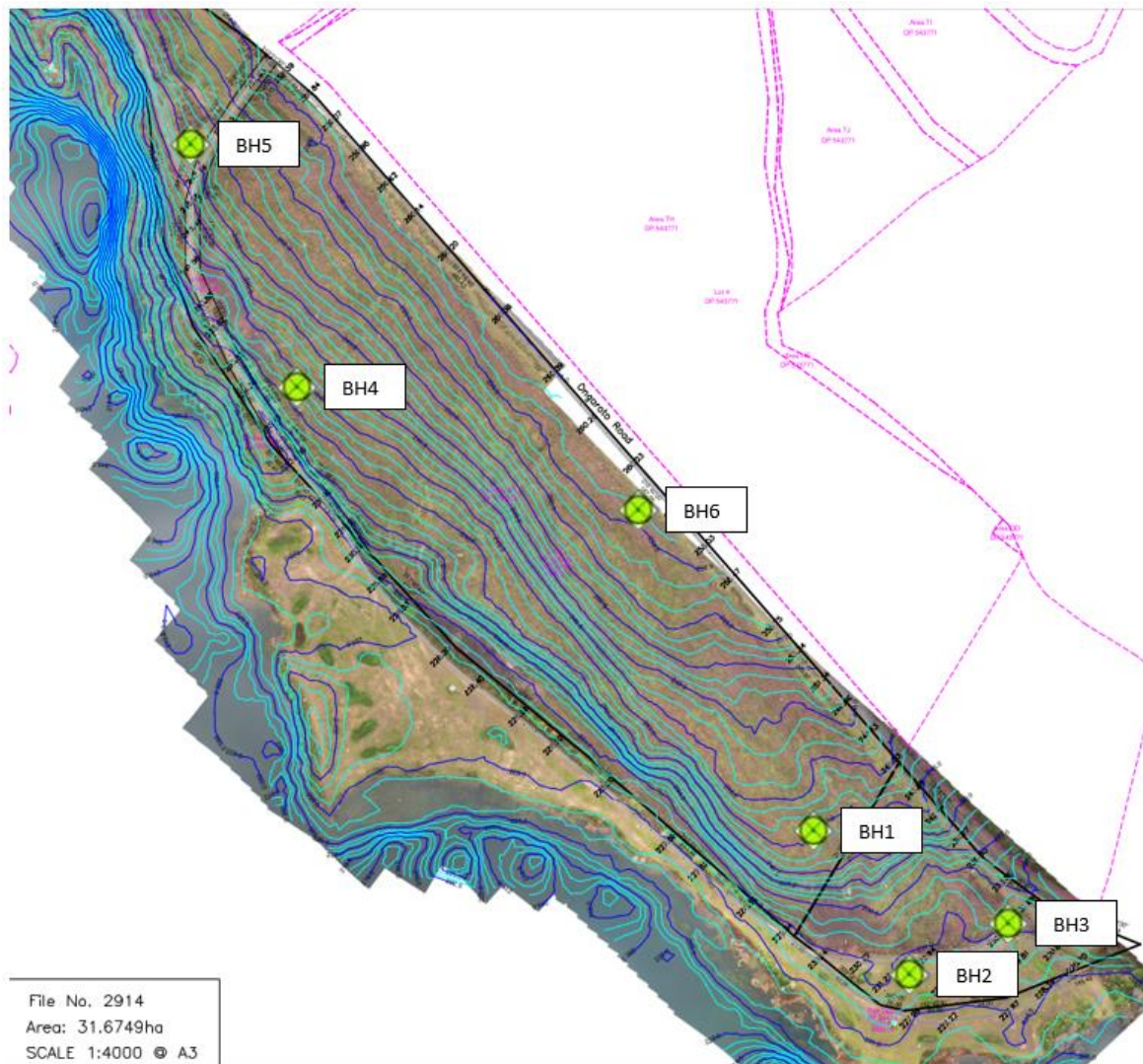
Soil Type	Topography	Underlying Geology	Slope Class	Erosion Potential	Vegetation
Taupo Soil, Pumice and Volcanic	Steep	Pumice over volcanic rock	E	High	Forestry

7 CONCLUSION

It is noted that the majority of the land is classed as 4e26 as noted on the previous LUC mapping. This has been further classified as a small area being 6e. This is where slopes are steeper and cropping and grazing is unsuitable. None of these soils are considered high class soils when noting high class soils are considered to be class 1 to 3.

APPENDICES

APPENDIX A – Site Test Locations



APPENDIX B – Site Soil Classification





SOIL REPORT

Waikato Regional Council

Taupo_35a.1

Report generated: 24-Nov-2022 from <https://smap.landcareresearch.co.nz>

Taupo_35a.1 (100% of the mapunit at location (1846416, 5742921), Confidence: Medium)

This information sheet describes the typical average properties of the specified soil to a depth of 1 metre, and should not be the primary source of data when making land use decisions on individual farms and paddocks. S-map correlates soils across New Zealand. Both the old soil name and the new correlated (soil family) name are listed below.

Capture of the base soil information in this region was funded by Waikato Regional Council, Manaaki Whenua and MPI.

Soil Classification

Soil Classification:

Immature Orthic Pumice Soils (MOI)

Family Name:

Taupo (Taup)

Sibling Name:

Taupo_35a.1 (Taupo_35a.1)

Soil profile material

Tephric soil

Profile texture

sand

Parent Material

Stones/rocks

rhyolitic rock

Depth class (diggability)

Deep (> 1 m)

Soil material

rhyolitic rock

Origin

Lacustrine

Soil Sibling Concept

This soil belongs to the Pumice soil order of the New Zealand soil classification. Pumice Soils are sandy or gravelly soils dominated by pumice, or pumice sand with a high content of natural glass. Drainage of excess water is rapid but the soils are capable of storing large amounts of water for plants. They occur in tephra ranging from 700 to 3500 years old. It is formed in lake sediments, from rhyolite parent material.

The topsoil typically has sand texture and is moderately stony. The subsoil has dominantly sand textures, with at least 30 cm of rock fragments deposited by a volcano within 100 cm of the mineral soil depth. The plant rooting depth extends beyond 1m.

Generally the soil is well drained with very low vulnerability of water logging in non-irrigated conditions, and has high soil water holding capacity. Inherently these soils have a moderate structural vulnerability and a low N leaching potential, which should be accounted for when making land management decisions.



Allan Hewitt ©

Orthic
Pumice

About this publication

- This information sheet describes the *typical average properties* of the specified soil.
- For further information on individual soils, contact Landcare Research New Zealand Ltd: www.landcareresearch.co.nz
- Advice should be sought from soil and land use experts before making decisions on individual farms and paddocks.
- The information has been derived from numerous sources. It may not be complete, correct or up to date.
- This information sheet is licensed by Landcare Research on an "as is" and "as available" basis and without any warranty of any kind, either express or implied.
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Taupo_35a.1

Soil horizons

Characteristics of functional horizons in order from top to base of profile:

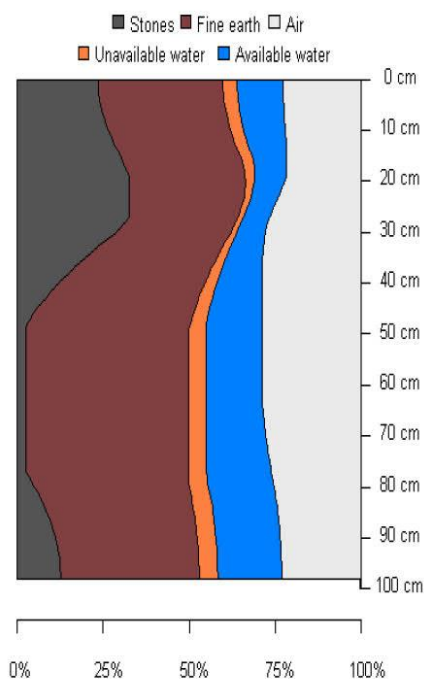
Functional Horizon	Thickness	Stones	Clay*	Sand*	Permeability
Stony (lapilli) Sandy Weak, Acidic Tep	10 - 17 cm	20 - 30 %	1 - 3 %	80 - 90 %	rapid
Stony (lapilli) Sandy Weak, Acidic Tep	5 - 15 cm	30 - 35 %	0 - 3 %	80 - 90 %	rapid
Stony (lapilli) Sandy Loose, Acidic Tep	5 - 10 cm	30 - 35 %	0 - 3 %	80 - 90 %	rapid
Sandy Weak, Acidic Tephric	45 - 50 cm	0 - 5 %	0 - 4 %	70 - 90 %	rapid
Stony (lapilli) Sandy Weak, Acidic Tep	5 - 35 cm	5 - 15 %	0 - 4 %	70 - 80 %	rapid

* clay and sand percent values are for the mineral fines (excludes stones). Silt = 100 - (clay + sand)

Texture



Water Retention



The values for the graphs above have been generated from horizon and pedotransfer data. These values have then been splined to create continuous estimates of soil water holding capacity and particle size distribution the soil profile. These curves express the particle size distribution and water retention of the soil however there may be barriers to rooting depth that are not necessarily represented in these properties directly. It is advisable to check the potential rooting depth and rooting barrier fields in the soil physical properties section on page three of this factsheet.

Taupo_35a.1

Soil physical properties

Depth class (diggability) Deep (> 1 m)	Texture profile Sand	Drainage class Well drained
Potential rooting depth Unlimited	Topsoil stoniness Moderately stony	Permeability profile Rapid
Rooting barrier No significant barrier within 1	Topsoil clay range 1 - 3 %	Depth to slowly permeable horizon No slowly permeable horizon
Depth to hard rock No hard rock within 1 m		Permeability of slowest horizon Rapid (> 72 mm/h)
Depth to soft rock No soft rock within 1 m		Aeration in root zone Unlimited
Depth to stony layer class No significant stony layer within		

Profile available water

(0 - 30cm or root barrier)	(0 - 60cm or root barrier)	(0 - 100cm or root barrier)
Moderate (44 mm)	High (93 mm)	High (169 mm)

Dry bulk density

topsoil	subsoil
0.85 g/cm³	0.85 g/cm³

Soil chemical properties

Topsoil P retention

Medium (51%)

Soil management factors

Vulnerability classes relate to soil properties only and do not take into account climate or management

Soil structure integrity	Contaminant management	Water management
Structural vulnerability	N leaching vulnerability	Water logging vulnerability
Moderate (0.60)	Low	Very low
Pugging vulnerability	P leaching vulnerability	Drought vulnerability - if not irrigated
not available yet	not available yet	Low
Septic tank installation category	Dairy effluent (FDE) risk category	Bypass flow
A1 if slope > 15 deg otherwise B3	D	Medium
		Hydrological soil group
		A
		Relative Runoff Potential

Slope	0-3°	4-7°	8-15°	16-25°	>25°
Risk	VL	VL	VL	VL	L

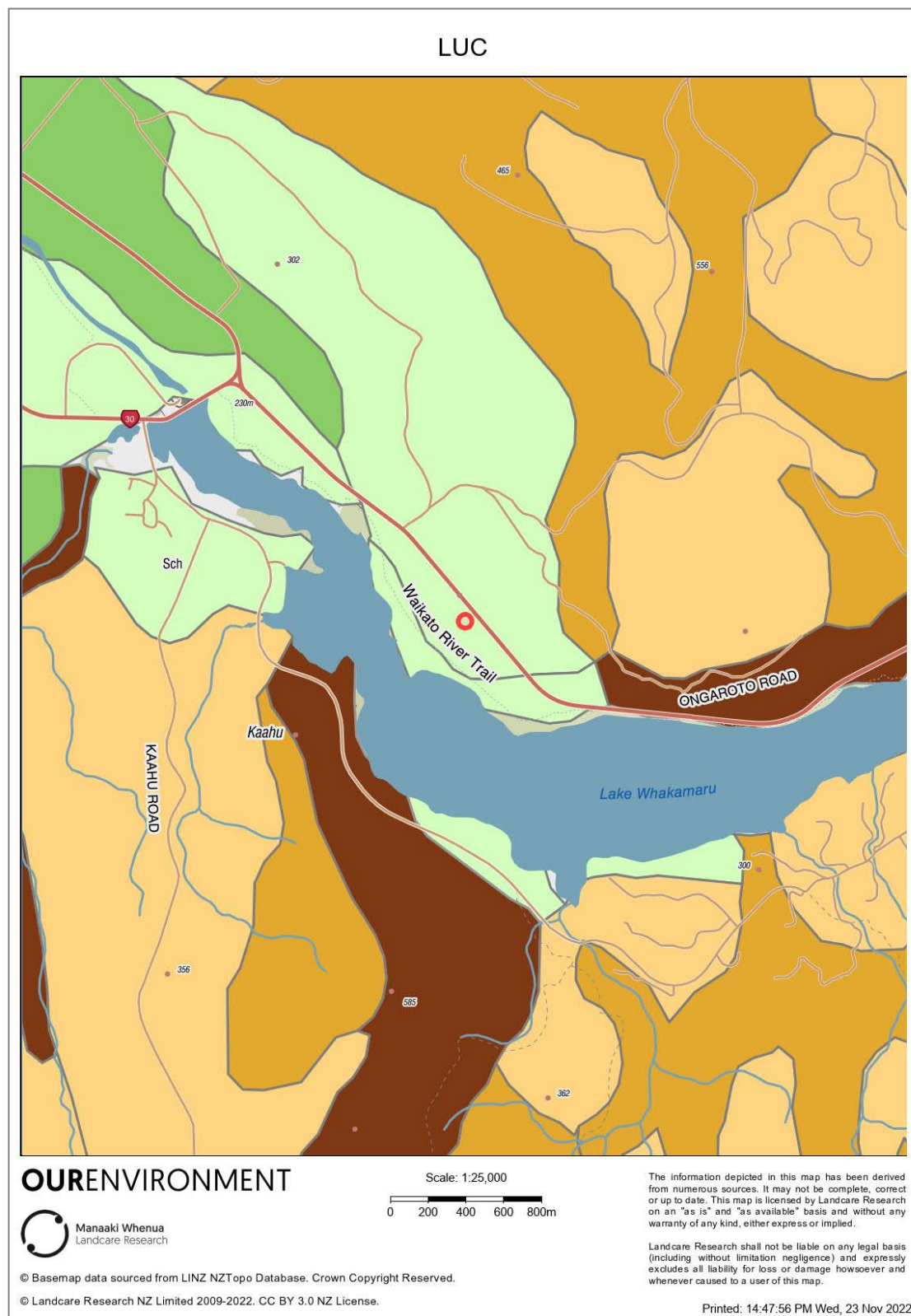
SINDI - Soil quality Indicators

SINDI - Soil Quality Indicators

A suite of soil quality indicators is available from <http://sindi.landcareresearch.co.nz/>

- Compare your soil with information from our soils databases.
- Assess the intrinsic resources and biological, chemical and physical quality of your soil
- See how your soil measures up against current understanding of optimal values.
- Learn about the effect each indicator has on soil quality and some general management practices that could be implemented to improve soil quality.

APPENDIX C – Existing LUC Classification



Legend

Land Use Capability

-  LUC Class 1
-  LUC Class 2
-  LUC Class 3
-  LUC Class 4
-  LUC Class 5
-  LUC Class 6
-  LUC Class 7
-  LUC Class 8

OURENVIRONMENT



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NZ Land Use Capability Unit

nz4e-26

LUC codes have 3 parts: Class + Subclass + Unit e.g. 6e22. The Class (1-8) indicates general land use capability. Subclass identifies the dominant physical limitation or hazard ('e' is erodibility; 'w' is wetness; 's' is soil; 'c' is climate). Units group together areas where similar land inventories have been mapped, and which have similar agricultural suitability, or require similar land management.

LUC Class

4 - Land with moderate limitations for arable use

Dominant limitation to land use

e - Erosion susceptibility, deposition or the effects of past erosion damage first limits production

Unit Description

Rolling slopes with a moderate deep mantle of Taupo airfall tephra over more weathered tephra below 900 m asl with Pumice, Allophanic and podzol (yellow-brown pumice) soils in moderate to high (1400-2000 mm) rainfall areas, with a potential for severe sheet, rill and gully erosion when cultivated.

Historic regional units

4e6 (Bay of Plenty-Volcanic Plateau), prt 4e9 (Taranaki-Manawatu)

APPENDIX D – Proposed LUC

Attached Separately