Soil and Resource Report for Awakino Road, Dargaville.

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19th of June 2023

Hanmore Land Management

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1.0 INTRODUCTION

This report has been prepared at the request of the client to assess the Land Use Capability (LUC) classes at a site on Awakino Road, Dargaville. The New Zealand Resource Inventory (NZLRI) maps have classified the majority of the property as LUC class 4 and 6 with a smaller area of class 3. As such, some of the site could potentially fall under the National Policy Statement for Highly Productive Land (NPS-HPL).

The purpose of the report is to map the site in detail and identify any Highly Productive Land as defined by the National Policy Statement for Highly Productive Land (NPS-HPL). To achieve this, a site visit was carried out to map the soils and land use classes present and assess them in relation to the NPS-HPL.

This report presents the description of each of the soil types identified on the proposed site as well as descriptions of each of the LUC units mapped. This information is then used to determine and quantify any highly productive land present. This information is accompanied by LUC, and soil maps along with the relevant LUC unit and soil profile descriptions.

2.0 MAPPING METHOD

A site visit was carried out on the 14th of June 2023 to evaluate and describe the soil types and the LUC units present. The site of interest was mapped at a scale of 1:5,000.

LUC mapping was carried out in accordance with the methods described in the 3rd Edition of the Land Use Capability Survey Handbook (Lynn et al 2009). This process involves making a land resource inventory (LRI) of the property in which soil types, soil parent materials, land slopes, erosion type and severity and land cover are recorded. Whenever any of these land features changes a new unit is made.

Specific field work activities include digging and describing soil profiles on each landform with supporting holes dug or profiles observed on bank/drain cuttings to establish soil boundaries, measuring slopes with a clinometer, and gathering any other data that may be of assistance in assessing the suitability of the land for primary production such as erosion, susceptibility of the land to flooding, winter wetness and/or cold, high temperatures, exposure to salt winds, aspect, and accessibility. This information is then used to determine the specific LUC units, as described in the LUC Classifications of the Northland Region (Harmsworth, 1996) for the area. At times when mapping at a scale finer than Harmsworth (1996) of 1:50,000, new LUC units are recorded and are noted with an * in the LUC description table.

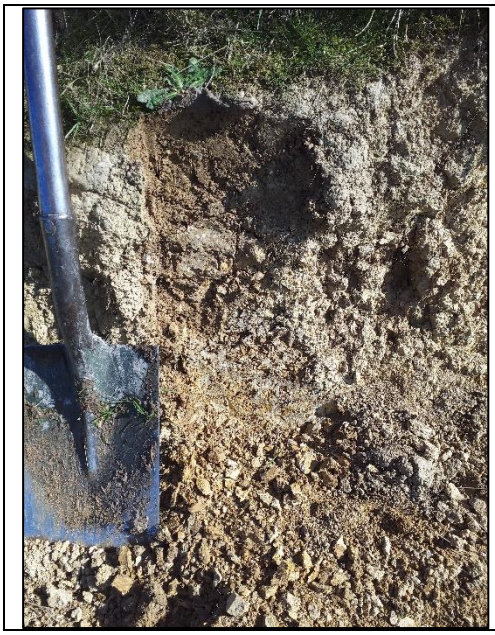
3.0 SITE DESCRIPTION

The site located at Awakino Road covers approximately 18.4 hectares. It consists of mostly flat to moderately steep topography with a combination of alluvial and sedimentary soils and drainage varying from poorly drained to imperfectly drained. The site includes two farm buildings and is currently used to graze cattle.

3.1 Soil Profiles and Descriptions

The soils identified at the proposed site are presented and described in the table below. Their distribution is shown on the soil map in Section 6.0 of this report.

Soil Profile	Soil Profile Description
	**Soil Name:** Kara silt loam **Soil classification**: Podzols from the Whareora suite **Parent material:** Alluvium mainly from sedimentary rocks **Soil description:** 0-240mm: Friable, moderately to strongly developed, 2-5mm crumb, slight sticky, plastic, very dark grey (10yr 3/2) to very dark greyish brown (10yr 3/1), fine sandy silt loam. Silica pan **Overall drainage:** Poorly drained.
	**Soil Name:** Kaipara clay and clay loam (KP) **Soil classification:** Gleyed soils from the Kaipara suite **Parent material:** Estuarine clays, sands and alluvium **Soil description:** Kaipara soils are seasonally wet because of their clay texture, and/or have high water tables during winter. Open drains need to quickly channel surface water from low spots on the floodplain, older river meanders for example, and intercept runoff from adjoining slopes. Careful management is required to prevent soil compaction under both arable and pastoral farming. **Overall drainage:** Poorly to very poorly drained



Soil Name: Okaka clay and silty loam

Soil classification: Strongly leached to weakly podzolised yellow-brown earths from the Omu suite

Parent material: Claystone, mudstone and shale.

Soil description:
A strongly leached to weakly podzolised soil formed on siliceous mudstone. It has developed under kauri forest and has 75 to 150 mm of grey clay on grey and cream-brown mottled clay. Because of its more distinct columnar subsoil development, Okaka clay and silty clay is more susceptible to gully erosion than the younger soils in the suite.

Overall drainage: Poorly to imperfectly drained

3.2 Land Use Capability Descriptions

LUC classifications categorize land into eight classes according to its long-term capability to sustain one or more productive uses.

- Classes 1-4 have arable potential with limitations to this land use moving from class one being the most versatile, multi-use land with minimal physical limitations for arable use and increasing to severe limitations under class four land. These classes are also suitable to viticulture, berry production, pastoralism, tree crops and production forestry.
- Classes 5-7 are suitable for pastoral farming and production forestry.
- Class 8 land has no productive use and is rather managed for catchment protection and conservation purposes.

The LUC units mapped on the proposed site are presented in the table below with copies of the full unit descriptions taken from Harmsworth (1996) contained in Appendix 1. An LUC map showing the distribution of the mapped units is contained in Section 6.

Resource information	Luc unit	Total area (ha)	Parent material	Dominant soil type	Slope (degree)	Land Cover	Erosion degree & severity		Landuse suitability	Stock carrying capacity (su/ha) Forestry site index (FSI)
							Actual	Potential		
4w 1 Flat to undulating areas on floodplains, valley plains and low terraces with severe continuing wetness or flooding limitation.		<0.01	Fine alluvium.	Recent soils on sedimentary and volcanic alluvium.	0-7^0	Pasture Rushes	Nil	Moderate streambank and deposition.	Intensive grazing Root and green fodder crops. Forestry	Average: 17 Top: 20 Potential:24 FSI: 20-23 **Revised** Average: 13 Top: 15 Potential: 18
4s 4 Flat to undulating slopes within a subdued rolling landscape with podzols and podzolised brown soils.		11.71	Fine alluvium or unconsolidated clays and silts and sheared mixed lithologies.	Podzols and podzolised brown soils.	0-15^0	Pasture	Nil	Moderate gully and tunnel gully under pasture. Slight to moderate sheet, rill and gully when cultivated.	Horticulture Vegetables Intensive Grazing Forestry	Average: 17 Top: 20 Potential: 24 FSI: 18-21 **Revised** Average: 15 Top: 20 Potential: 22

Resource information	Luc unit	Total area (ha)	Parent material	Dominant soil type	Slope (degree)	Land Cover	Erosion degree & severity		Landuse suitability	Stock carrying capacity (su/ha) Forestry site index (FSI)
							Actual	Potential		
6e 7 Strong rolling to moderately steep slopes forming hilly terrain formed on shattered and sheared argillite complexed with sandstone and bedded mudstone.		5.88	Argillite, massive sandstone, interbedded sandstone, massive mudstone, interbedded mudstone, jointed mudstone, crushed argillite.	Yellow-brown earth hill soils on shattered argillites and sandstones.	16-25º	Pasture Native trees	Nil	Moderate earthflow, gully, soil slip, tunnel gully and earth slip. Severe sheet	Pasture Forestry	Average: 11 Top: 13 Potential: 15 FSI: 32-35

Land use capability unit descriptions are taken from the author's field work, and the Land Use Capability Classification of the Northland Region (Harmsworth, 1996).

Revised stock carry capacities are taken from a review of Harmsworth (1996) stock carry capacities by Bob Cathcart in 2017

4.0 SOIL CLASSIFICATIONS

4.1 Highly Productive Land

The NPS-HPL came into effect in October 2022. This policy seeks to protect the productivity potential of our most productive land by regulating non-productive land uses and inappropriate subdivision. The policy statement identifies all land in LUC classes 1, 2 and 3 as highly productive land. The following definition is taken from section 1.3, page 4 of the NPS-HPL:

> *LUC 1, 2, or 3 land means land identified as Land Use Capability Class 1, 2, or 3, as mapped by the New Zealand Land Resource Inventory or by any more detailed mapping that uses the Land Use Capability classification.*

4.2 Site Classifications

The table below shows the LUC area breakdown for the proposed site as well as the percentage of highly productive land.

LUC Unit	Area (ha)	HPL Classification	% of total Area
4w 1	<0.01	Not HPL	<0.1
4s 4	11.71	Not HPL	63.8
6e 7	5.88	Not HPL	32.0
Access way	0.77	Not HPL	4.2
Total area	**18.36**		
Area HPL	**0.0**	**Total % HPL**	**0.0**
Total area non-HPL	**18.36**	**Total % non-HPL**	**100.0**

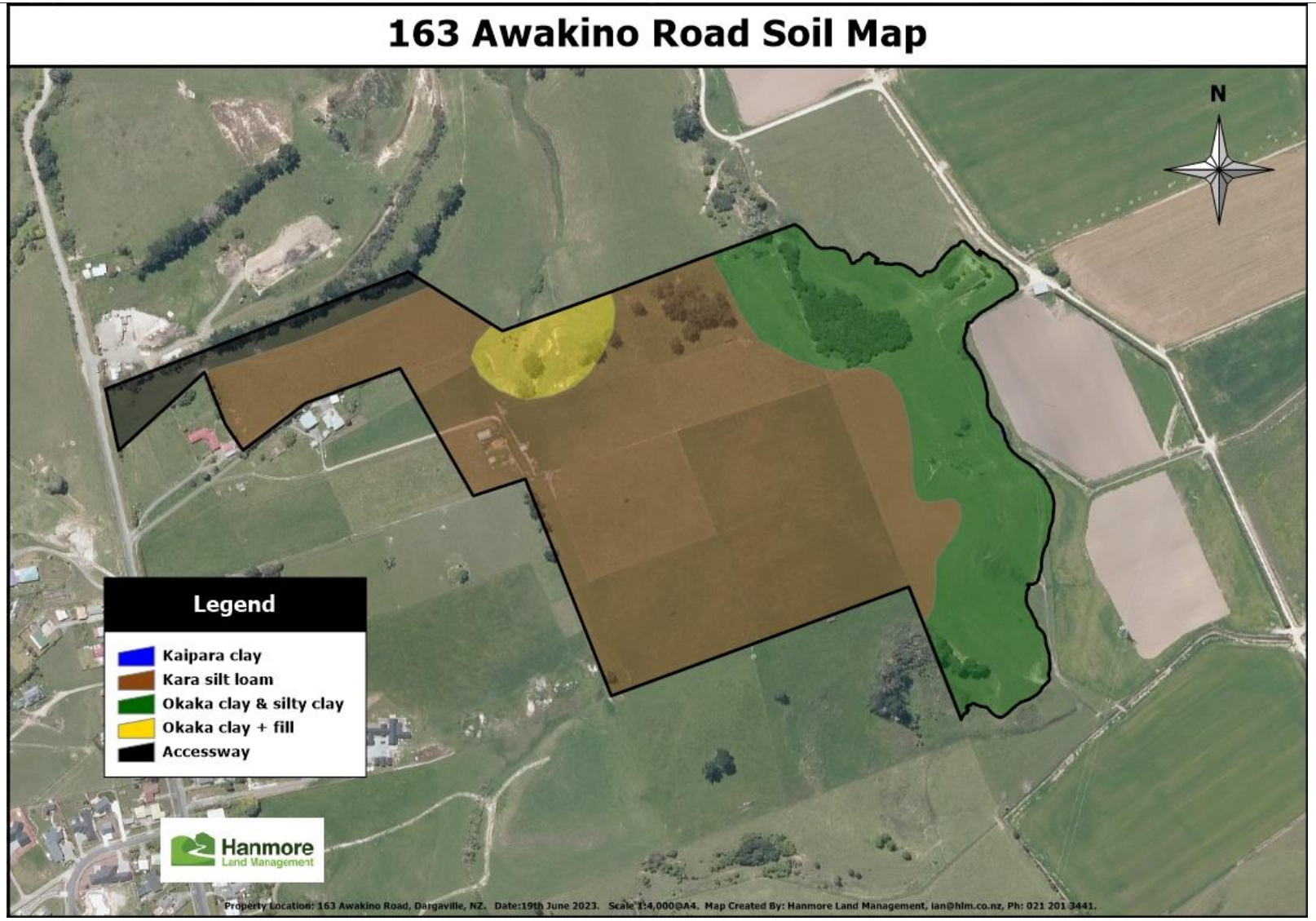
4.2.1 Reclassified LUC Units

The property has been mapped by the NZLRI as LUC units 3w 2, 4s 4 and 6e14. Detailed farm scale mapping of the area has reclassified the area of 6e14 to 6e 7 based on the soil type present. The area of 3w 2 has been reclassified as 4w 1 due to the increased wetness limitation.

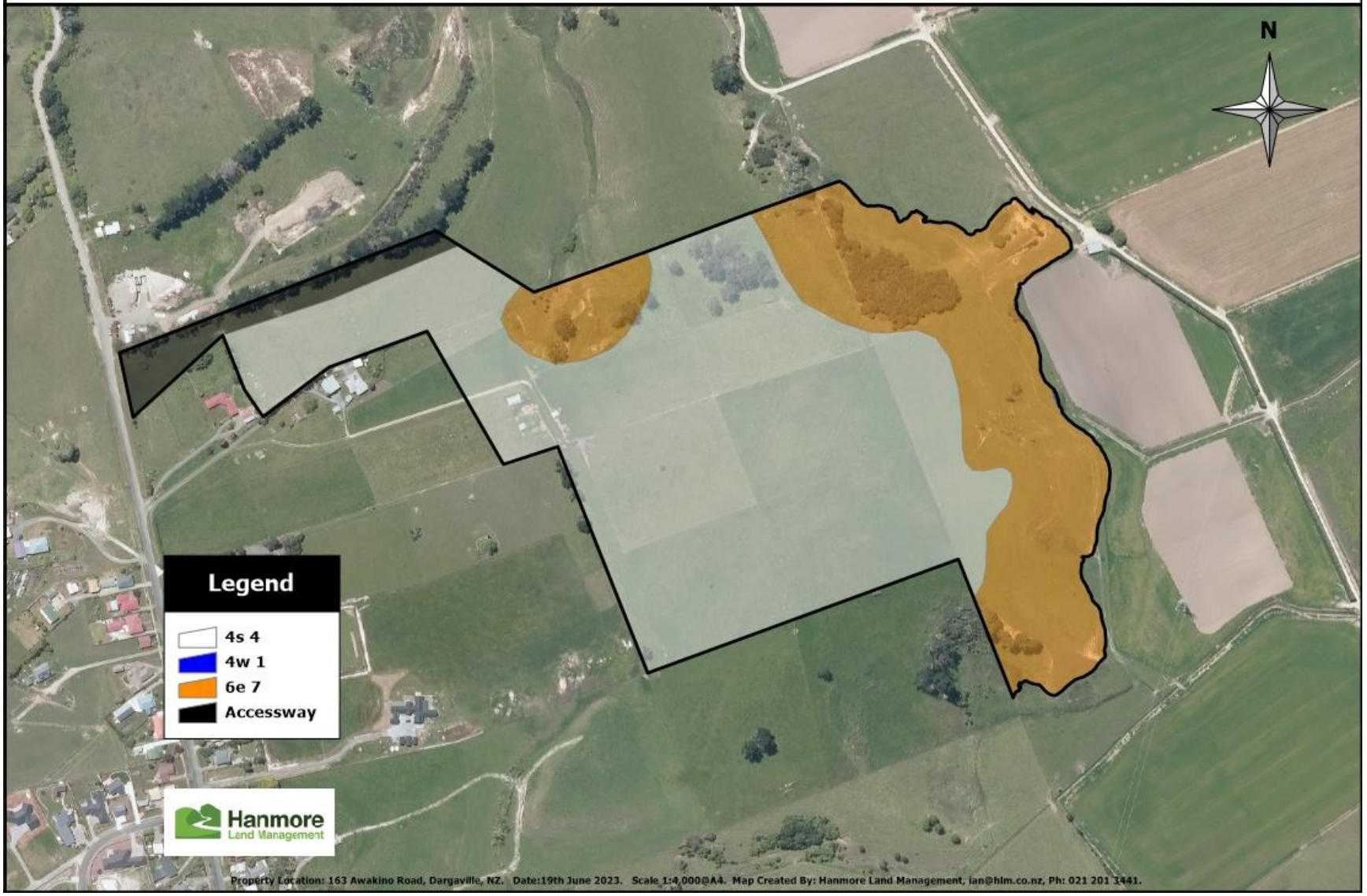
5.0 OVERALL SITE ASSESSMENT

Under the NPS-HPL all LUC units in LUC classes 1, 2 and 3 are classified as HPL. As such, there is no HPL present at the site with all LUC units being class 4 or 6 with the balance being unproductive land. The HPL classifications are presented in the soil classifications map in Section 6.

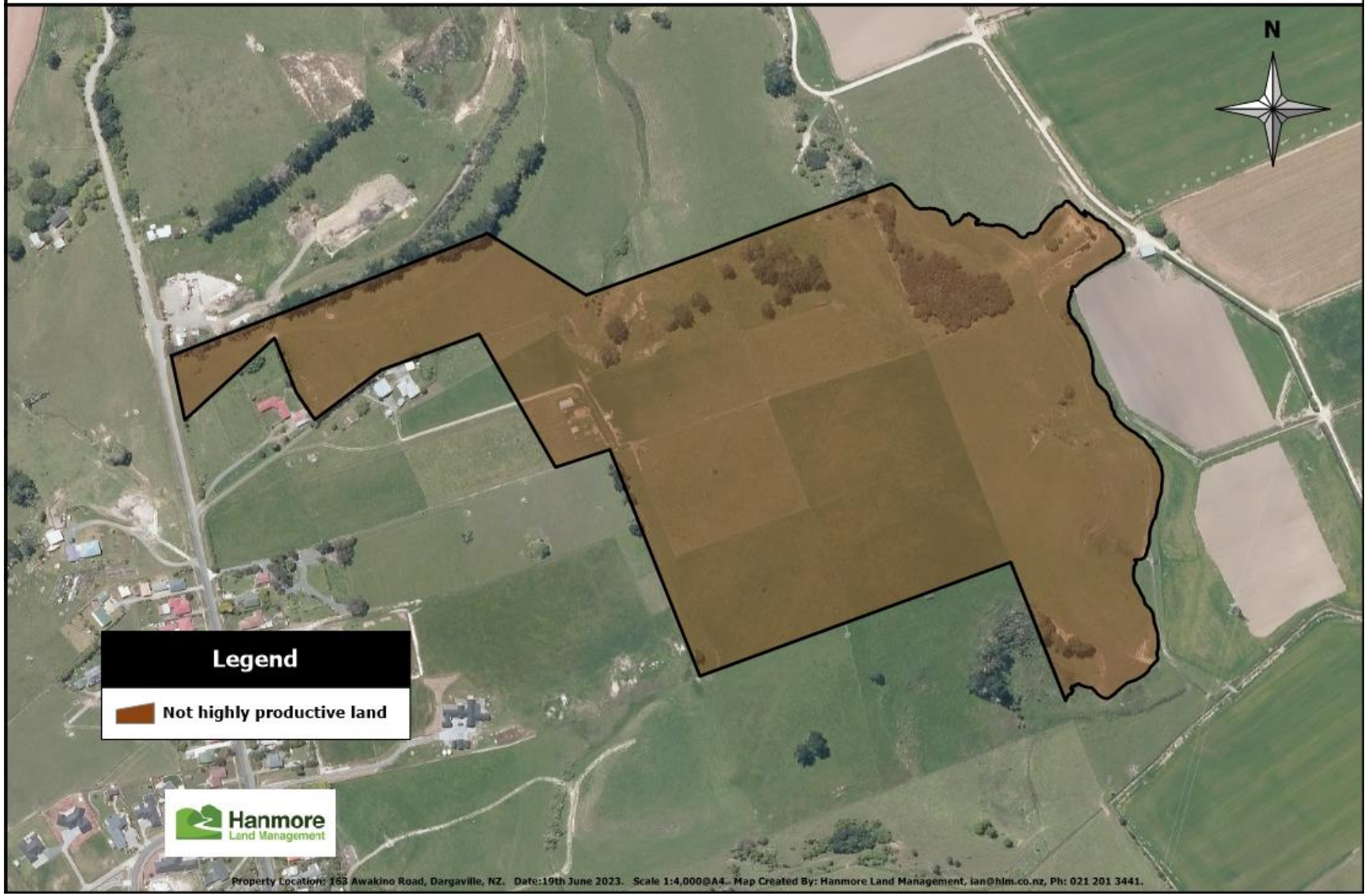
6.0 MAPS


163 Awakino Road Soil Map
N
Legend
Kaipara clay
Kara silt loam
Okaka clay & silty clay
Okaka clay + fill
Accessway
Hanmore
Land Management
Property Location: 163 Awakino Road, Dargaville, NZ. Date:19th June 2023. Scale 1:4,000@A4. Map Created By: Hanmore Land Management, ian@hlm.co.nz, Ph: 021 201 3441.

163 Awakino Road Land Use Capability Classifications



163 Awakino Road Soil Classifications



7.0 APPENDICES

7.1 Appendix 1 – LUC units mapped at the Awakino Road.

LUC unit: **IVw1** (35 423 ha)

LUC suite: 2. Alluvial and estuarine plains and low terraces

LUC subsuite: 2c. Poorly drained floodplains and low terraces: (LUC units IVw1, VIw1, VIIw1)

Description: Flat to gently undulating areas on floodplains, valleyplains and low terraces on alluvium, with continuing severe wetness or flooding limitation to arable use. Severe limitations to cropping because of runoff from adjacent hills, flooding of streams and high watertables. Potential for moderate streambank erosion and deposition. Recent soils on alluvium characteristic of this unit. Weakly to strongly leached yellow-brown earths and brown granular loams and clays with severe wetness limitations recorded on higher terraces. Waipuna clay on higher terraces included because of continuing wetness due to poor internal drainage of soils. Areas assessed as requiring on-farm drainage.

Type location: Q06/pt R06/217305

Altitudinal range: 0–100 m

Slope: Flat to undulating with limited areas of undulating land (A, B), 0–7°

Landform: Floodplains and low terraces.

Rock type: Fine alluvium (Af). Undifferentiated fine-grained alluvium, floodplain alluvium (Af), and fine alluvium intercalated with organic-peat deposits (Af + Pt).

Soils: Recent soils on sedimentary and volcanic alluvium. Recent soils of Whareora suite (WFa, WF, WFa) and Kohumaru suite (MF, MFm). Moderately to strongly leached yellow-brown earths of Whareora suite (WU). Moderately to strongly leached brown granular loams and clays of Kohumaru suite (KM, KMm). Gley soils of Kaipara suite (TZ, TZy, KP, KPy, KA, KAy), Waipapa suite (KO, KOr, KOl, KOy, YF), Waipu suite (YUa, YUay, YU, YUy, YA) included where wetness is considered a severe limitation to arable use.

Erosion: *Present:* Negligible (0) to moderate (2) streambank (Sb). Negligible (0) to slight (1) deposition (D). Some areas may show moderate (2) to severe (3) deposition after floods

Potential: Moderate streambank (Sb) and deposition (D)

Vegetation: Improved pasture (gl), rushes, sedges (hR), wetland vegetation (hW), gorse (sG), manuka, kanuka (sM).

Annual rainfall range: 1200–1600 mm

Land use: *Present:*

Grazing – Intensive
– Present average carrying capacity (s.u./ha) = 17
– Top farmer carrying capacity (s.u./ha) = 20
Cropping – Root and green fodder crops

Potential:

Grazing – Intensive
– Attainable physical potential carrying capacity (s.u./ha) = 24
Cropping – Root and green fodder crops
Forestry – Production – site index for *Pinus radiata* = 20–23.

Soil conservation management: These areas may be prone to occasional flooding (deposition and erosion). Suitable flood protection such as drainage and stopbanks should be

considered on a long-term basis, management should be directed over whole catchment.

- On-farm drainage required. Maintain condition of drains.
- Stopbanks should be constructed in flood prone areas and their condition maintained.
- Streambank protection may be required. Erosion can be locally severe and difficult and expensive to repair or control.
- Maintain clearance of vegetation within stream and river channels.
- Watertables need to be monitored and controlled.

Comments: Soils may range from well to poorly drained. Much land can be effectively drained, but high watertables, periodic flooding, and runoff from surrounding hills add to the drainage difficulty. Many areas require stopbank protection.

LUC unit: IVs4 (21 753 ha)

LUC suite: 4. Sedimentary rock terrain excluding greywacke

LUC subsuite: 4g. Podzols on sedimentary rock:
(LUC units IVe12, IVs4, IVw4, VIs5)

Description: Flat to undulating slopes within a subdued rolling landscape where podzols and podzolised yellow-brown earths have developed on alluvium, colluvium and/or a range of sedimentary lithologies including fractured and sheared sedimentary lithologies, and deeply weathered massive sedimentary deposits. Typical gumland. Soils generally of very low natural fertility and have poor structure. Extreme limitations for arable use.

Type location: R10/560065 Pine Valley Road, Silverdale

Altitudinal range: 0–400 m

Slope: Flat to rolling (A-C), 0–15°

Landform: Flat to rolling surfaces within subdued landscape. Includes surfaces within downlands, terraces, and plains.

Rock type: Fine alluvium (Af) or unconsolidated clays and silts (Uf), sheared mixed lithologies (Mx). A mixture of shattered and sheared sedimentary lithologies (Mx), often associated with alluvium (Af), unconsolidated clays and silts (Uf), or argillite (Ar).

Soils: Podzols and podzolised yellow-brown earths on various sedimentary rocks. Podzols of Whareora suite (KRa, KR, KRy, KRe), Puhoi suite (WKf, WKfp), Waiotira suite (WKa) Omu suite (WK, WKr), Maungarei suite (PR). Moderately podzolised yellow-brown earths of Puhoi suite (HKf, MV, OU), Waiotira suite (HKa, PD, PW), Omu suite (HK, HKg, YK, YKI, OP), Marua suite (HKr), Maungarei suite (PM), Omanaia suite (HW).

Erosion:
Present: Negligible (0) to slight (1) sheet (Sh) and gully (G)
Potential: Moderate (2) gully (G) and tunnel gully (T) under pasture. Slight (1) to moderate (2) sheet (Sh) rill (R) and gully (G) when cultivated

Vegetation: Improved pasture (gl), rushes, sedges (hR), podocarp forest (fP), lowland podocarp–broadleaved forest (fP), commonly scattered in pasture, manuka, kanuka (sM), gorse (sG).

Annual rainfall range: 1200–1600 mm

Land use:
Present:
Grazing
- Intensive to semi-intensive, incl. dairying
- Present average carrying capacity (s.u./ha) = 13
- Top farmer carrying capacity (s.u./ha) = 15

Undeveloped land

Potential:
Grazing
- Intensive
- Attainable physical potential carrying capacity (s.u./ha) = 18

Cropping – Root and green fodder crops

Forestry – Production – site index for *Pinus radiata* = 26–30

Soil conservation management: Good soil conservation management is essential.
- When cultivating, contour cultivation and minimum-tillage practices are essential to minimise sheet and rill erosion. Avoid structural degradation of soils under saturated conditions. Deeper cultivation may be necessary to break up hard layers at depth.

- Surface drains required. Maintain condition of drains.
- Attention to subsurface drainage necessary in some areas.
- Control grazing by avoiding overstocking and concentrated stock movement (e.g. repeated tracking, tracking along fencelines, gates, around troughs). Controls may include closer subdivision, rotational grazing, adequate spelling of pastures. Avoid excessive pugging of soils by heavy stock in winter.
- Pugging of soils is a major problem.
- Control runoff using appropriate techniques such as grassed waterways, graded banks.
- Maintain good-quality pasture cover/apply adequate fertiliser–trace-element levels.

Comments: Soils strongly acid, very strongly leached, have poor structure and are gleyed in low-lying areas. Drainage generally poor and biological activity very low. Soils can maintain good pastures for pastoral farming, with moderate applications of lime and plant nutrients, but light stocking in winter is essential to prevent surface pugging.

LUC unit: VIe7 (128 894 ha)

LUC suite: 4. Sedimentary rock terrain excluding greywacke

LUC subsuite: 4b. Old shattered and sheared argillites and sandstone: (LUC units IVe6, VIe7)

Description: Strongly rolling to moderately steep slopes forming hilly terrain. Shattered and sheared argillite complexed with sandstone, bedded mudstone. Minor constituents of crushed argillite (siliceous claystone) and/or jointed mudstone also recorded. Sandstones and mudstones often deformed showing evidence of shearing, shattering. Faulting or folding often proximal to land on sheared mixed lithologies (e.g. Northland Allochthon). Soils are yellow-brown earths. Potential for moderate soil slip, gully and tunnel gully erosion, and severe sheet erosion. Also potential for moderate earthflow on lower slopes.

Type location: 005/453568 Buchanan Road and 004/640736 Otangaroa Road

Altitudinal range: 0–400 m

Slope: Strongly rolling to moderately steep (D+E, E+D), 16–25°

Landform: Hilly terrain with tunnel gully, earthflow and gully.

Rock type: Argillite (Ar), massive sandstone (Sm), interbedded sandstone (Sb), massive mudstone (Mm), interbedded mudstone (Mb), jointed mudstone (Mj), crushed argillite (Ac).

Soils: Yellow-brown earth hill soils on shattered argillites and sandstones. Weakly to strongly leached and weakly podzolised yellow-brown earths of Omanaia suite (WHN, ONH, AEH, AEeH, KWH, HWH), Purua suite (PUeH, TNH, TNaH, OCH), Waiotira suite (YCgH, YCeH, YCH, YCeH, RPH, RPaH, PVH, PDH, PWH) and Omu suite (TFH, OMH, APH, OAH, PH).

Erosion:
Present: Slight (1) to moderate (2) sheet (Sh), soil slip (Ss), earthslip (Es), earthflow (Ef) and tunnel gully (T). Negligible (0) to slight (1) gully (G)
Potential: Moderate (2) earthflow (Ef), gully (G), soil slip (Ss), tunnel gully (T) and earthslip (Es). Severe (3) sheet (Sh)

Vegetation: Improved pasture (gI), semi-improved pasture (gS), rushes, sedges (hR), mixed indigenous scrub (sX), manuka, kanuka (sM), exotic scrub (SE), lowland podocarp–broadleaved forest (fO), gorse (sG).

Annual rainfall range: 1200–1600 mm

Land use:
Present:
Grazing – Semi-intensive
– Present average carrying capacity (s.u./ha) = 11
– Top farmer carrying capacity (s.u./ha) = 13
Undeveloped land
Reversion to scrub
Forestry – Production – exotic spp.
Potential:
Grazing – Attainable physical potential carrying capacity (s.u./ha) = 15
Cropping – Unsuitable
Forestry – Production – site index for *Pinus radiata* = 32–35

Soil conservation management:
- Maintain good-quality pastures/apply adequate fertiliser levels – major elements and trace element requirements.
- Open plant conservation trees on areas susceptible to mass movement.

- Block planting of trees may be required for stabilising severely eroded sites or sites with high erosion potential, whereas wide space planting is recommended on areas with lower erosion potential.
- Pair plant soil conservation trees in tunnel gullies and gullies.
- Oversow and fertilise slip scars.
- Control runoff away from steep slopes and potentially unstable sites.
- Maintain permanent vegetation cover on runoff channels to prevent gully erosion.
- Control grazing by avoiding overstocking. Stock treading may continually reactivate erosion on soil slip/flow surfaces. Earthflow areas may pug badly in winter under heavy stock.
- To minimise soil erosion and maintain water quality, carefully plan all earthworks and excavation of roads, drains, dams. Avoid undercutting slopes.

Comments: Sheet erosion is a particular problem on drier slopes on "argillaceous" terrains and adequate spelling from stock is recommended on these slopes. Bare ground can be minimised by oversowing and topdressing together with more intensive subdivision fencing.

8.0 REFERENCES

Harmsworth, G.R. 1996. Land Use Capability classification of the Northland region. A report to accompany the second edition (1:50,000) NZLRI worksheets. Landcare Research Science Series 9. Lincoln, Manaaki Whenua Press.

Lynn IH, Manderson AK, Page MJ, Harmsworth GR, Eyles GO, Douglas GB, Mackay AD, Newsome PJF 2009. NZ Land Use Capability Survey Handbook – a New Zealand handbook for the classification of land 3rd Edition. Hamilton, AgResearch; Lincoln, Landcare Research; Lower Hutt, GNS Science.

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