

This Technical Data Sheet describes the *typical average properties* of the specified soil.

It is essentially a summary of information obtained from one or more profiles of this soil that were examined and described during the Topoclimate survey or previous surveys. It has been prepared in good faith by trained staff within time and budgetary limits. However, no responsibility or liability can be taken for the accuracy of the information and interpretations. Advise should be sought from soil and landuse experts before making landuse decisions on individual farms and paddocks. The characteristics of the soil at a specific location may differ in some details from those described here.

No warranties are expressed or implied unless stated.

## Soil name: **Kaihiku**

### Overview

Kaihiku soils occupy about 11,500 ha on predominantly sunny facing rolling to steep slopes of the Hokonui hills and the Kaiwera district, at altitudes of up to 500m. They are formed in stony colluvium from tuffaceous greywacke, and minor additions of windblown loess. Kaihiku soils are well drained, with a slightly deep rooting depth and moderate water holding capacity, that is limited by gravelliness that occurs throughout the soil. Bedrock commonly occurs in the subsoil, below 45cm depth. They are used for extensive pastoral grazing with sheep and beef cattle. Climate is cool temperate with regular rain, though these soils can dry out in summer because of their shallow depth, good drainage and mainly sunny aspect.

### Soil classification

#### NZ Soil Classification (NZSC):

Argillic Orthic Melanic; angular-stony, tuffaceous sandstone; loamy

#### Previous NZ Genetic Classification:

Weakly to moderately leached lowland yellow-brown earth.

### Classification explanation

The NZSC of Kaihiku soils has been reclassified because the soil properties are more similar to Melanic than to Brown soils. This is reflected in the dark coloured topsoils and moderate to strong structure to at least 60cm depth. The soils are naturally fertile, with low P-retention, high base saturation and pH values of >5.8 throughout the profile. Subsoils also show a significant accumulation of clay. Kaihiku soils have a horizon with >35% gravels within 45cm depth, and textures are typically clay loam.

### Soil phases and variants

Identified units in the Kaihiku soils are:

- Kaihiku hilly shallow (KhH3): has gravels within 45cm depth; occurs on slopes of 15–25°
- Kaihiku rolling shallow (KhR3): has gravels within 45cm depth; occurs on slopes of 7–15°
- Kaihiku steep shallow (KhS3): has gravels within 45cm depth; occurs on slopes of >25°

The soil properties described in this Technical Data Sheet are based on the most common phase, Kaihiku hilly shallow (KhH3). Values for other phases and variants can be taken as being similar. Where they differ significantly they are recorded with a separate versatility rating, e.g., Kaihiku rolling shallow (KhR3).

### Associated soils

Some soils that commonly occur in association with Kaihiku soils are:

- Waikaka: deep well drained Brown soil formed into loess
- Kaiwera: strongly leached Brown soil, with high P-retention and pH values of <5.5 in the subsoil; occur in moister environments, such as shady slopes and/or higher rainfall
- Stony creek: poorly to imperfectly drained, shallow stony soils occurring on toeslopes

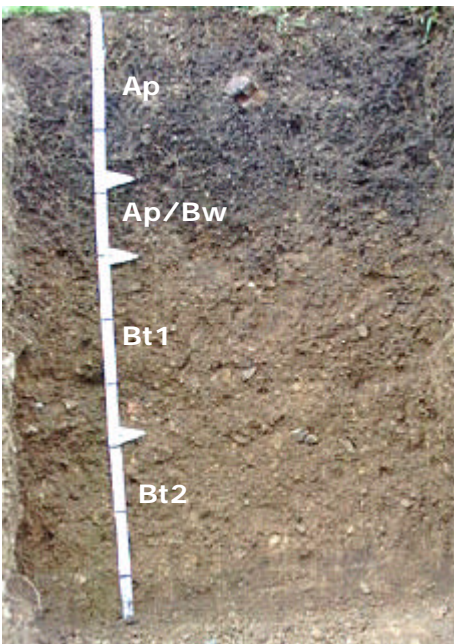
## Similar soils

Some soils that have similar properties to Kaihiku soils are:

- Mandeville: also a Melanic soil; occurs where tuffaceous greywacke bedrock is within 45cm depth.
- Josephville: weakly leached Brown soil formed in a mix of stony colluvium and a significant proportion of loess; is gravelly but has <35% gravels within 45cm depth
- Wendon: moderately leached Brown soil formed on greywacke bedrock and colluvium; has acidic subsoils with pH of <5.5
- Kuriwao: moderately leached Brown soil formed in tuffaceous greywacke colluvium; has acidic subsoils with pH of <5.5.

## Typical profile features

The following is a 'generic' or composite profile description representing the most common combination of characteristics for this soil type. The actual profiles for which descriptions and data are available are listed at the end of this Technical Data Sheet.

Kaihiku profile	Horizon	Depth (cm)	Description
	Ap	0–28	Brownish black moderately gravelly clay loam; very weak soil strength; loose particle packing; strongly developed fine polyhedral structure; gravel angular and slightly weathered; abundant roots
	Ap/Bw	28–40	Dull yellowish brown very gravelly clay loam; abundant worm casts; compact particle packing; strongly developed fine polyhedral structure; gravel angular and slightly weathered; abundant roots
	Bt1	40–68	Dull yellowish brown very gravelly clay loam; few worm casts; compact particle packing; moderately developed fine polyhedral structure; gravel angular and slightly weathered; many clay skins; common roots
	Bt2	68–90	Dull yellowish brown extremely gravelly clay loam; dense particle packing; weakly developed fine polyhedral structure; gravel angular and moderately weathered; abundant clay skins; few roots
	Bt2	68–90	Dull yellowish brown extremely gravelly clay loam; dense particle packing; weakly developed fine polyhedral structure; gravel angular and moderately weathered; abundant clay skins; few roots

## Key profile features

Kaihiku soils have a 25–30cm depth topsoil that is characterised by the dark colour and strongly developed fine structure. Subsoil structure is strong to moderate, grading to weakly developed in the lower subsoil. Subsoils show a significant accumulation of clay, that increases in abundance with depth.

## Typical physical properties

Note: values in *Italics* are estimates

Horizon	Depth (cm)	Bulk density	Permeability	Texture	Gravel content
Ap	0–28	—	<i>Moderate</i>	Clay loam	Moderately gravelly
Ap/Bw	28–40	—	<i>Moderate</i>	Clay loam	Very gravelly
Bt1	40–68	—	<i>Moderate</i>	Clay loam	Very gravelly
Bt2	68–90	—	<i>Moderate</i>	Clay loam	Extremely gravelly

<b>Profile drainage:</b>	Well
<b>Plant readily available water:</b>	<i>Moderate</i>
<b>Potential rooting depth:</b>	Slightly deep
<b>Rooting restriction:</b>	Subsoil gravelliness and/or presence of bedrock

## Key physical properties

Kaihiku soils have a slightly deep rooting depth and moderate available water that is restricted by the gravelliness of the subsoil. These soils are well drained, with good aeration and moderate permeability throughout the soil. Textures are typically clay loam, with topsoil clay content of 28–35%. The soils are gravelly throughout, and typically have at least 35% gravel within 45cm depth.

## Typical chemical properties

Horizon	Depth (cm)	pH	P retention	CEC	BS	Ca	Mg	K	Na
Ap	0–28	Moderate	Low	High	High	High	Moderate	Very high	Low
Ap/Bw	28–40	Moderate	Low	Moderate	High	High	Moderate	Very high	Low
Bt1	40–68	Moderate	Low	Moderate	Very high	High	Moderate	High	Low
Bt2	68–90	High	Low	Moderate	Very high	Moderate	Moderate	Moderate	Low

### Additional chemical properties (as a profile average)

Sulphate sulphur levels are low.

## Key chemical properties

Topsoil organic matter levels are 7–8%; P-retention under 30%; pH values are moderate and tend to increase down the profile. Cation exchange values are moderate and base saturation high to very high. Calcium, magnesium and potassium levels are high to moderate. Reserve phosphorus and sulphur levels are low and these soils are very responsive to these nutrients. Micronutrient levels are generally adequate for pasture growth but may be deficient in cobalt for sheep, and copper for deer and cattle over summer.

## Vulnerability to environmental degradation

**Note:** the vulnerability ratings given in the table below are generalised and should not be taken as absolutes for this soil type in all situations. The actual risk depends on the environmental and management conditions prevailing at a particular place and time. Specialist advice should be sought before making management decisions that may have environmental impacts. Where vulnerability ratings of Moderate to Very severe are indicated, advice may be sought from Environment Southland or a farm management consultant.

Vulnerability factor	Rating	Vulnerability compared to other Southland soils
<b>Structural compaction</b>	slight	These soils have a slight vulnerability to structural degradation by long-term cultivation, or compaction by heavy stocking and vehicles. This rating reflects the good drainage, moderate clay and organic matter levels.
<b>Nutrient leaching</b>	severe	These soils have a severe vulnerability to leaching to groundwater. This rating reflects the good drainage, moderate permeability, and moderate water holding capacity.
<b>Topsoil erodibility by water</b>	minimal	Due to the clay loam texture, topsoil erodibility in these soils is minimal. Erodibility is highly dependent on management, particularly when there is no vegetation cover.
<b>Organic matter loss</b>	moderate	Vulnerability to long-term decline in soil organic matter levels is partly dependent on soil properties, and highly dependent on management practices (e.g., crop residue management and cultivation practices).
<b>Waterlogging</b>	nil	These soils have a nil vulnerability to waterlogging during wet periods. This rating reflects the good drainage, moderate permeability, and the rolling to steep slopes.

## General landuse versatility ratings for Kaihiku soils

**Note:** The versatility ratings in the table below are indicative of the major limitations for semi-intensive to intensive land use. These ratings differ from those used in the past in that sustainability factors are incorporated in the classification.

Refer to the Topoclimate district soil map or property soil map to determine which of the soil symbols listed below are applicable, then check the versatility ratings for that symbol in the appropriate table.

### KhH3: (Kaihiku hilly shallow)

Versatility evaluation for soil KhH3		
Landuse	Versatility rating	Main limitation
Non-arable horticulture	Unsuitable	Hilly slopes
Arable	Unsuitable	Hilly slopes
Intensive pasture	Limited	Hilly slopes
Forestry	Limited	Restricted rooting depth

### KhR3: (Kaihiku rolling shallow)

Versatility evaluation for soil KhR3		
Landuse	Versatility rating	Main limitation
Non-arable horticulture	Unsuitable	Restricted rooting depth
Arable	Limited	Rolling slopes
Intensive pasture	Moderate	Vulnerability to leaching; restricted rooting depth
Forestry	Limited	Restricted rooting depth

**KhS3: (Kaihiku steep shallow)**

Versatility evaluation for soil KhS3		
Landuse	Versatility rating	Main limitation
Non-arable horticulture	Unsuitable	Steep slopes
Arable	Unsuitable	Steep slopes
Intensive pasture	Limited	Steep slopes
Forestry	Limited	Steep slopes ; Restricted rooting depth

**Management practices that may improve soil versatility**

- Management of nutrient applications that minimise leaching losses

**Soil profiles available for Kaihiku soils**

Soil symbol	Profile ID	Topoclimate map sheet	Profile description available	Physical data available	Chemical data available	Profile photo available
KhH3	FT6	15	✓	✓	✓	✓

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