

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: **Haldane**

Overview

Haldane soils occupy about 2300 ha on hilly and rolling land southeast of Waimahaka in southern Southland. They are formed in loess derived from greywacke and schist which overlays tuffaceous greywacke rock. Haldane soils are imperfectly drained, have a deep rooting depth, high water-holding capacity, and have heavy silt loam textures with P-retention of 50–85%. They generally occur above 100m altitude, in association with strongly leached soils with podzolised features. Present use is pastoral farming with sheep and beef cattle. Climate is moderate because of the close proximity to the coast, with high rainfall through the year.

Soil classification

NZ Soil Classification (NZSC):

Mottled-acidic Orthic Brown; stoneless; silty

Previous NZ Genetic Classification:

Strongly leached yellow-brown earth

Classification explanation

The NZSC of the Haldane soils is consistent with the previous classification. Haldane soils are imperfectly drained soils with yellow-brown subsoils, and rarely suffer from drought. Subsoils are structured to 90cm depth, but have slow permeability that causes waterlogging during wet periods, which is reflected in the imperfect drainage. The soils have a P-retention of 60–85%, typically have subsoil pH of less than 5.5, are stone free and have silt loam textures to 90cm depth.

Soil phases and variants

Identified units in the Haldane soils are:

- Haldane hilly deep (HaH1): has no gravel within 90cm depth; occurs on slopes of 15–25°
- Haldane rolling deep (HaR1): has no gravel within 90cm depth; occurs on slopes of 7–15°
- Haldane steep deep (HaS1): has no gravel within 90cm depth; occurs on slopes >25°
- Haldane undulating deep (HaU1): has no gravel within 90cm depth; occurs on slopes of 0–7°

The soil properties described in this Technical Data Sheet are based on the most common phase, Haldane hilly deep (HaH1). 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., Haldane undulating deep (HaU1).

Associated soils

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

- Otarua: well drained with a firm structureless lower subsoil
- Scrubby Hill: occurs above 100m altitude in the hilly land southeast of Waimahaka, but is strongly leached and has podzolised and acidic properties, high P-retention and thin iron pans.

- Fortification: moderately deep on the underlying bedrock; strongly leached with P-retention of >85%.
- Pukerau: shallow to underlying bedrock; strongly leached soil with P-retention of >85%

Similar soils

Some soils that have similar properties to Haldane soils are:

- Chaslands: non-acidic (pH of >5.5) with a firm structureless lower subsoil; generally does not occur in complexes with the strongly leached profile forms
- Ferndale: also pH of less than 5.5 in the subsoil, but has a firm structureless lower subsoil; occurs in the rolling and hilly land between Mataura and Clinton
- Mokotua: are strongly mottled, with imperfect drainage tending towards being poorly drained; are associated with soils showing podzolised features on the southern Southland plains

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.

Haldane profile	Horizon	Depth (cm)	Description
	Ap	0–19	Brownish black silt loam; very few reddish brown mottles; weak soil strength; strongly developed very fine polyhedral structure; abundant roots
	Ap/Bw(g)	19–28	Dull yellow orange silt loam; few bright brown and few greyish yellow mottles; many worm casts; weak soil strength; strongly developed very fine polyhedral structure; abundant roots
	Bw(g)	28–50	Dull yellow orange silt loam; few bright brown and few greyish yellow mottles; few worm casts; common humus coats; slightly firm soil strength; moderately developed fine to medium prismatic and very fine polyhedral structure; common roots
	BC(g)	50–90+	Dull yellow orange silt loam; few greyish yellow and few bright brown mottles; slightly firm soil strength; moderately developed coarse to very coarse prismatic structure; few roots between prisms
	BC(g)	50–90+	Dull yellow orange silt loam; few greyish yellow and few bright brown mottles; slightly firm soil strength; moderately developed coarse to very coarse prismatic structure; few roots between prisms

Key profile features

Haldane topsoils are 19–25cm deep and have a strongly developed structure. Subsoil structure is moderately developed throughout the profile. Mottles are present throughout the profile, reflecting the imperfect drainage.

Typical physical properties

Note: values in *Italics* are estimates

Horizon	Depth (cm)	Bulk density	Permeability	Texture	Gravel content
Ap	0–19	Low – Moderate	<i>Moderate</i>	Silt loam	Gravel free
Ap/Bw(g)	19–28	Moderate	<i>Moderate</i>	Silt loam	Gravel free
Bw(g)	28–50	Moderate	<i>Moderate</i>	Silt loam	Gravel free
BC(g)	50–90+	Moderate – High	<i>Slow</i>	Silt loam	Gravel free

Profile drainage:	Imperfect
Plant readily available water:	<i>High</i>
Potential rooting depth:	Deep
Rooting restriction:	No major rooting restriction

Key physical properties

Haldane soils have a deep rooting depth and high plant available water, meaning there is no major physical barrier to root growth. The topsoil has a low bulk density with good aeration and permeability. This decreases down the profile, resulting in the soil being imperfectly drained. Texture is silt loam in all horizons, with topsoil clay content of 25–30%, and the soils are typically stone free.

Typical chemical properties

Horizon	Depth (cm)	pH	P retention	CEC	BS	Ca	Mg	K	Na
Ap	0–19	Low	High	High	Low	Low	High	Low	High
Ap/Bw(g)	19–28	Moderate	High	High	Low	Low	Moderate	Very low	Moderate
Bw(g)	28–50	Low	High	Moderate	Very low	Very low	Moderate	Very low	Moderate
BC(g)	50–90+	Low	Moderate	Moderate	Very low	Very low	Moderate	Very low	Moderate

Key chemical properties

Topsoil organic matter levels are 13–16%; P-retention 60–75% and pH low–moderate (low–high 5s). Subsoil pH values are low. Cation exchange values are high but base saturation is low. Available magnesium levels are high but calcium and potassium levels are low. Reserve phosphorus levels are also low. Micronutrient levels are generally adequate.

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
Structural compaction	minimal	These soils have a minimal vulnerability to structural degradation by long-term cultivation, or compaction by heavy stocking and vehicles. This rating reflects the high organic matter content and P-retention.
Nutrient leaching	slight	These soils have a slight vulnerability to leaching to groundwater. This rating reflects the imperfect drainage, high water-holding capacity, and slow permeability.
Topsoil erodibility by water	minimal	Due to the high organic matter content, topsoil erodibility in these soils is minimal. Erodibility is highly dependent on management, particularly when there is no vegetation cover.
Organic matter loss	minimal	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).
Waterlogging	moderate	These soils have a moderate vulnerability to waterlogging during wet periods. This rating reflects the imperfect drainage and slow permeability.

General landuse versatility ratings for Haldane soils

Note: The versatility ratings in the table below are indicative of the major limitations for semi-intensive to intensive landuse. 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.

Haldane rolling deep (HaR1)

Versatility evaluation for soil HaR1		
Landuse	Versatility rating	Main limitation
Non-arable horticulture	Moderate	Inadequate aeration during wet periods; risk of short-term waterlogging after heavy rain.
Arable	Limited	Rolling slopes
Intensive pasture	Moderate	Inadequate aeration during wet periods; risk of short-term waterlogging after heavy rain.
Forestry	Moderate	Vulnerability to sustained waterlogging

Haldane undulating deep (HaU1)

Versatility evaluation for soil HaU1		
Landuse	Versatility rating	Main limitation
Non-arable horticulture	Moderate	Inadequate aeration during wet periods; risk of short-term waterlogging after heavy rain.
Arable	Moderate	Inadequate aeration during wet periods; risk of short-term waterlogging after heavy rain.
Intensive pasture	Moderate	Inadequate aeration during wet periods; risk of short-term waterlogging after heavy rain.
Forestry	Moderate	Vulnerability to sustained waterlogging

Haldane hilly deep (HaH1)

Versatility evaluation for soil HaH1		
Landuse	Versatility rating	Main limitation
Non-arable horticulture	Unsuitable	Hilly slopes
Arable	Unsuitable	Hilly slopes
Intensive pasture	Limited	Hilly slopes
Forestry	Moderate	Hilly slopes

Haldane steep deep (HaS1)

Versatility evaluation for soil HaS1		
Landuse	Versatility rating	Main limitation
Non-arable horticulture	Unsuitable	Steep slopes
Arable	Unsuitable	Steep slopes
Intensive pasture	Limited	Steep slopes
Forestry	Limited	Steep slopes

Management practices that may improve soil versatility

- Careful management after heavy rain and wet periods will reduce the impact of short-term waterlogging. Intensive stocking, cultivation and heavy vehicular traffic should be minimised during these periods.
- Installation and maintenance of subsurface mole and tile drains will reduce the risk of short-term waterlogging.

Soil profiles available for Haldane soils

Soil symbol	Profile ID	Topoclimate map sheet	Profile description available	Physical data available	Chemical data available	Profile photo available
HaR1	ST10	29	✓	✓	✓	✓
HaH1	ST2	29	✓	✓	✓	✓

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