

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: **Freestone**

Overview

Freestone soils occupy about 700 ha on outwash terraces of the Waiau river southwest of Manapouri township. They are formed in fine gravelly alluvium derived from Fiordland rocks. They are moderately deep to deep, very well drained soils, with moderately deep rooting depth, moderately high water holding capacity, and sandy loam textures. They are used for pastoral farming with sheep and beef cattle and are recognised as having cropping potential. Climate is cold in the winter and summers can occasionally be dry, when soils can dry out.

Soil classification

NZ Soil Classification (NZSC):

Typic Firm Brown; with stones; loamy over skeletal

Previous NZ Genetic Classification:

Very strongly leached yellow-brown loam

Classification explanation

Freestone soils have been reclassified from the previous classification based the soil properties being more similar to Brown soils. This is reflected in the firm subsoil, and P-retention of less than 85%. Freestone soils typically have gravels between 45 and 90cm depth, and sandy loam textures.

Soil phases and variants

Identified units in the Freestone soils are:

- Freestone undulating moderately deep (FsU2): has gravel between 45 and 90cm depth; occurs on slopes 0–7°
- Freestone undulating deep (FsU1): has no gravel within 90cm depth; occurs on slopes 0–7°

The soil properties described in this Technical Data Sheet are based on the most common phase, Freestone undulating moderately deep (FsU2). 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., Freestone undulating deep (FsU1).

Associated soils

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

- Monowai soils: occur on the same surface, but are shallow, stony soils
- Otanomomo: very poorly drained peat soils
- Te Anau: shallow and moderately deep soils forming on moraines
- Manapouri: deep, poorly drained due to a high groundwater table

Similar soils

Some soils that have similar properties to Freestone soils are:

- Mararoa: forming into loess on fans and terraces; has silty textures
- Tuatapere: formed into younger alluvium on floodplains and low terraces; has more varied soil properties depending on the age and parent material influence
- Ardlussa: forming into alluvium of rivers in northern Southland; has silty textures and lower P-retentions.

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.

Freestone profile	Horizon	Depth (cm)	Description
	Ap	0–17	Brownish black loamy silt; slightly firm soil strength; moderately developed fine polyhedral structure; abundant roots.
	Ap/Bw	17–24	Bright yellowish brown loamy silt; many worm casts; weak soil strength; moderately developed fine polyhedral structure; abundant roots
	Bw	24–52	Bright yellowish brown sandy loam; slightly firm soil strength; weakly developed coarse columnar grading to massive structure; many roots
	BC	52–64	Bright yellowish brown moderately gravelly sandy loam; slightly firm soil strength; massive structure; many roots.
	2C	64–90	Extremely gravelly sand; dense particle packing; massive structure; fine sub-rounded gravel; few roots.

Key profile features

Freestone soils have a topsoil 15–20cm deep with a moderately developed structure. Subsoil structural development is weak. The bright yellowish brown colours indicate the moderate weathering of the soils.

Typical physical properties

Note: values in *Italics* are estimates

Horizon	Depth (cm)	Bulk density	Permeability	Texture	Gravel content
Ap	0–17	Moderate	<i>Moderate</i>	Loamy sil	Gravel free
Ap/Bw	17–24	Moderate	<i>Moderate</i>	Loamy sil	Gravel free
Bw	24–52	Moderate – Hi	<i>Moderate</i>	Sandy lo	Gravel free
BC	52–64	Moderate – Hi	<i>Moderate</i>	Sandy lo	Moderately grave
2C	64–90	Moderate – Hi	<i>Rapid</i>	Sand	Extremely gravell

Profile drainage: Well
Plant readily available water: *Moderately high*
Potential rooting depth: Moderately deep
Rooting restriction: Subsoil gravelliness

Key physical properties

Freestone soils have a moderately deep rooting depth with moderately high plant-available water. They are well drained, with good aeration and permeability. Textures are loamy silts to sandy loams, and the topsoil clay content of 15–20%. The soils typically have gravels between 45 and 90cm. The deep phase has no gravels within 90cm depth, and has a deep rooting depth and high water-holding capacity.

Typical chemical properties

Horizon	Depth (cm)	pH	P retention	CEC	BS	Ca	Mg	K	Na
Ap	0–17	Moderate	High	Moderate	Low	Moderate	Very low	Very low	Very low
Ap/Bw	17–24	Moderate	High	Moderate	Very low	Very low	Very low	Very low	Very low
Bw	24–52	Moderate	High	Low	Very low	Very low	Very low	Very low	Very low
BC	52–64	Moderate	Moderate	Very low	Very low	Very low	Very low	Very low	Very low
2C	64–90	Moderate	Low	Very low	Very low	Very low	Very low	Very low	Very low

Key chemical properties

Topsoil organic matter levels are about 11%; P-retention values 75% and pH values moderate, with little change in the subsoil. Cation exchange values are moderate and base saturation low, with both properties grading to very low in the subsoil. Available magnesium, potassium, and sodium levels are very low. Reserve phosphorus levels are low, with high P-retention values compounding this. Micro-nutrient 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 good drainage, high organic matter and P-retention levels.
Nutrient leaching	moderate	These soils have a moderate vulnerability to leaching to groundwater. This rating reflects the good drainage and permeability, but is offset by the moderately high water-holding capacity.
Topsoil erodibility by water	minimal	Due to the topsoil clay percentage, the topsoil erodibility of 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	slight	These soils have a slight vulnerability to waterlogging during wet periods. This rating reflects the good drainage and permeability.

General landuse versatility ratings for Freestone 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.

FsU2 (Freestone undulating moderately deep)

Versatility evaluation for soil FsU2		
Landuse	Versatility rating	Main limitation
Non-arable horticulture	Moderate	Restricted rooting depth
Arable	High	No major limitations
Intensive pasture	Moderate	Vulnerability to nutrient leaching to groundwater
Forestry	Moderate	Restricted rooting depth.

FsU1 (Freestone undulating deep)

Versatility evaluation for soil FsU1		
Landuse	Versatility rating	Main limitation
Non-arable horticulture	High	No major limitations
Arable	High	No major limitations
Intensive pasture	Moderate	Vulnerability to nutrient leaching to groundwater
Forestry	High	No major limitations

Management practices that may improve soil versatility

- Management of nutrient applications that minimise leaching losses
- Can be seasonally dry in some years, with irrigation of benefit for growth.

Soil profiles available for Freestone soils

Soil symbol	Profile ID	Topoclimate map sheet	Profile description available	Physical data available	Chemical data available	Profile photo available
FsU2	PT02	38	✓	✓	✓	✓
FsU1	149/75/2	38	✓	✓		

Published by Crops for Southland with financial support from Environment Southland.

Copyright © 2002, Crops for Southland

This Technical Data Sheet may be reproduced in whole or in part and in any form for educational or non-profit purposes without special permission from the copyright holder, provided acknowledgement of the source is made. Crops for Southland and Environment Southland would appreciate receiving a copy of any publication that uses this Technical Data Sheet as a source.

No use of this Technical Data Sheet may be made for resale or for any other commercial purpose whatsoever without prior permission in writing from Crops for Southland.

Crops for Southland
PO Box 1306, Invercargill. New Zealand



www.cropssouthland.co.nz