

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: **Otararaia**

Overview

Otararaia soils occupy about 15,000 ha on rolling downs and hills in the Kaiwera district of eastern Southland and in southern Southland. They are formed into loess derived from schist, greywacke and tuffaceous greywacke. Otaraia soils are well drained and have a deep rooting depth, high water holding capacity, heavy silt loam textures and P-retention of 40–85%. Present use is pastoral grazing with sheep, beef cattle and deer. Climate is cool temperate with regular rain during the year.

Soil classification

NZ Soil Classification (NZSC):

Acidic Firm Brown; stoneless; silty

Previous NZ Genetic Classification:

Strongly leached southern yellow-brown earth.

Classification explanation

The NZSC of the Otaraia soils is consistent with the previous classification. Otaraia soils are well-drained soils with yellow-brown subsoils, and rarely suffer from drought. There is a subsoil horizon that is structureless, with slightly firm or greater soil strength that may limit root penetration, and has slow permeability that may cause waterlogging during wet periods. The soils are moderately leached, with a P-retention of 30–70%, have acidic subsoils (pH <5.5), are typically stone free and have heavy silt loam textures to 90cm depth.

Soil phases and variants

Identified units in the Otaraia soils are:

- Otaraia rolling deep (OrR1): has no gravel within 90cm depth; occurs on slopes of 7–15°
- Otaraia rolling moderately deep (OrR2): has gravel between 45 and 90cm depth; occurs on slopes of 7–15°
- Otaraia undulating deep (OrU1): has no gravel within 90cm depth; occurs on slopes of 0–7°
- Otaraia undulating moderately deep (OrU2): has gravel between 45 and 90cm depth; occurs on slopes of 0–7°
- Otaraia hilly deep (OrH1): has no gravel within 90cm depth; occurs on slopes of 0–7°
- Otaraia hilly moderately deep (OrH2): has gravel between 45 and 90cm depth; occurs on slopes of 15–25°
- Otaraia steep deep (OrS1): has no gravel within 90cm depth; occurs on slopes >25°

The soil properties described in this Technical Data Sheet are based on the most common phase, Otaraia rolling deep (OrR1). 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., Otaraia hilly deep (OrH1).

Associated soils

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

- Kaiwera: strongly leached shallow Brown soil formed in gravelly colluvium; P-retention of >85%
- Kuriwao: moderately leached, shallow Brown soil formed in gravelly colluvium; P-retention of 60–85%
- Craigdale: moderately leached, moderately deep Brown soil formed in loess overlying bedrock
- Haldane: imperfectly drained, deep Brown soil; occurs in complexes with strongly leached soils south of Waimahaka

Similar soils

Some soils that have similar properties to Otarara soils are:

- Tokanui: very similar soil, but occurs in hilly and rolling land east of the Matura River, south of Matura; does not have acidic subsoils
- Ferndale: imperfectly drained equivalent of the Otarara soil
- Rosemarkie: strongly leached upland equivalent of the Otarara soil; has P-retention of >85%
- Tuturau: occurs in near-source loess adjacent to the Matura river north of Waimahaka; has loamy silt textures in the subsoil

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.

Otarara profile	Horizon	Depth (cm)	Description
	Ap	0–25	Dark brown silt loam; weak soil strength; moderately developed fine polyhedral structure; abundant roots
	Ap/Bw	25–37	Yellowish brown silty clay; common worm casts; many yellowish brown mottles; weak soil strength; moderately developed fine blocky and polyhedral structure; abundant roots
	Bw	37–66	Yellowish brown silt loam; few worm casts; weak soil strength; weakly developed very fine blocky structure; few roots
	BC	66–90+	Yellowish brown silt loam; slightly firm soil strength; massive structure; few roots
	BC	66–90+	Yellowish brown silt loam; slightly firm soil strength; massive structure; few roots

Key profile features

Otarara soils have topsoils 20–30cm deep with a moderate to strongly developed structure. Subsoils have moderate structure that becomes compact and structureless below 50cm depth. The moderate weathering of the soils is reflected in the bright yellowish brown colour.

Typical physical properties

Note: values in *Italics* are estimates

Horizon	Depth (cm)	Bulk density	Permeability	Texture	Gravel content
Ap	0–25	Moderate	<i>Moderate</i>	Silt loam	Gravel free
Ap/Bw	25–37	Moderate – High	<i>Moderate</i>	Silty clay	Gravel free
Bw	37–66	Moderate – High	<i>Moderate</i>	Silt loam	Gravel free
BC	66–90+	Moderate – High	<i>Slow</i>	Silt loam	Gravel free

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

Key physical properties

Otarara soils have a deep rooting depth and high plant available water, meaning there is no major physical barrier to root growth. The soils are well drained but the compact subsoil is slowly permeable, which may cause short-term waterlogging after heavy rainfall. Texture is heavy silt loam in all horizons, and some horizons may be silty clay. The topsoil clay content is about 25–35%, and the soils are typically stone free.

Typical chemical properties

Horizon	Depth (cm)	pH	P retention	CEC	BS	Ca	Mg	K	Na
Ap	0–25	Low	Moderate	Moderate	Very low	Very low	Very low	Very low	Low
Ap/Bw	25–37	Low	Moderate	Low	Very low	Very low	Very low	Very low	Low
Bw	37–66	Moderate	Moderate	Low	Very low	Very low	Very low	Very low	Very low
BC	66–90+	Moderate	Moderate	Low	Very low	Very low	Very low	Very low	Low

Additional chemical properties (as a profile average)

Reserve potassium (kc) values are low; sulphate sulphur levels are high in the subsoil.

Key chemical properties

Topsoil organic matter levels are 6–8%; P-retention values 30–70% and pH levels low–moderate (low–mid 5s). Cation exchange values are moderate with base saturation low. Available calcium, magnesium and potassium levels are low, as is reserve phosphorus. Subsoils have high levels of sulphate sulphur. Molybdenum responses in legumes and boron responses in brassicas can be expected.

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	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, and the topsoil clay and P-retention values.
Nutrient leaching	moderate	These soils have a moderate vulnerability to leaching to groundwater. This rating reflects the high water-holding capacity and slow subsoil permeability.
Topsoil erodibility by water	slight	Due to the moderate to high clay content, topsoil erodibility in these soils is slight. 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, but slowly permeable subsoil.

General landuse versatility ratings for Otaraiā 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.

OrR1 (Otaraiā rolling deep)

Versatility evaluation for soil OrR1		
Landuse	Versatility rating	Main limitation
Non-arable horticulture	Moderate	Rolling slopes; risk of short-term waterlogging after heavy rain
Arable	Limited	Rolling slopes
Intensive pasture	Moderate	Vulnerability to leaching to groundwater; risk of short-term waterlogging after heavy rain
Forestry	High	Few limitations

OrU1 (Otaraiā undulating deep)

Versatility evaluation for soil OrU1		
Landuse	Versatility rating	Main limitation
Non-arable horticulture	Moderate	Risk of short-term waterlogging after heavy rain
Arable	Moderate	Risk of short-term waterlogging after heavy rain
Intensive pasture	Moderate	Vulnerability to leaching to groundwater; risk of short-term waterlogging after heavy rain
Forestry	High	Few limitations

OrR2 (Otarara rolling moderately deep)

Versatility evaluation for soil OrR2		
Landuse	Versatility rating	Main limitation
Non-arable horticulture	Moderate	Risk of short-term waterlogging after heavy rain, restricted rooting depth
Arable	Limited	Rolling slopes
Intensive pasture	Moderate	Vulnerability to leaching to groundwater; risk of short-term waterlogging after heavy rain
Forestry	Moderate	Restricted rooting depth

OrU2 (Otarara undulating moderately deep)

Versatility evaluation for soil OrU2		
Landuse	Versatility rating	Main limitation
Non-arable horticulture	Moderate	Risk of short-term waterlogging after heavy rain; restricted rooting depth
Arable	Moderate	Risk of short-term waterlogging after heavy rain
Intensive pasture	Moderate	Vulnerability to leaching to groundwater; risk of short-term waterlogging after heavy rain
Forestry	Moderate	Restricted rooting depth

OrH1 (Otarara hilly deep)**OrH2 (Otarara hilly moderately deep)**

Versatility evaluation for soil OrH1, OrH2		
Landuse	Versatility rating	Main limitation
Non-arable horticulture	Unsuitable	Hilly slopes
Arable	Unsuitable	Hilly slopes
Intensive pasture	Limited	Hilly slopes
Forestry	Moderate	Hilly slopes; restricted rooting depth on moderately deep soils.

OrS1 (Otarara steep deep)

Versatility evaluation for soil OrS1		
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 risk 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 on flatter terrain will reduce the risk of short-term waterlogging.
- If compaction occurs, aeration at the correct depth and moisture content can be of benefit.

Soil profiles available for Otarara soils

Soil symbol	Profile ID	Topoclimate map sheet	Profile description available	Physical data available	Chemical data available	Profile photo available
OrU1	KT1108R	42	✓	✓	✓	
OrR1	K123	42	✓			
OrU1	VT5	2	✓	✓	✓	✓
OrU1	GG/GW10	35	✓	✓		

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