Balfour Catchment Group

Fresh water health and landscape influences in Balfour Catchment

THRIVING SOUTHLAND
Tōnui ana te whenua. Tōnui ana te takata.
A thriving, prosperous land. A thriving, prosperous people.

AS AT OCTOBER 2022
Further updates will be included as new information becomes available.

Welcome to Balfour Catchment brochure

This Balfour Catchment Group brochure is one of a series of brochures on catchments in Southland.

Catchment Groups have been asking for more detailed insights into their individual catchments. This brochure provides insights based on available information, bringing together published science, research, data and information on the state of water, soil and land in the Balfour Catchment.

It provides details on what affects water quality and how these impact the rest of the catchment, including out-of-catchment areas that may be impacted by what goes on in the catchment, such as the estuary.

Although this brochure collates all the available information that has been brought together in a literature review commissioned by Thriving Southland – called the Science Report, ***thrivingsouthland.co.nz/science-report/*** - it may not have all the details you know about in your catchment, or the research you may have done on your farm or in your Catchment Group.

How to use this brochure

This brochure sets out publicly available details on:

- Water quality
- Landscape influences
- Physiographic zones
- Groundwater management zones (GMZs)
- Measuring what lives in streams and rivers
- Macroinvertebrate community index (MCI)
- Estuary health
- Where to get more information.

If you are not familiar with the terms and language used, read the brochure in conjunction with this glossary ***environment.govt.nz/publications/environment-aotearoa-2019-glossary***.

We also recommend you check out the Catchment Group page on ***thrivingsouthland.co.nz/balfour/*** to learn more about the catchment and what projects the Catchment Group has underway or planned.

Interpreting what the data in the brochure means

Because this brochure brings together the data available, we have deliberately not interpreted that data or explained what the trends may mean for your catchment.

We recommend you contact an environmental consultant, your Thriving Southland Catchment Group coordinator or Environment Southland to speak to experts who can explain what these trends and data may mean for your catchment, or for your farm specifically.

You can also check out a range of information on the Thriving Southland Information Resource Hub ***thrivingsouthland.co.nz/info-hub*** which will connect you with tools and resources from many different organisations to help you with understanding limit setting, environmental contributing factors, mitigations and options available to you.

A little bit about Thriving Southland

Thriving Southland supports Southland's Catchment Groups to understand challenges and opportunities in their catchments and create innovative and exciting solutions.

We have a vision to create a prosperous Southland, healthy people, and a healthy environment, and believe that by working together, Thriving Southland's communities will create a better future for all by protecting the region's prosperity, heritage, environment and health.

Thanks

Thank you to the farmers who supported the development of this brochure, and to the Ministry of Primary Industry for its Sustainable Land Use Programme which supports the work Thriving Southland is delivering for farmers and communities in Southland. Thank you also to Environment Southland who reviewed the content of this brochure.

Water quality and quantity in the Mataura Catchment

Mataura Catchment

Balfour is part of the Mataura Catchment which outflows via the Mataura River into the Toetoes (Fortrose) Estuary. The Mataura River and Toetoes Estuary are an important source of mahinga kai, particularly kanakana (lamprey), inanga (whitebait) and tuna (eels).

Land use and various industrial and municipal water discharges, are key contributors to the degradation of water quality in the Mataura Catchment. Currently the Toetoes Estuary is considered to be in poor condition.

The Mataura Water Conservation Order was made in 1997. This stipulates that at any point above the Mataura Island Road Bridge 95 percent of the natural flow in the Mataura River must remain, meaning only five percent of the flow in the Mataura River is available for allocation and use - e.g., irrigation, dairy supply - at any one time. The Mataura River above Gore has been over allocated (more water is allocated to abstractors than is allowed by the Water Conservation Order). Environment Southland is working with consent holders to resolve this.

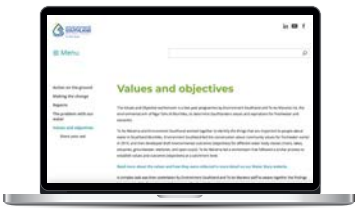
Summary of Balfour Catchment

The hydrology, health and functions of a stream/river or area of groundwater is directly linked to the characteristics of its catchment, including the landscape, soils and human activities.

- This catchment covers a mosaic of five different physiographic zones that differ in nitrate levels from land use
- It overlies parts of three main GMZs:
  - Waimea Plains GMZ, which has high nitrate levels near Balfour
  - Longridge GMZ, which has moderate to high nitrate levels
  - Riversdale GMZ, which has low nitrate levels close to the Mataura River, but high levels further from the river
- Water quality in this catchment is showing signs of stress. In places it is degraded in terms of nitrogen (groundwater and surface water), phosphorus (surface water), *E. coli* (faecal bacteria) (surface water), and the MCI.
- Neighbouring farms on different zones may have very different water quality outcomes with similar farm practices, due to different contamination movement and attenuation pathways (reducing the effects of contaminants).

What does this mean?

- In August 2020, the Government announced changes to the National Policy Statement for Freshwater Management (NPS-FM), the National Environmental Standard for Freshwater (NES) and changes to the Resource Management Act. These outline changes in regulations relating to wetlands and rivers, intensive winter grazing, intensification, stockholding areas and stock exclusion
- Environment Southland, in partnership with Te Ao Marama Incorporated (as the environmental arm of Ngāi Tahu Ki Murihiku), is working towards updating the Water and Land Plan in line with the 2020 NPS-FM. This update is known as Plan Change Tuatahi (first plan change), and will set limits, targets and methods (for discharges to and abstractions from waterways) that will help achieve hauora, a state of healthy resilience, for waterbodies. There will be an opportunity for public submissions to this plan in 2023 before it is finalised in 2025 ***waterandland.es.govt.nz/about/values-and-objective***



- Plan changes will result in additional controls and rules in Southland that will be focused on reducing the loss of nutrients, specifically nitrogen and phosphorus, and reducing discharges of sediment and faecal microorganisms, from land to groundwater and surface water
- In the Environment Southland Proposed Water and Land Plan there is a focus on good management practices (GMPs) and farm environmental management plans (FEPs). You can view GMP factsheets for each physiographic zone on The Environment Southland website. ***es.govt.nz***

* Te Ao Mārama Incorporated looks after mana whenua interests in resource management and other aspects related to local government in Southland. It is authorised to represent three Ngāi Tahu papatipu runanga in Murihiku/Southland. It is involved in the protection of the spiritual and cultural values of the region, including wahi tapu (sacred places), mahinga kai (gathering of food and resources) and other natural resources.

Balfour water quality

Surface water quality is assessed by testing how much nitrogen, phosphorus and *E. coli* is present. LAWA summary results for this catchment are shown below (***lawa.org.nz***):

Total oxidised nitrogen

Monitoring site	5-year median	5-year trend	10-year trend	15-year trend
Longridge Stream at Sandstone	3.7 mg/L			
North Peak Stream at Waimea Valley Road	0.27 mg/L			

^ Total Oxidized Nitrogen (TON) is the sum of nitrate and nitrite. Nitrite is generally a very small fraction of the TON concentration in rivers, TON is taken to be equivalent to the nitrate concentration

* 2016-2020 LAWA median per NPS-FM 2020 using TON as surrogate for NO_3-N

Too much TON can contribute to excessive algal growth in waterways.

Ammoniacal nitrogen

Monitoring site	5-year median	State	5-year trend	10-year trend	15-year trend
Longridge Stream at Sandstone	0.005 mg/L	C			
North Peak Stream at Waimea Valley Road	0.012 mg/L	B			

If ammoniacal nitrogen reaches very high concentrations it can become toxic under certain temperature and pH conditions.

Dissolved reactive phosphorus

Monitoring site	5-year median	State	5-year trend	10-year trend	15-year trend
Longridge Stream at Sandstone	0.03 mg/L	D			
North Peak Stream at Waimea Valley Road	0.014 mg/L	C			

Dissolved reactive phosphorus concentrations are an indication of a waterbody's ability to support nuisance algal or plant growths (algal blooms).

Total phosphorus

Monitoring site	5-year median	5-year trend	10-year trend	15-year trend
Longridge Stream at Sandstone	0.062 mg/L			
North Peak Stream at Waimea Valley Road	0.042 mg/L			

Too much phosphorus can encourage the growth of nuisance plants such as algal blooms.

KEY (STATE)

A Very good

B Good

C Fair

D Poor

KEY (TREND)

 Very likely improving

 Likely improving

 Indeterminate

 Very Likely degrading

 Likely Degrading

 Not Assessed

E. coli

Monitoring site	5-year median	State	5-year trend	10-year trend	15-year trend
Longridge Stream at Sandstone	250 n/100 mL	D			
North Peak Stream at Waimea Valley Road	210 n/100 mL	D			

* 2016-2020 LAWA median graded as per NPS-FM 2020

KEY (STATE)

A **Very good** (infection risk is 1%)

B **Good** (infection risk is 2%)

C **Fair** (infection risk is 3%)

D **Poor** (infection risk is >3%)

E **Very Poor** (infection risk is >7%)

KEY (TREND)

Very likely improving

Likely improving

Indeterminate

Very Likely degrading

Likely Degrading

Not Assessed

Results from lawa.org.nz (September 2022)

MCI

Macroinvertebrates include the caddisflies, mayflies, stoneflies, worms and snails that live in rivers. They are an important food source for fish and birds and sensitive to the combination of nutrients, sediment and habitat. Due to this sensitivity they are considered to be a good representation of overall water quality and ecosystem health. The different macroinvertebrates present can be identified and then converted to a score called the MCI.

A higher MCI score generally indicates a healthier stream. Generally, MCI scores range from >150 (very good water quality) to as low as 20 (very poor water quality).

The MCI scores for the Balfour Catchment are (LAWA September 2022):

MCI

Monitoring site	5-year median	State	10-year trend	15-year trend
Longridge Stream at Sandstone	81.0	D		
North Peak Stream at Waimea Valley Road	-	-	-	-

KEY (STATE)

A **Macroinvertebrate community indicative of pristine conditions with almost no organic pollution or nutrient enrichment.**

B **Macroinvertebrate community indicative of mild organic pollution or nutrient enrichment. Largely composed of taxa sensitive to organic pollution/ nutrient enrichment.**

C **Macroinvertebrate community indicative of moderate organic pollution or nutrient enrichment. There is a mix of taxa sensitive and insensitive to organic pollution/ nutrient enrichment.**

National bottom line: MCI score 90

D **Macroinvertebrate community indicative of severe organic pollution or nutrient enrichment. Communities are largely composed of taxa insensitive to inorganic pollution/nutrient enrichment.**

KEY (TREND)

Very likely improving

Likely improving

Indeterminate

Very Likely degrading

Likely Degrading

Not Assessed

Estuary Health

Table: Estuary state information (provided by Environment Southland July 2021 es.govt.nz state and outcome map).

The estuary is at the bottom of the Mataura Catchment and receives water from the Upper Mataura, Gore and Lower Mataura Catchments. Decisions made in the Catchment that affect water quality, flow downstream and impact on water quality in the estuary.

The below assessment of estuary health based on the sediment quality gives a good indication of what is happening upstream across all catchments that feed into waterways supplying the estuary and therefore impact on the ecosystems and the cultural values of the area.

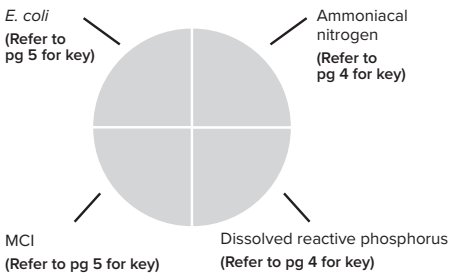
Estuary	Soft mud	Nutrients in sediment	Oxygen in sediment	Macroalgae cover	Seagrass loss	GEZ*
Waiau Lagoon/Te Wae		Poor	Fair			
Lake Brunton			Good			
Waituna Lagoon/Waiparera (not assessed)						
New River Estuary	Poor	Poor	Poor	Fair	Poor	Poor
Jacobs River Estuary	Poor	Fair	Poor	Poor	Poor	Poor
Waikawa Estuary	Poor	Fair	Poor	Good	Poor	Good
Haldane Estuary	Fair	Good	Very Good	Very Good		Very Good
Freshwater Estuary	Very Good	Good	Very Good	Good	Fair	Very Good
Waimatuku Estuary		Fair	Fair			
Toetoes Estuary	Fair	Good	Poor	Fair	Poor	Good

KEY Very Good · Good · Fair · Poor

* Gross Eutrophic Zone (GEZ) is defined as an area that has low sediment oxygenation (<1cm aRPD), soft mud (>25% mud content) and the presence of high macroalgal cover (>50% cover). These areas are in poor condition and can no longer support most estuarine animals and shellfish.

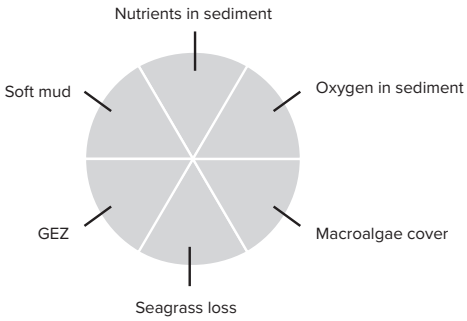
Mataura Catchment with estuaries and surface water quality monitoring sites

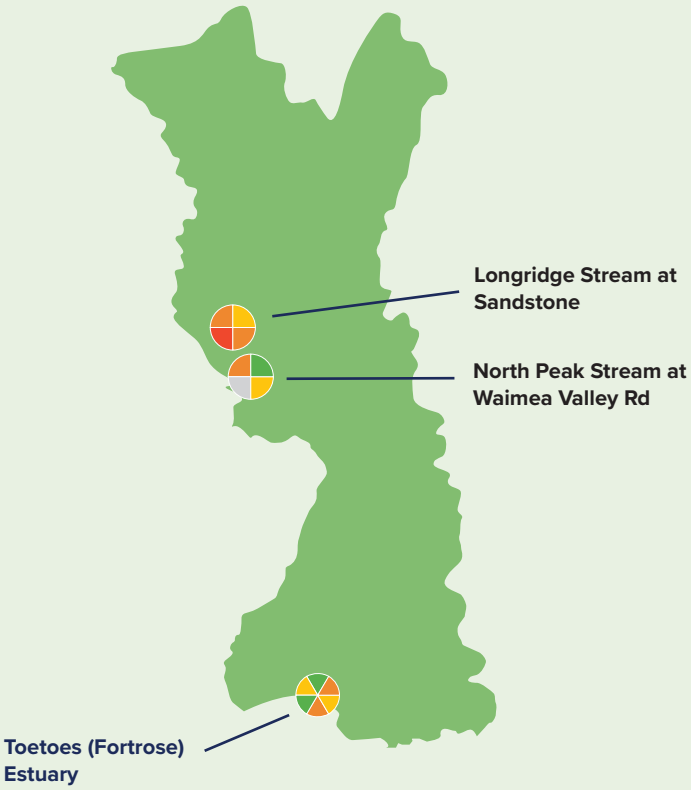
Water quality state and MCI



Estuary risk indicators

(Refer to pg 6 for key)





*sites in Balfour Catchment only shown

Landscape influences

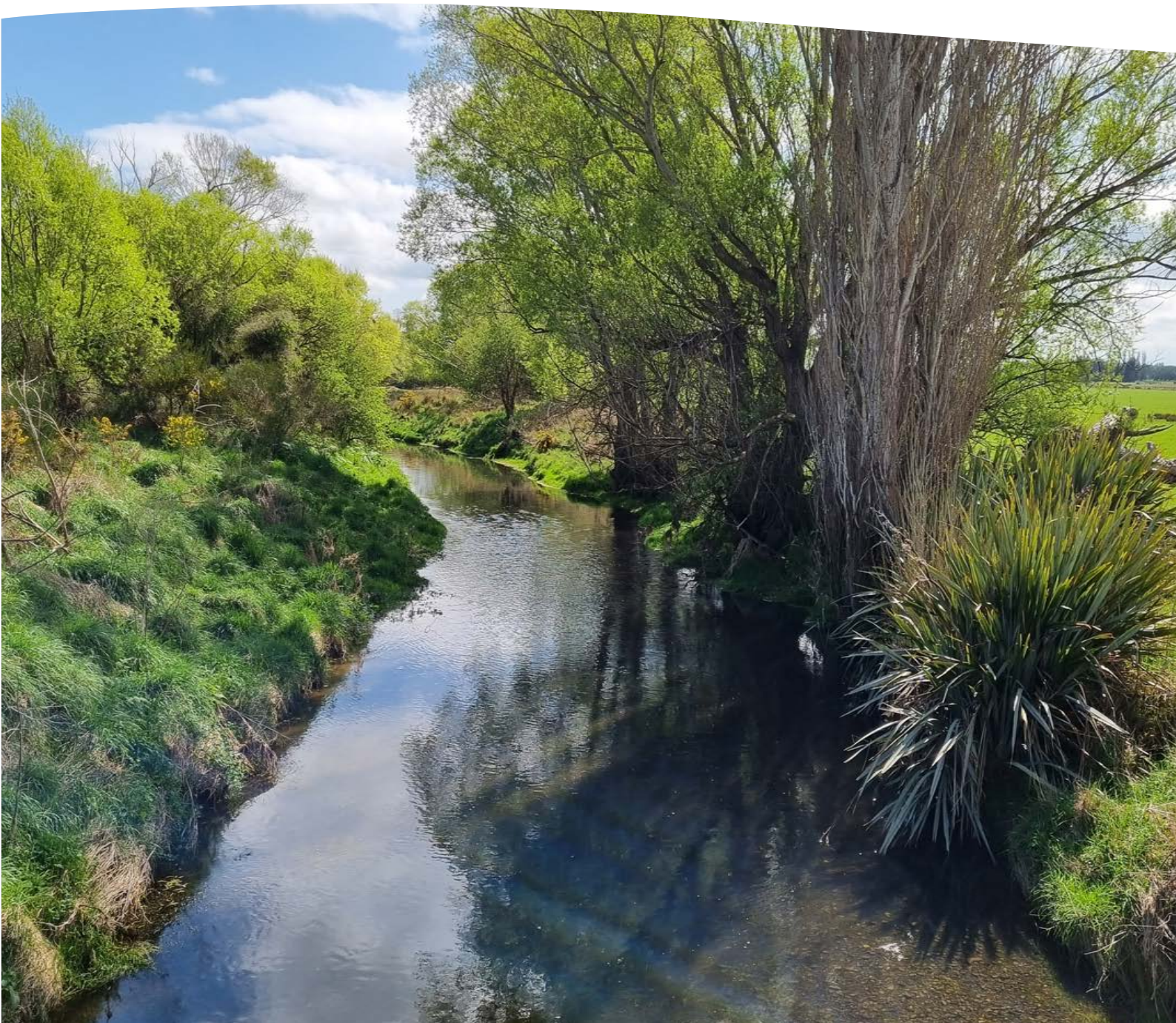
What we do on the land can affect our water, but how it affects our water depends on a range of factors, including how our landscape works. It is useful to look at:

- Physiographic zones which help to explain how nitrogen, phosphorus, sediment and faecal microorganisms (such as *E. coli*) move and are attenuated (reduced, e.g. by biological or chemical processes)
- GMZs which highlight the connectivity between land, surface water and groundwater.

Physiographic zones

Southland has been divided into nine physiographic zones to help understand how water moves across the landscape and why water quality is better in some places than others. Each physiographic zone represents an area that has similar factors influencing water quality, such as climate, topography, geology and soil type.

The Balfour Catchment area is a mosaic of five physiographic zones (see map below). These zones differ greatly in the way contaminants are transported and attenuated within the catchment.



Balfour Catchment showing physiographic zones

Bedrock/Hill country – overland flow

This zone is found on rolling to steep land below 800 metres. This zone is characterized by high rainfall and a dense network of branching streams.

Water quickly flows down-slope to nearby streams following high or prolonged rainfall. Nitrogen, phosphorus, sediment and faecal microorganisms are all carried with water, particularly during late autumn and winter.

Bedrock/Hill country

This zone is found on rolling to steep land below 800 metres that is flatter and more well drained compared to the overland flow areas (darker green).

Water quality risk is lower in these flatter areas due to high rates of denitrification* in the soil.

Oxidising

Soils and aquifers in this zone have high risk of nitrogen build-up due to low rates of denitrification. Denitrification occurs when nitrate is converted to nitrogen gas via various reactions involving bacteria. Where denitrification occurs, nitrogen is effectively 'lost' from soil and water as a gas. This is a form of 'attenuation'.

The combination of flat land and well drained soils results in high rates of nitrogen leaching (deep drainage) to underlying aquifers.

Oxidising – overland flow

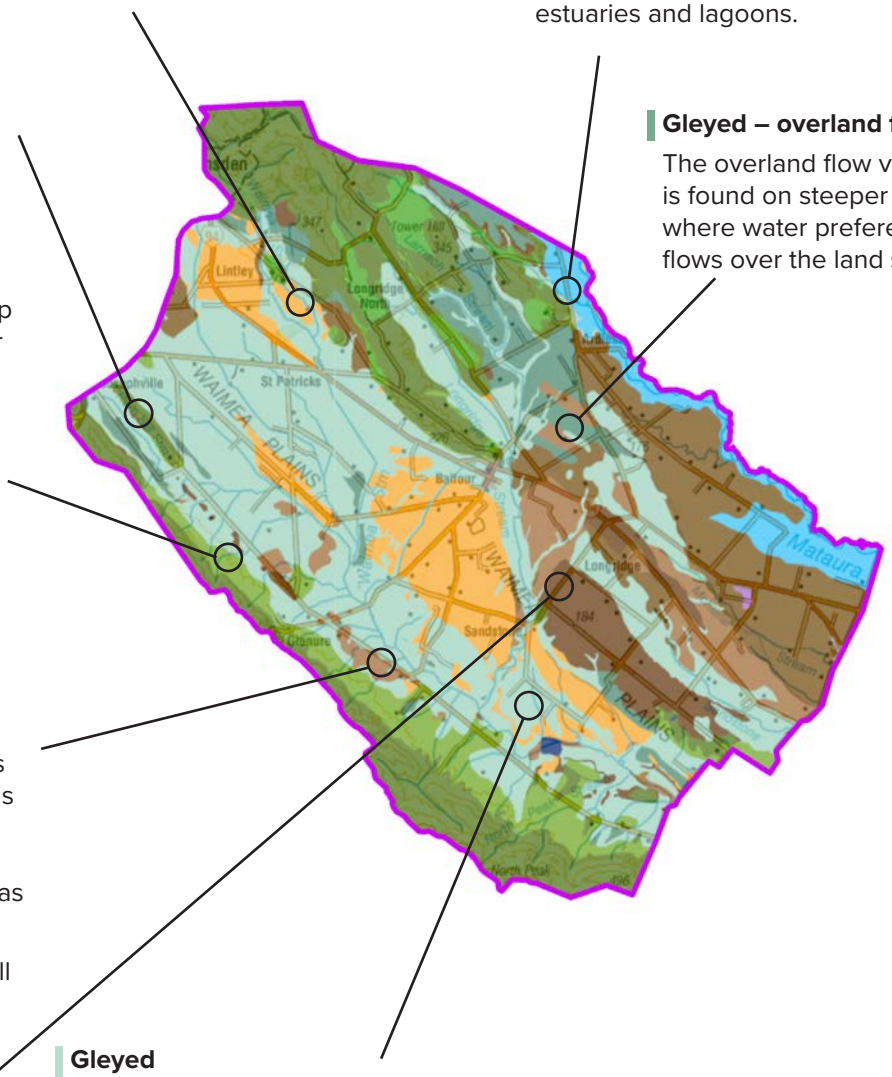
The overland flow variant is found on steeper areas where water preferentially flows over the land surface.

Old Mataura

This zone has low denitrification potential in soils and aquifers. As a result, nitrate levels can accumulate to high concentrations.

Riverine

Located along the margins of major rivers, this zone is characterized by shallow, stony soils that drain quickly to underlying shallow aquifers. This zone transports contaminants, particularly nitrogen, to coastal estuaries and lagoons.



Gleyed – overland flow

The overland flow variant is found on steeper areas where water preferentially flows over the land surface.

Gleyed

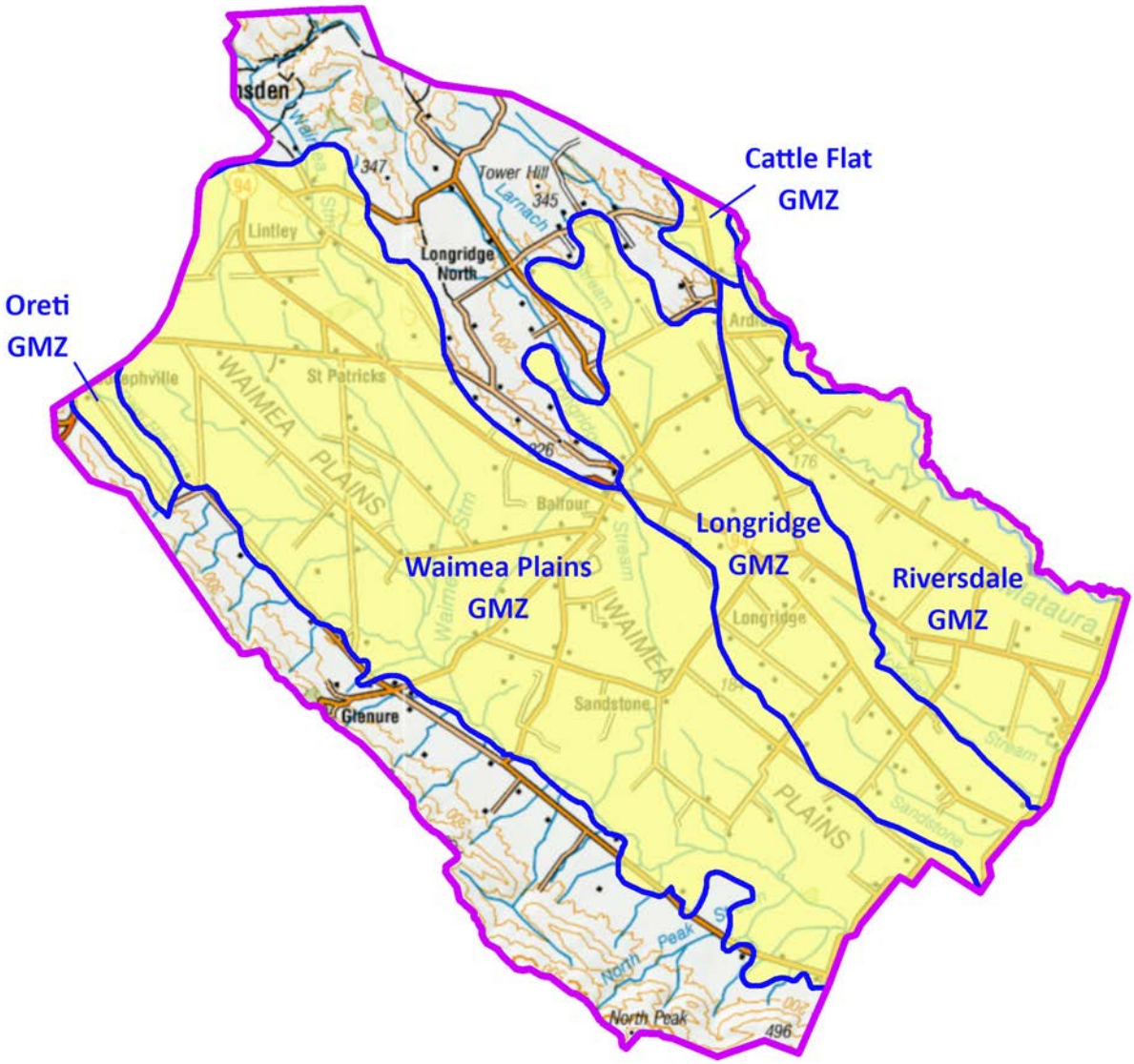
This zone is generally found in areas that were once wetlands. It is characterized by a dense network of streams and a high water table during winter.

Soils are prone to waterlogging and have some denitrification ability, which reduces build-up of soil nitrogen. However, an extensive network of artificial drainage rapidly transports nitrogen, phosphorus, sediment and faecal microbes to surface water, particularly during heavy rain.

Map Source: Environment Southland *maps.es.govt.nz/index.aspx?app=water-and-land*

GMZ – Balfour

Large areas of the Balfour Catchment area overlie aquifers of the Waimea Plains, Longridge and Riversdale GMZs. Small areas overlie parts of the Oreti and Cattle Flat GMZs (see map below).

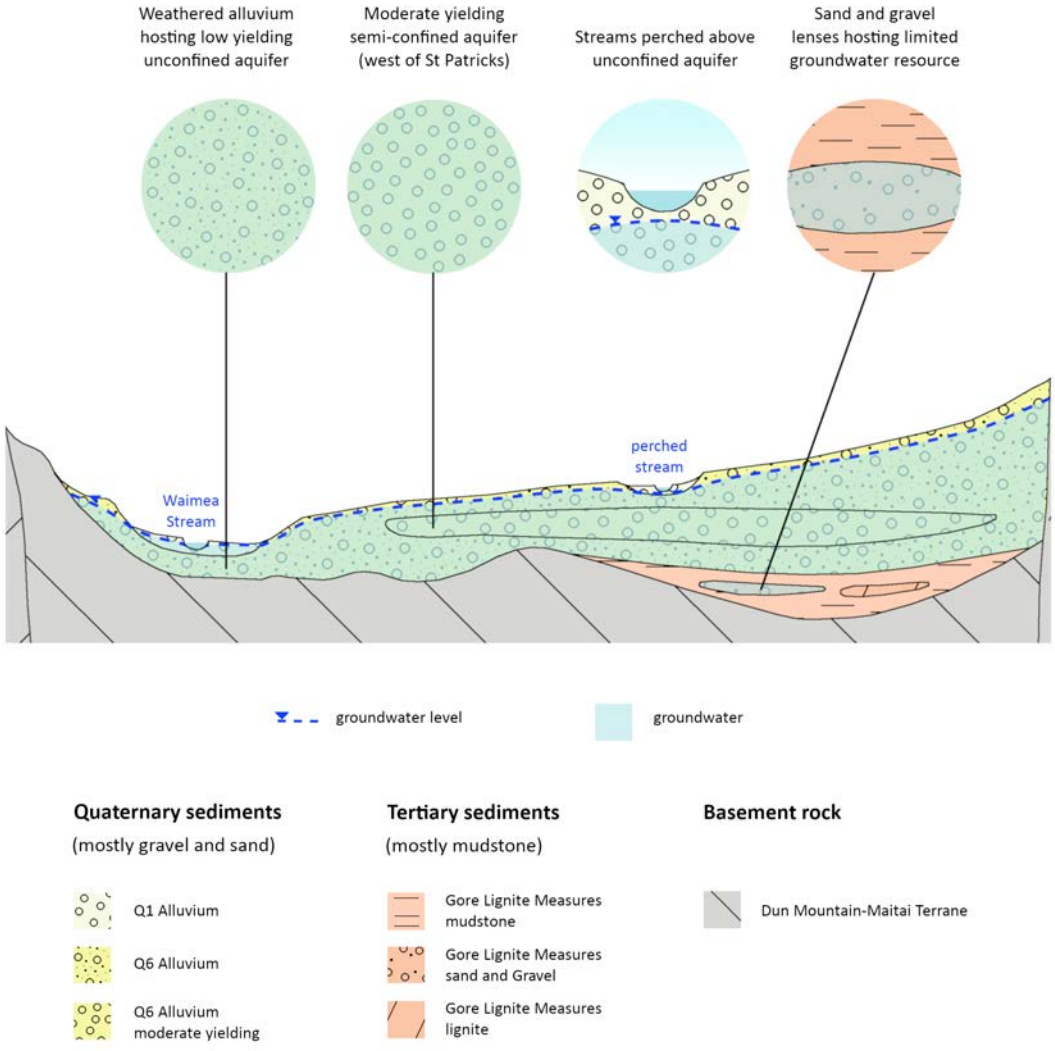


Map Source: Environment Southland *maps.es.govt.nz/index.aspx?app=water-and-land*

Waimea Plains GMZ

The Waimea Plains GMZ covers an area of approximately 19,700 ha encompassing the catchment of the Waimea Stream, which extends west of Mandeville to the margins of the Oreti River south of Lumsden:

- Depth to groundwater ranges from one-five metres. Groundwater levels are generally shallow towards the western end of the Waimea Plains, becoming deeper south of Balfour
- Seasonal variation in groundwater levels is generally one and a half to two and a half metres following seasonal patterns in rainfall
- See below for a diagrammatic cross-section of this GMZ showing areas of groundwater (source ***es.govt.nz/environment/water/groundwater/groundwater-management-zones/waimea-plains***)
- Groundwater recharge in this zone is derived from local rainfall and runoff from surrounding hills that soaks through the soil therefore, there is a high risk of groundwater contamination from leaching. Discharge occurs as baseflow to streams and artificial drainage networks, particularly along the western end of the Waimea Plains.



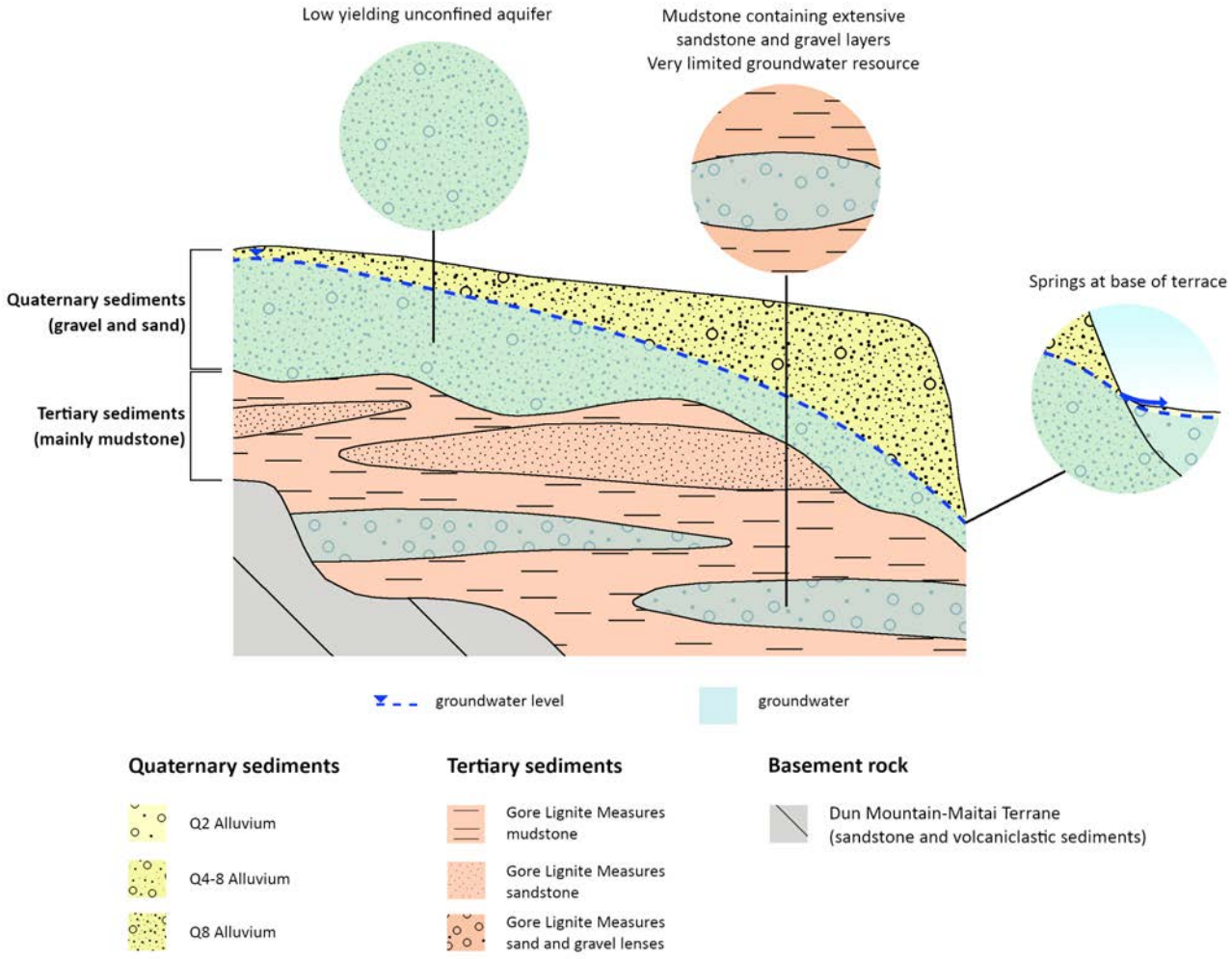
Groundwater quality Waimea Plains GMZ

- Nitrate = variable, with very high levels near Balfour
- Phosphorus = low
- *E. coli* = low, but risk may be elevated close to source.

Londridge GMZ

The Longridge GMZ covers an elongated area of approximately 8,200 ha located on the north-eastern margin of the Waimea Plain:

- Depth to groundwater typically ranges from five to seven metres, becoming shallower toward the western part of the zone
- Groundwater levels are generally highest in winter and lowest in early autumn, ranging from two and a half to three and a half metres
- See below for a diagrammatic cross-section of this GMZ showing areas of groundwater (source ***es.govt.nz/environment/water/groundwater/groundwater-management-zones/longridge***)
- Groundwater recharge in this zone is derived from local rainfall that soaks through the soil therefore, there is a high risk of groundwater contamination from leaching. Discharge occurs as springs and as through-flow to the neighbouring Riversdale GMZ. Groundwater quality in the Longridge GMZ directly affects the adjoining Riversdale GMZ.



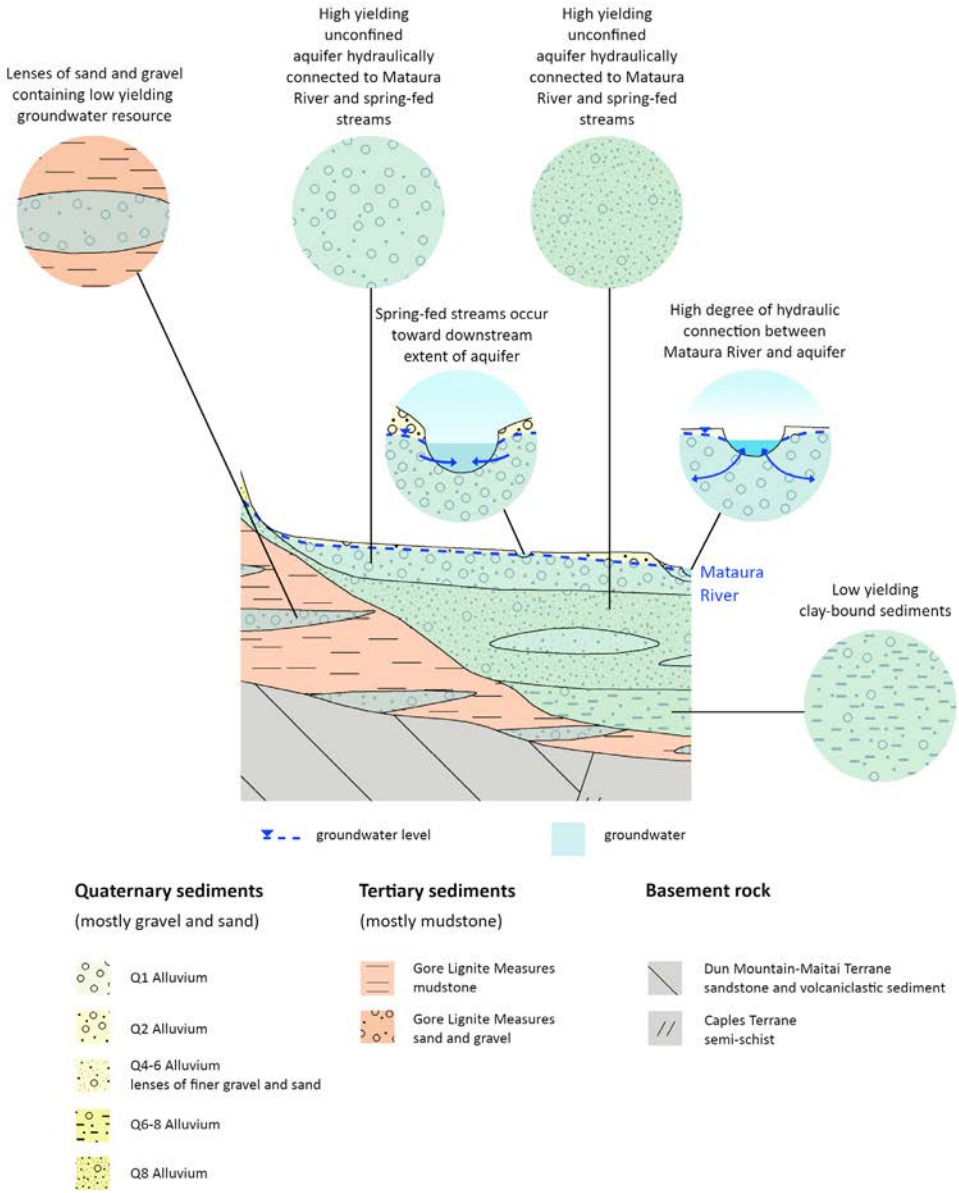
Groundwater quality Longridge GMZ

- Nitrate = moderate to high
- Phosphorus = low
- *E. coli* = low, but risk may be elevated close to source.

Riversdale GMZ

The Riversdale GMZ covers an area of approximately 11,000 ha, encompassing a large terrace in the middle reaches of the Mataura catchment:

- Depth to groundwater typically ranges from one to three metres
- Groundwater levels are less than one metre due to the high level of connectivity with the Mataura River
- See below for a diagrammatic cross-section of this GMZ showing areas of groundwater (source ***es.govt.nz/environment/water/groundwater/groundwater-management-zones/riversdale***)
- Groundwater recharge in this zone is derived from local rainfall that soaks through the soil and recharge from the Mataura River. This has a flushing effect close to the river and is reflected in lower groundwater nitrate levels close to the Mataura River. Discharge occurs to the Mataura River and a number of springs across the edge of the terrace.



Groundwater quality Riversdale GMZ

- Nitrate = low in areas close to the Mataura River (due to flushing), but moderate to high away from the river
- Phosphorus = low
- *E. coli* = low, but risk may be elevated close to source, particularly on well drained soils.

Notes

Notes

Find out more

Find out more about physiographic zones
bit.ly/2Ol7z7F

Find out more about Southland's groundwater
bit.ly/30Db5g1

Find out more about stream health

Environment Southland
es.govt.nz/environment/water/rivers-and-streams

Land Air Water Aotearoa (LAWA)
lawa.org.nz

Ministry for the Environment
environment.govt.nz/facts-and-science/freshwater

Link to iwi freshwater objectives
bit.ly/2P4HsBV

Get in contact

For more information about your catchment and to contact your local catchment coordinator

021 466 700 | office@thrivingsouthland.co.nz
thrivingsouthland.co.nz/catchment-groups

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