Between the Domes Catchment Group

Fresh water health and landscape influences in Between the Domes Catchment

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

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

Welcome to Between the Domes Catchment brochure

This Between the Domes 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 Between the Domes 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 the 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/environmentaotearoa-2019-glossary***.

We also recommend you check out the Catchment Group page on ***thrivingsouthland.co.nz/between-the-domes/*** 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 in Oreti Catchment

Oreti Catchment

Between the Domes is part of the Oreti Catchment which outflows into the New River Estuary. The Oreti River and the New River Estuary are an important source of mahinga kai, particularly waterfowl, eels and inanga (whitebait).

Currently the New River Estuary is considered to be in poor condition as a result of rural, urban, industrial and historic practices.

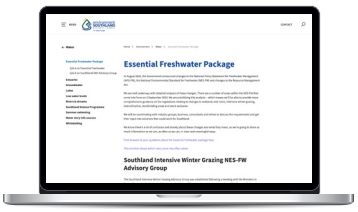
Summary of Between the Domes Catchment

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 six different physiographic zones that differ greatly in nitrate levels from land use
- It overlies two whole GMZs:
  - Five Rivers, moderate to very high nitrate levels
  - Castlerock, moderate to high nitrate levels
- It also overlies parts of the following GMZs:
  - Centre Hill, low to moderate nitrate levels
  - Oreti, generally low nitrate levels
  - Dipton, low to moderate nitrate levels
  - Upper Aparima, variable nitrate levels, with some areas having high concentrations
- Water quality in this catchment is variable, with some areas showing signs of stress. In places it is degraded in terms of nitrogen (surface and groundwater), and *E. coli* (faecal bacteria) (surface water)
- 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
- More about Environment Southland's response to the Government's Essential Freshwater Package is here ***es.govt.nz/environment/water/essential-freshwater-package***



Environment Southland, in partnership with Te Ao Mārama Inc*, has indicated that a proposed limits and targets' plan change (LTPC) will be notified in 2023. This will establish nutrient limits and targets to improve the quality of groundwater and surface water. ***waterandland.es.govt.nz/about/values-and-objectives***

- Environment Southland and Te Ao Mārama Inc have established a community-based regional forum to consider and advise on limits, targets and methods
- 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.

Between the Domes 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
Cromel Stream at Selbie Rd	0.009 mg/L			
Irthing Stream at Ellis Rd	1.61 mgL			
Oreti River at Lumsden Bridge	0.67 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
Cromel Stream at Selbie Rd	0.005 mg/L	A			
Irthing Stream at Ellis Rd	0.005 mg/L	A			
Oreti River at Lumsden Bridge	0.005 mg/L	A			

* 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
Cromel Stream at Selbie Rd	0.002 mg/L	A			
Irthing Stream at Ellis Rd	0.002 mg/L	A			
Oreti River at Lumsden Bridge	0.002 mg/L	A			

* 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
Cromel Stream at Selbie Rd	0.004 mg/L			
Irthing Stream at Ellis Rd	0.007 mg/L			
Oreti River at Lumsden Bridge	0.005 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
Cromel Stream at Selbie Rd	11n/100 mL	A			
Irthing Stream at Ellis Rd	70n/100 mL	D			
Oreti River at Lumsden Bridge	50n/100 mL	B			

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

Results from lawa.org.nz (October 2021)

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

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 Between the Domes Catchment are (LAWA October 2021):

MCI

Monitoring site	5-year median	State	10-year trend	15-year trend
Cromel Stream at Selbie Rd	121.0	B		
Irthing Stream at Ellis Rd	120.0	B		
Oreti River at Lumsden Bridge	115.0	B		

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.

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

National bottom line: MCI score 90

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).

Although the New River Estuary is not in the Between the Domes Catchment, it is an important factor in understanding the impacts of water quality in Between the Domes. Decisions made in the catchment that affect water quality, flow downstream and impact on water quality in the estuary.

The New River Estuary has been significantly affected by urban and rural development over the past 150 years. This includes large areas of reclaimed land, urban discharges including treated sewage and untreated stormwater, past landfill leaching, and agricultural activities and run-off further up the catchment.

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.

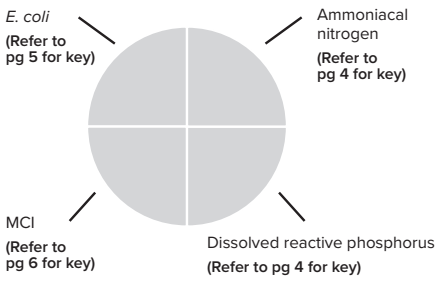
Estuary	Soft mud	Nutrients in sediment	Oxygen in sediment	Macroalgae cover	Seagrass loss	GEZ*
Waiau Lagoon/Te Wae		Poor	Fair			
Lake Brunton			Good			
Waituna Lagoon/Waiparera (not assessed)						
New River Estuary	Poor	Poor	Poor	Fair	Poor	Poor
Jacobs River Estuary	Poor	Fair	Poor	Poor	Poor	Poor
Waikawa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

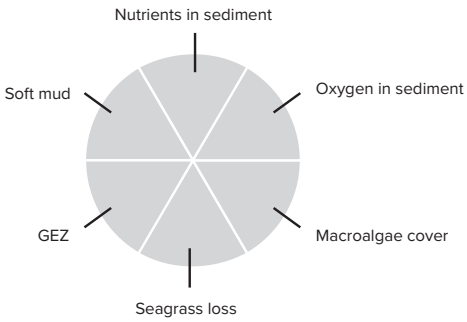
Oreti Catchment with estuaries and surface water quality monitoring sites*

Water quality state and MCI



Estuary risk indicators

(Refer to pg 7 for key)



*sites in Between the Domes 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.

Extensive areas of the Between the Domes Catchment fall into the alpine and bedrock/hill country physiographic zones. Lower lying areas are mainly classified as oxidising, gleyed or riverine. A minor component is the peat wetlands physiographic zone (see map below). These zones differ in the way contaminants are transported and attenuated within the catchment.

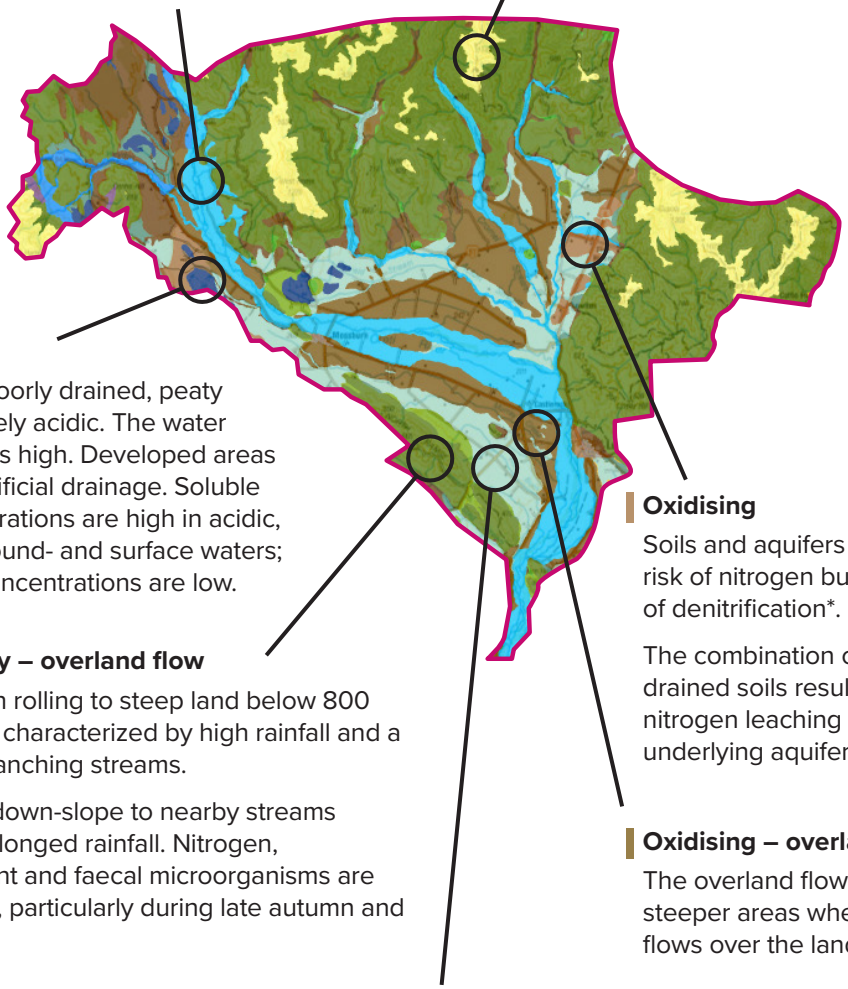
Between the Domes Catchment showing Physiographic Zones

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.

Alpine

This zone occupies land above 800 metres elevation. It is steeply sloping, with high rainfall and snow. There is limited loss of nutrients and faecal microbial contamination from this zone due to low land use intensity.



Peat wetlands

This zone features poorly drained, peaty soils that are extremely acidic. The water table in these areas is high. Developed areas require extensive artificial drainage. Soluble phosphorus concentrations are high in acidic, oxygen depleted ground- and surface waters; conversely nitrate concentrations are low.

Oxidising

Soils and aquifers in this zone have high risk of nitrogen build-up due to low rates of denitrification*.

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

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.

Oxidising – 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.

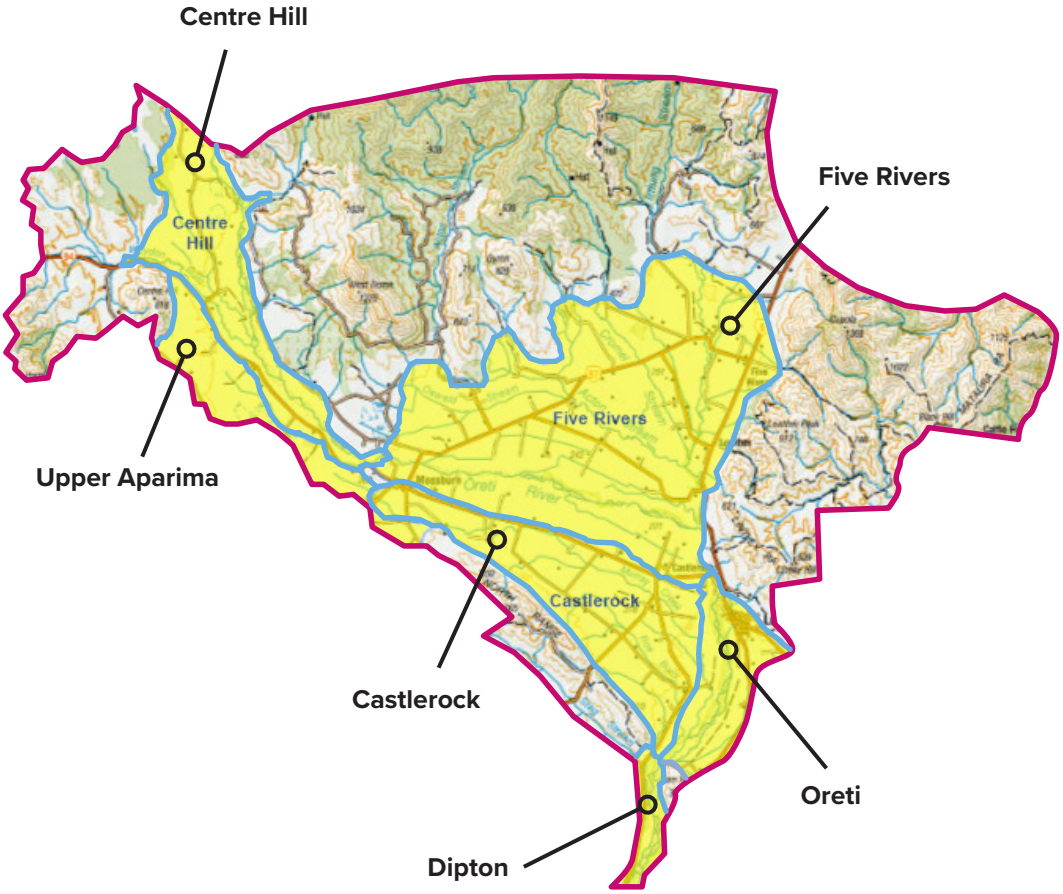
Soils are prone to waterlogging and have some denitrification ability, which reduces build-up of soil nitrogen. However, an extensive network of artificial drainage rapidly transports nitrogen, phosphorus, sediment and faecal microbes to surface water, particularly during heavy rain.

* 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.

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

GMZ – Between the Domes Catchment

The Between the Domes Catchment overlies six GMZs. These zones differ in geology and contaminant levels.

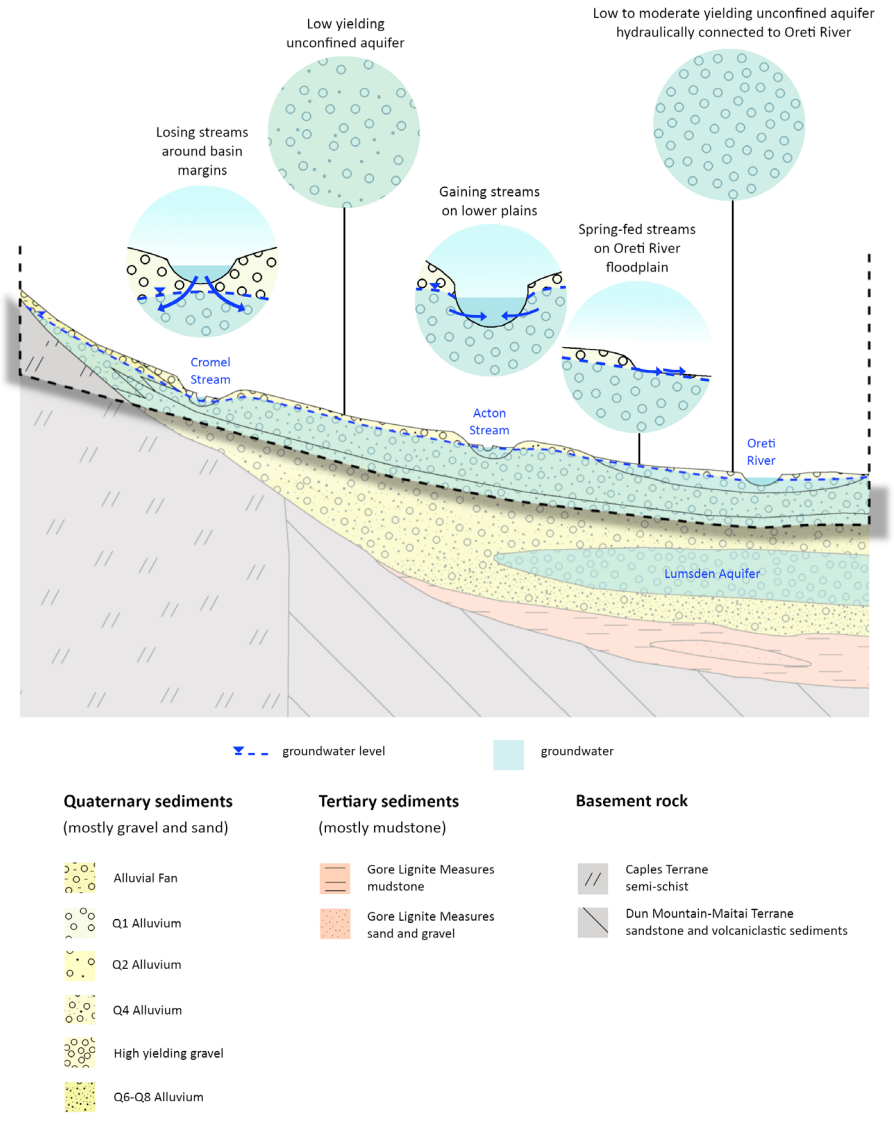


Map Source Environment Southland *maps.es.govt.nz/index.aspx?app=water-and-land*

Five Rivers GMZ

The Five Rivers GMZ covers an area of approximately 13,800 ha. It extends across the central and northern areas of the Oreti Basin to the foothills of the surrounding Eyre Mountains and Mataura Range:

- Depth to groundwater generally occurs within two to three metres of the ground surface across most of the zone
- Seasonal groundwater level varies between one-two metres
- Note that the Lumsden Aquifer is a confined aquifer that sits below the Five Rivers GMZ, separated by a layer of silty gravel
- A diagrammatic cross-section of this GMZ showing areas of groundwater is provided below (source ***es.govt.nz/environment/water/groundwater/groundwater-management-zones/five-rivers***)
- Groundwater recharge in this zone is derived from local rainfall and runoff from surrounding hills that soaks through the soil. There is a high risk of groundwater contamination from leaching in this zone. There is a high level of connection between the Oreti River and its tributaries and groundwater. Many of these waterways lose water to groundwater as they flow from headwaters in surrounding hills then gain flow from groundwater discharge in their lower reaches
- Discharge also occurs to the many spring-fed streams on the Oreti River floodplain.



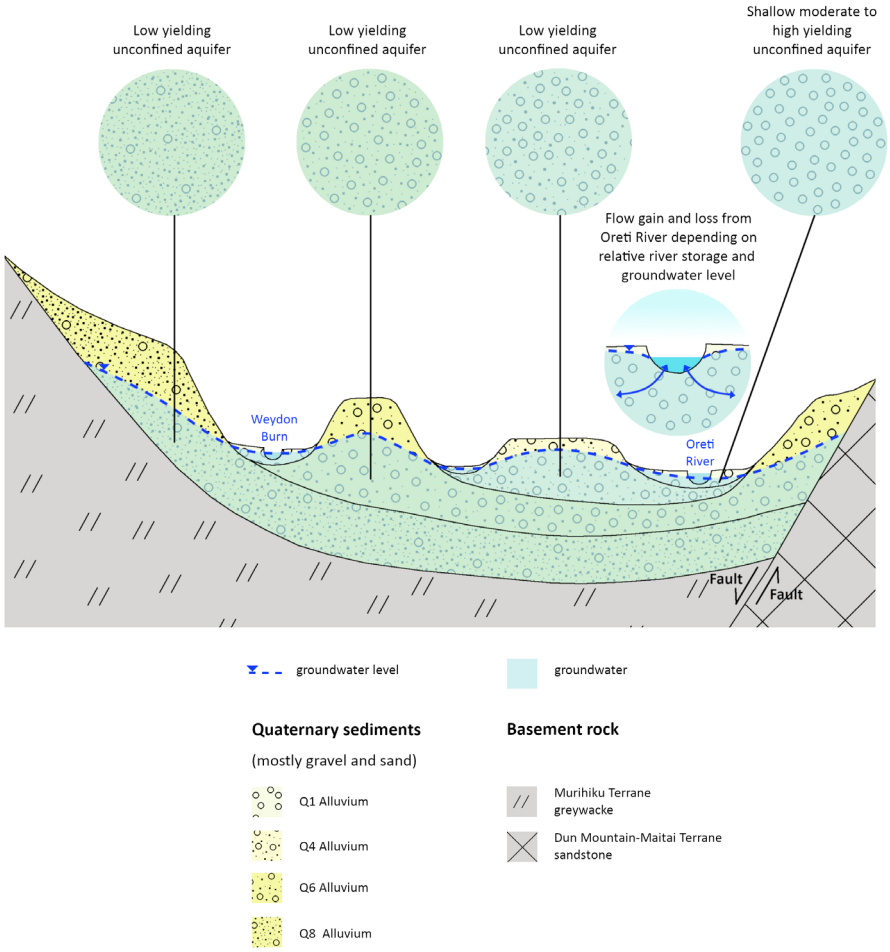
Groundwater quality Five Rivers GMZ

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

Centre Hill GMZ

The Centre Hill GMZ covers an area of approximately 6,000 ha, encompassing gravel deposits along the upper Oreti River, upstream of Rocky Point:

- Depth to groundwater typically ranges from one-two metres on the Oreti River floodplain, increasing to about five metres on higher terraces
- Groundwater level variation is about two metres, reducing close to the Oreti River
- A diagrammatic cross-section of this GMZ showing areas of groundwater is provided below (source ***es.govt.nz/environment/water/groundwater/groundwater-management-zones/centre-hill***)
- Groundwater recharge in this zone is derived from local rainfall and runoff from surrounding hills that soaks through the soil. There is a high level of connectivity between the Oreti River and groundwater in this zone
- Discharge occurs to the Oreti River and a number of spring-fed streams.



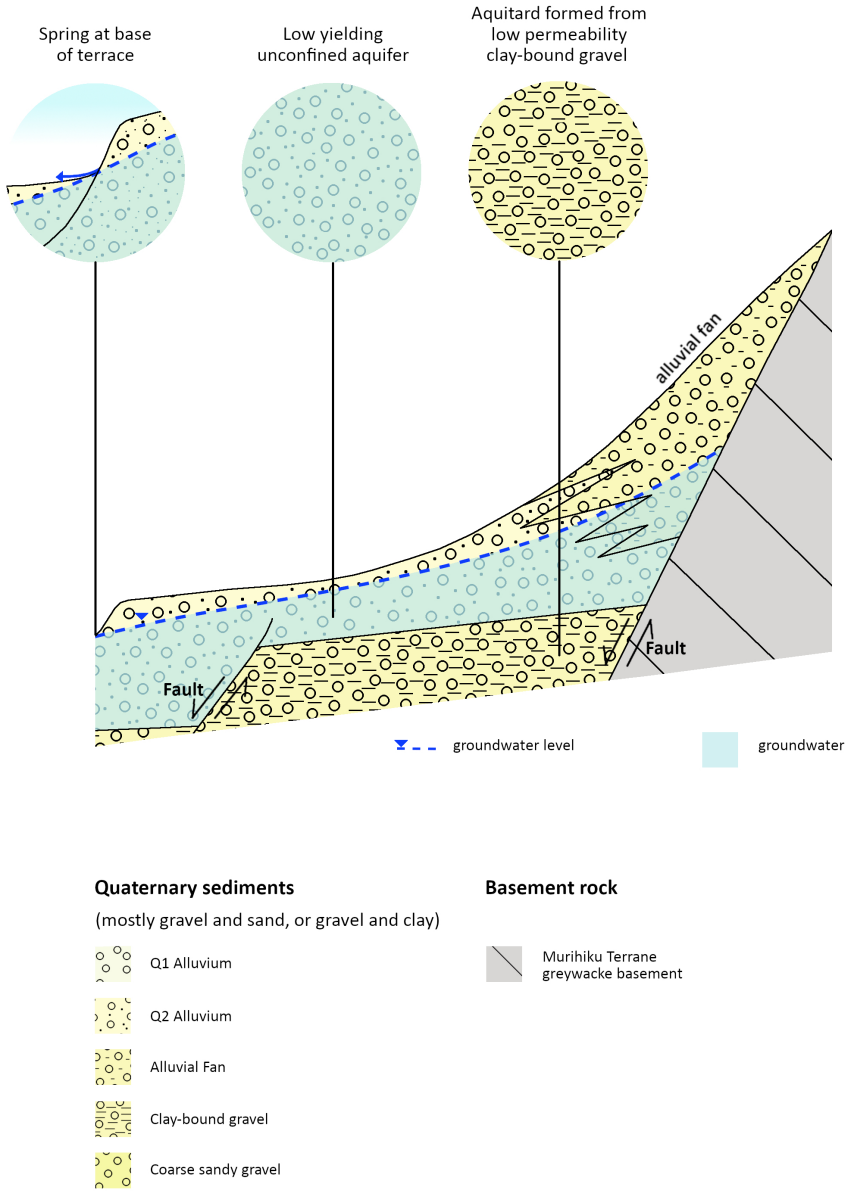
Groundwater quality Centre Hill GMZ

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

Castlerock GMZ

The Castlerock GMZ covers an area of approximately 6,600 ha, encompassing an elevated terrace that runs along the foot slopes of the North Range in the middle reaches of the Oreti River Catchment:

- Depth to groundwater typically ranges from two-six metres, becoming shallower toward the northern and eastern terrace margins
- Seasonal groundwater level variation is usually less than two metres
- A diagrammatic cross-section of this GMZ showing areas of groundwater is provided below (source ***es.govt.nz/environment/water/groundwater/groundwater-management-zones/castlerock***)
- Groundwater recharge in this zone is derived from local rainfall and runoff from surrounding hills that soaks through the soil
- Groundwater discharge mostly occurs via springs and as throughflow to the neighbouring Oreti GMZ. Therefore the water quality of the Castlerock GMZ, also affects the lower lying Oreti GMZ.



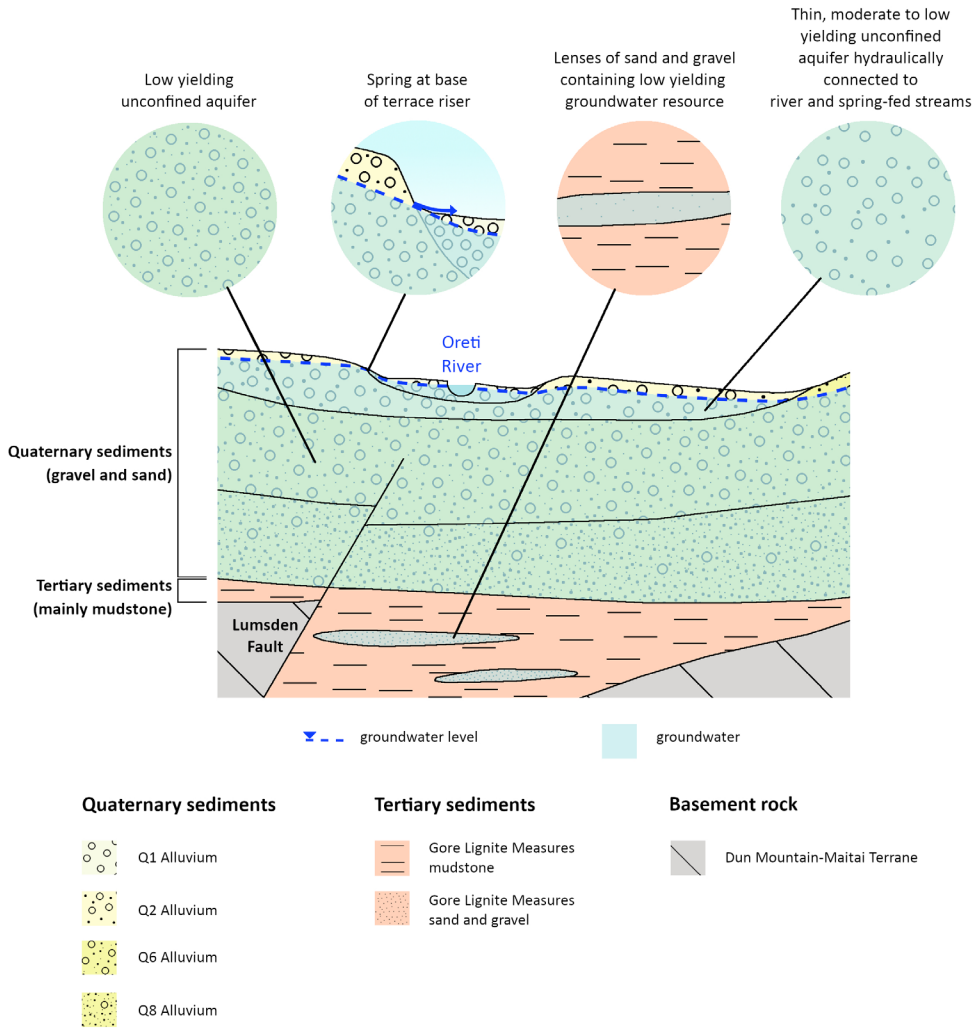
Groundwater quality Castlerock GMZ

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

Oreti GMZ

The Oreti GMZ covers an area of approximately 3,300 ha in the middle reaches of the Oreti River between Lumsden and Ram Hill:

- Depth to groundwater is generally less than two metres
- Seasonal groundwater level variation is typically less than two metres
- A diagrammatic cross-section of this GMZ showing areas of groundwater is provided below (source ***es.govt.nz/environment/water/groundwater/groundwater-management-zones/oreti***)
- Groundwater recharge in this zone is derived from local rainfall that soaks through the soil and recharge from the Oreti River. This zone also receives throughflow from the neighbouring Castlerock GMZ
- Groundwater discharges to the Oreti River between Lumsden and Ram Hill, and spring-fed streams such as Murray Creek and the Roe Burn.



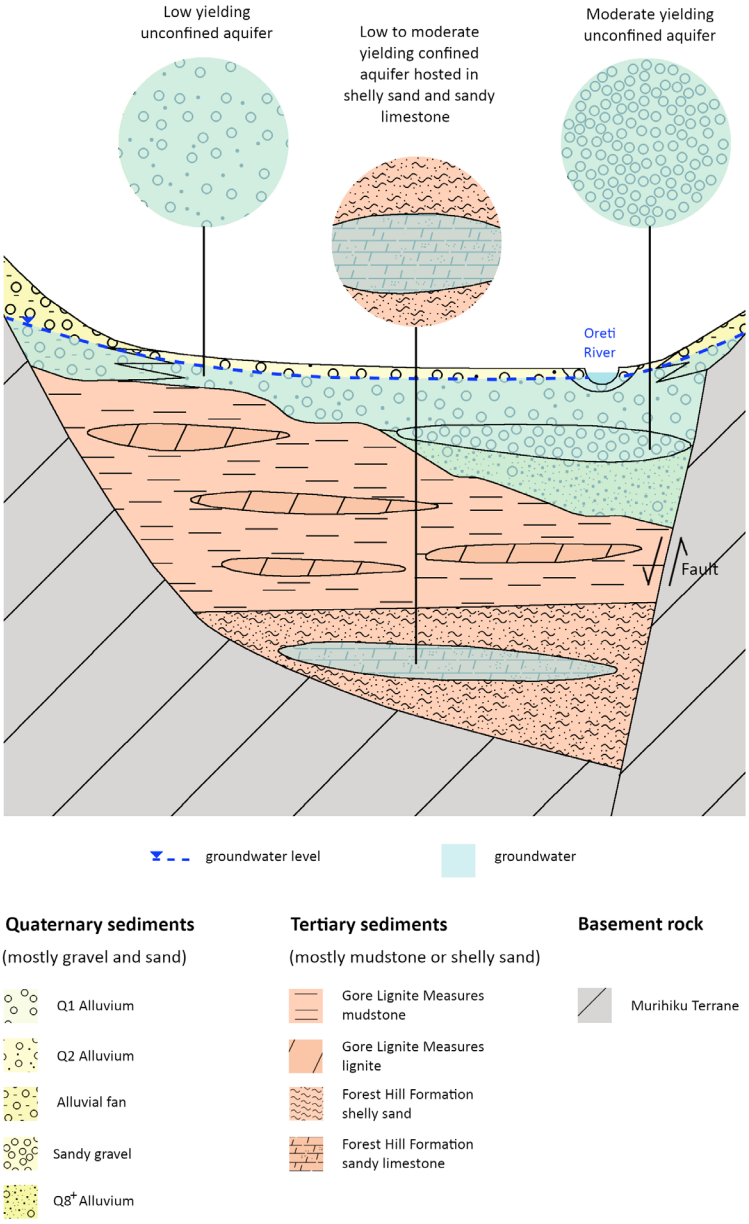
Groundwater quality Oreti GMZ

- Nitrate = generally low, but can be elevated due to intensive land use
- Phosphorus = low
- *E. coli* = low, but risk may be elevated close to source in coarse-grained aquifers.

Dipton GMZ

The Dipton GMZ covers an area of approximately 11,700 ha between the Hokonui Hills to the east and the Taringatura Hills to the west:

- Depth to groundwater is generally less than two metres
- Seasonal groundwater level variation is typically less than two metres
- A diagrammatic cross-section of this GMZ showing areas of groundwater is provided below (source ***es.govt.nz/environment/water/groundwater/groundwater-management-zones/dipton***)
- Groundwater recharge in this zone is derived from local rainfall and runoff from surrounding hills that soaks through the soil. Some recharge may occur from the Oreti River
- Discharge mainly occurs via baseflow to the Oreti River and major tributaries, such as Dipton Stream and Stag Stream.



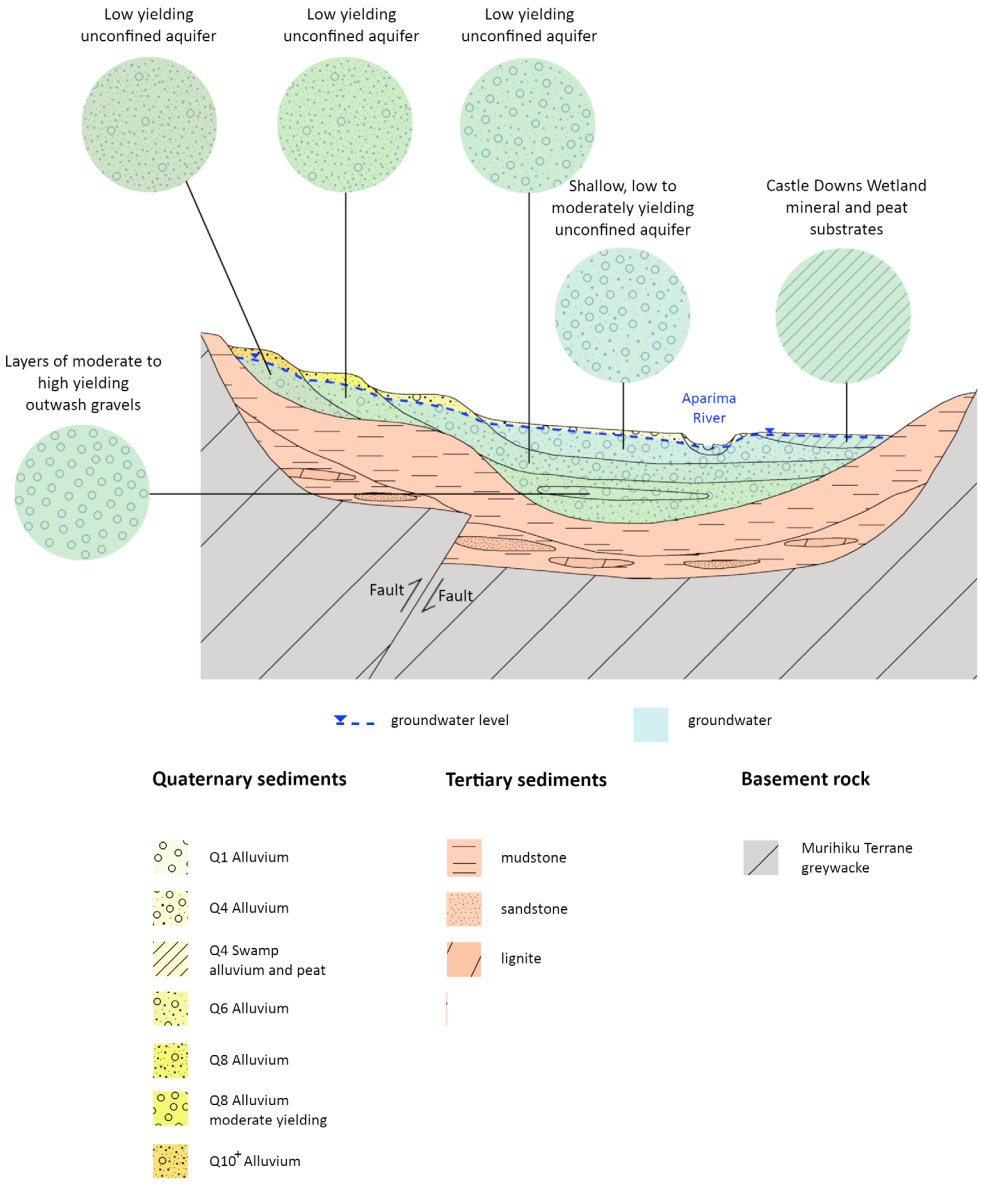
Groundwater quality Dipton GMZ

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

Upper Aparima GMZ

The Upper Aparima GMZ covers an area of approximately 49,000 ha in the Aparima River catchment upstream of Otautau:

- Depth to groundwater in the Aparmia GMZ typically ranges from less than two metres below ground level along the margins of the Aparima River, to more than 10 metres below ground level under elevated terraces toward the valley margins
- Seasonal variation in groundwater levels is generally two-three metres, reducing on lower terraces adjacent to the Aparima River
- A diagrammatic cross-section of this GMZ showing areas of groundwater is provided below (source ***es.govt.nz/environment/water/groundwater/groundwater-management-zones/upper-aparima***)
- 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.



Groundwater quality Upper Aparima GMZ

- Nitrate = variable, with some areas having high concentrations
- Phosphorus = low
- *E. coli* = low, but risk may be elevated where soils are well-drained and the water table is shallow.

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

THRIVING SOUTHLAND

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