Mid Aparima Catchment Group

Fresh water health and landscape influences in Mid Aparima Catchment

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

AS AT OCTOBER 2021
Further updates will be included as new information becomes available.

Welcome to Mid Aparima Catchment Brochure

This Mid Aparima 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 Mid Aparima 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 - 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/mid-aparima*** 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/infohub*** 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 Aparima Catchment

Aparima Catchment

Mid Aparima is part of the Aparima Catchment which outflows into the Jacobs River Estuary. Aparima River and Jacobs River Estuary are an important source of mahinga kai, particularly shellfish, mussels, paua, tuna and inanga.

Currently Jacobs River Estuary is considered to be in fair to poor condition.

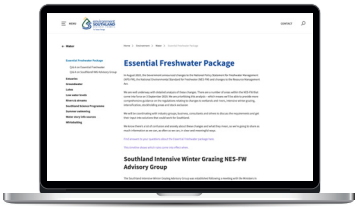
Summary of Mid Aparima Catchment

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

- This catchment covers a mosaic of seven different physiographic zones that differ greatly in nitrate and phosphorus levels from land use.
- Most of this catchment overlies part of the Upper Aparima GMZ, which has variable nitrate levels, with some areas having high concentrations.
- A small area in the south of the catchment overlies part of the Lower Aparima GMZ which generally has low nitrate levels, but nitrate may be elevated in shallow limestone aquifers.
- Water quality in this catchment is showing stress in terms of *E. coli* (faecal bacteria) (surface water), nitrogen in some areas (groundwater and surface water), phosphorus (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
- 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 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 micro-organisms, 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 Enviroment 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.

Mid Aparima 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
Otautau Stream at Otautau-Tuatapere Rd	1.16 mg/L			
Otautau Stream at Waikouro	1.07 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
Otautau Stream at Otautau-Tuatapere Rd	0.038 mg/L	B			
Otautau Stream at Waikouro	0.029 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
Otautau Stream at Otautau-Tuatapere Rd	0.024 mg/L	D			
Otautau Stream at Waikouro	0.022 mg/L	D			

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
Otautau Stream at Otautau-Tuatapere Rd	0.063 mg/L			
Otautau Stream at Waikouro	0.057 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
Otautau Stream at Otautau-Tuatapere Rd	700n/100mL	E			
Otautau Stream at Waikouro	1050n/100mL	E			

* 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 (October 2021)

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 Mid Aparima Catchment are (LAWA October 2021):

MCI

Monitoring site	5-year median	State	10-year trend	15-year trend
Otautau Stream at Otautau-Tuatapere Rd	93.0	C		
Otautau Stream at Waikouro	100	C		

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 estuary is not in Mid Aparima Catchment, it is an important factor in understanding the impacts of water quality in Mid Aparima. Decisions made in Mid Aparima that affect water quality upstream, 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 the 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						
Lake Brunton						
Waituna Lagoon/Waiparera (not assessed)						
New River Estuary						
Jacobs River Estuary						
Waikawa Estuary						
Haldane Estuary						
Freshwater Estuary						
Waimatuku Estuary						
Toetoes Estuary						

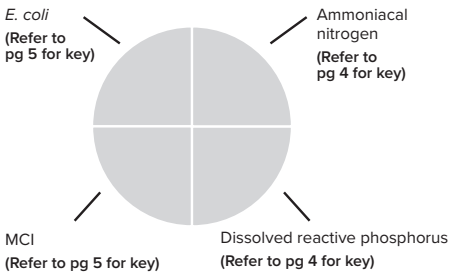
KEY Very Good · Good · Fair · Poor

* 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.

Aparima Catchment with estuaries and surface water quality monitoring sites*

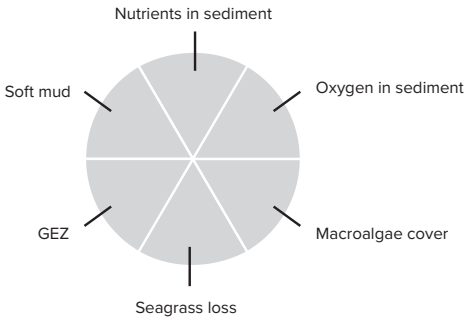
*Sites in Mid Aparima Catchment only shown

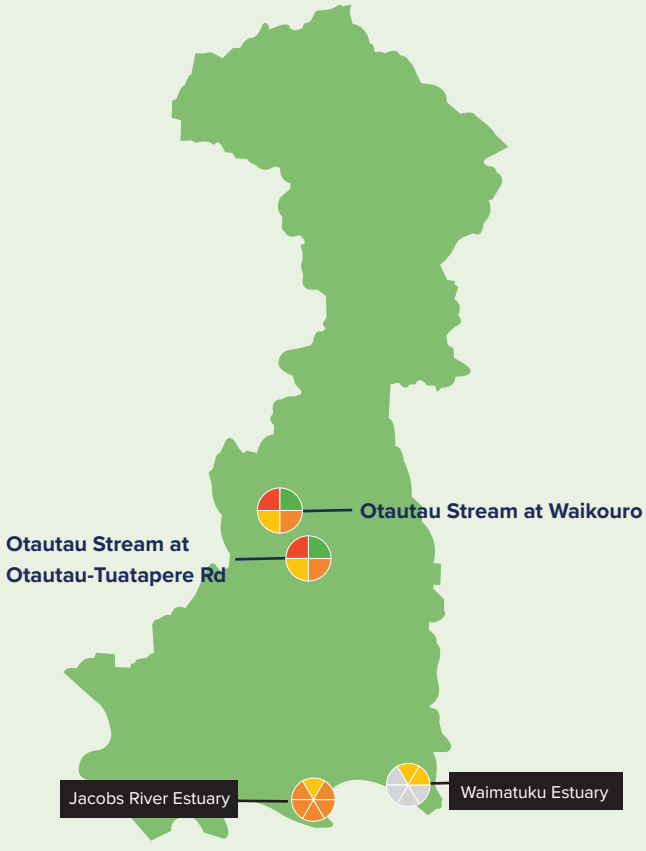
Water quality state and MCI



Estuary risk indicators

(Refer to pg 6 for key)





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 micro-organisms (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.

Most of the central Mid Aparima Catchment area falls into the gleyed physiographic zone. The periphery of this zone is a complex mosaic of bedrock/hill country, oxidising, lignite-marine terraces, central plains, riverine and peat wetlands physiographic zones (see map below). These zones differ in the way contaminants are transported and attenuated within the catchment.

Mid Aparima Catchment showing Physiographic Zones

Bedrock/hill country – overland flow

This zone is found on rolling to steep land below 800 metres. It is characterised 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 micro-organisms 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.

Oxidising

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

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

Gleyed

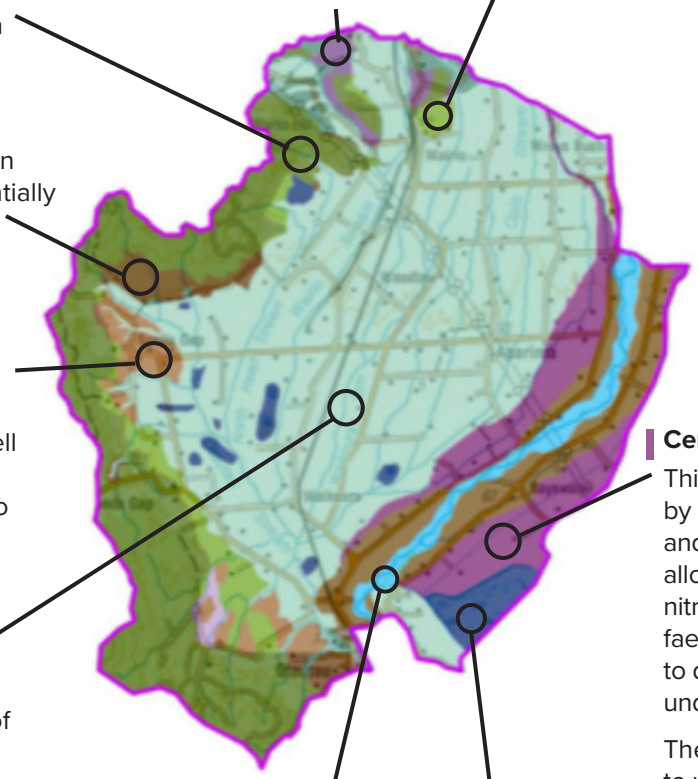
This zone is generally found in areas that were once wetlands. It is characterised by a dense network of streams and a high water table during winter.

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.

Lignite-marine terraces

Organic-rich sediments like lignite, are found at depth within this zone. The presence of these sediments has a strong influence on reducing the amount of nitrate in groundwater.

Denitrification* rates are high, meaning that much of the nitrate leached to groundwater in this zone is converted to nitrogen gas via various reactions involving bacteria.



Riverine

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

Bedrock/hill country – artificial drainage

Generally located on developed land along the base of hillslopes, artifical drainage is needed in areas of low slope and low subsoil permeability.

Central plains

This zone is characterised by clay-rich soils that shrink and crack when dry. This allows water (carrying nitrogen, phosphorus and faecal micro-organisms) to drain quickly to underlying aquifers.

These soils are also prone to waterlogging when wet and require extensive drainage to maintain productivity. Nitrogen, phosphorus, sediment and faecal micro-organisms can all be rapidly carried to surface waterways via mole-pipe drains.

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.

*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 - Mid Aparima

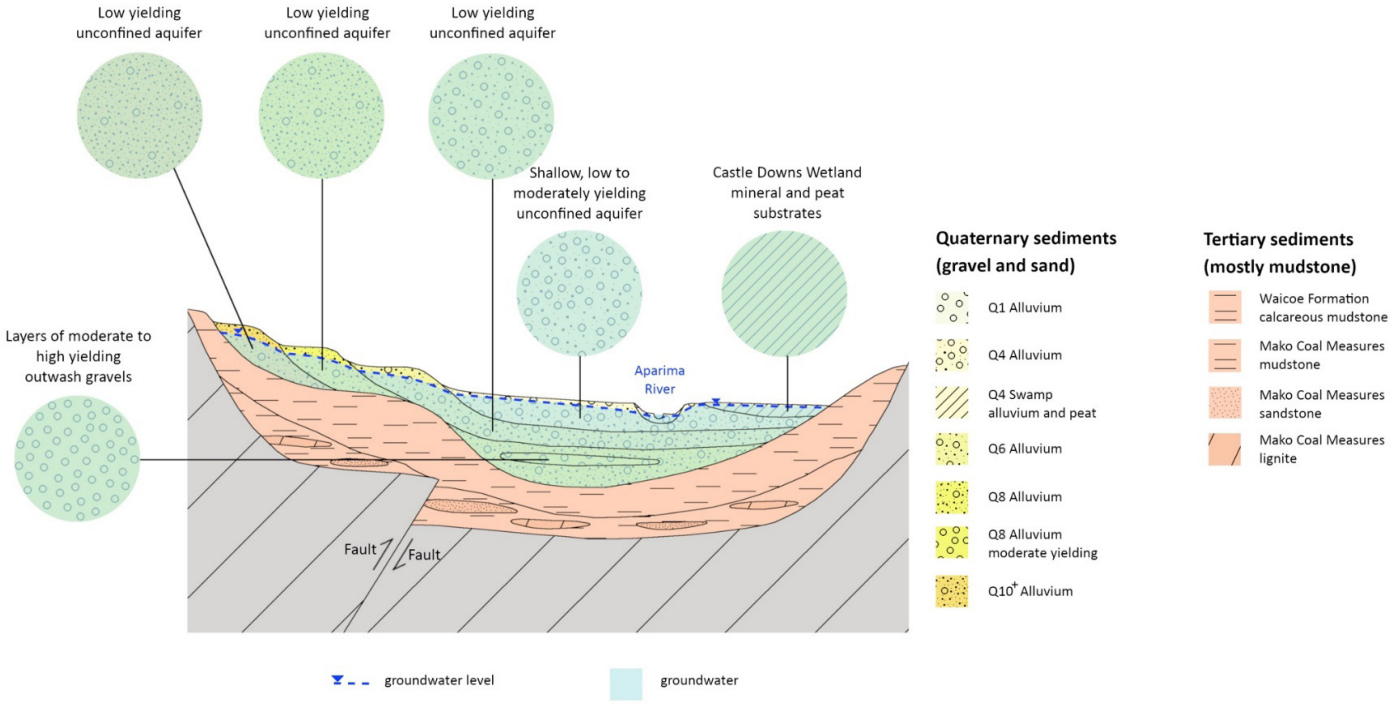
Most of Mid Aparima Catchment overlies part of the Upper Aparima GMZ.
A small area in the south of the catchment overlies part of the Lower Aparima GMZ.

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

Upper Aparima GMZ

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

- Depth to groundwater in the Aparima GMZ typically ranges from less than two metres below ground level along the margins of Aparima River to more than 10 metres below ground level under elevated terraces toward the valley margins.
- Seasonal variation in groundwater levels is generally less than two to three metres, reducing on lower terraces adjacent to Aparima 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/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.



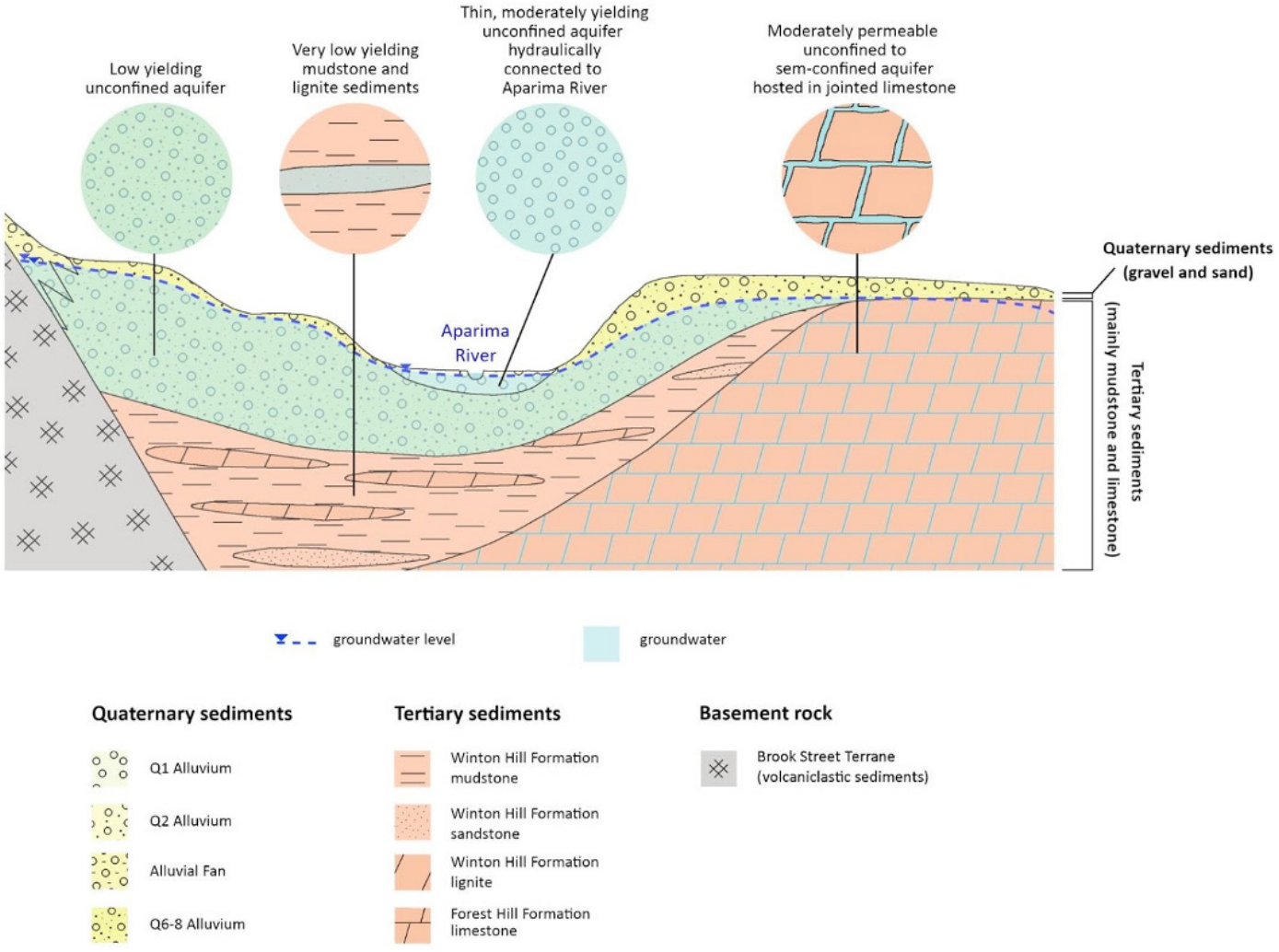
Groundwater quality Upper Aparima GMZ

- 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.

Lower Aparima GMZ

The Lower Aparima GMZ covers approximately 29,000 ha in the lower reaches of the Aparima River Catchment.

- Depth to groundwater ranges from less than two metres below ground level on the Aparima river floodplain to 20 metres below ground level in limestone aquifers underlying higher terraces.
- Seasonal groundwater variation is generally less than two metres, but can be up to 10 metres in limestone aquifers.
- See below for a diagrammatic cross-section of this GMZ showing areas of groundwater (source ***es.govt.nz/environment/water/groundwater/groundwater-management-zones/lower-aparima)***
- Groundwater recharge in this zone is derived from local rainfall and runoff from surrounding hills that soaks through the soil. Groundwater discharge mostly occurs as springs and as baseflow to Aparima River.



Groundwater quality Lower Aparima GMZ

- nitrate = generally low but may be elevated in shallow limestone aquifers
- phosphorus = low
- *E.coli* = low, but risk may be elevated close to source.

Find out more

Environment Southland Aparima flood warning fact sheet
bit.ly/3cLate5

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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