

Te wai māori
Freshwater

Te nui o te waipapa 122
Surface water quantity

Te kounga o te wainuku 129
Groundwater quantity

Mātai kēhi | Case study 135
Gravel Bed Rivers National Project

Te oranga o ngā awa 137
River health

Te kounga o te wai rēhia - ngā awa 140
Recreational water quality - rivers

Te oranga o ngā roto 142
Lake health

Te kounga o te wainuku 145
Groundwater quality

Te wai māori Freshwater

Te ao Māori

Wai māori (freshwater) is a life source, te waiora, essential for all living things. For tangata whenua, the word wai means water, but the question 'ko wai koe?' means 'who are you?', or 'from what waters do you descend?'. The recounting of pepeha – maunga, awa, marae, waka and moana – connects us back to the wai we come from.

Wai has its own mauri, which can be described as a life source. Rivers, lakes, wetlands and estuaries are imbued with mauri and wairua and have their own mana. Mauri is not static; it is influenced by everything in and around it, and vice versa. Wai can be imbued with mauri as waiora, more commonplace as wai māori or degraded as waimate. They are places of gathering, sustenance and spiritual connection that support many taonga species, including ika (fish), manu (birds) and ngārara (insects).

Wetlands in particular are repositories of biodiversity and traditional resources, while rivers and streams connect iwi to their ancestral landscapes. The health of freshwater is closely connected to the well-being of people and the wider environment.

Freshwater environment

Freshwater flows through the region from mountains to the sea, as surface water in our rivers, streams, lakes and wetlands, and in the ground as groundwater in aquifers which can then emerge as springs, on its journey to the coast. These bodies of water can be interconnected in complex ways while at the same time having individual characteristics and features.

Council recognises these complex interconnections, and there are extensive monitoring programmes in place for the quantity and quality of both surface and ground water, ensuring that the management of Marlborough's waterbodies respects them as integral parts of its catchments.

Freshwater is essential for providing drinking water, supporting farming and viticulture, enabling industry, sustaining mahinga kai and offering recreation. Council routinely monitors rivers and groundwater across the region and overall, Marlborough's water is in good condition compared with many other parts of New Zealand.

The region's three largest river catchments are Te Hoiere / Pelorus in the northwest, Wairau River in the centre and Awatere River in the south. All flow from mountains in the west with high rainfall to the eastern coast, making them more reliable than smaller rivers, especially those in the drier southeast such as the Flaxbourne River. To the north, in the Marlborough Sounds, rainfall is about twice that of the south, but the topography creates hundreds of short, steep creeks with only a few large rivers. To the southwest, the Acheron River flows through Rangitahi / Molesworth and joins the Waiau-toa / Clarence River on Marlborough's southern boundary.

The Wairau River has the largest catchment and flow of Marlborough's rivers. It also has the longest history of channel modification, dating back to 1861. At this time wetlands were drained for pasture and channel modification and stop banks were erected to reduce flood risk to settlements.

The region has several groundwater aquifers. The most important is beneath the Wairau Plain, where springs bring groundwater to the surface. Recent research has improved Council's understanding of how surface water and groundwater interact, especially between the Wairau River and the aquifer. This understanding helps manage these resources better. In other parts of Marlborough, groundwater is less common because the geology doesn't store water well.

Council has a significant water monitoring network across our rivers, lakes and groundwater systems. Detailed reports and annual updates on water monitoring, water quality and suitability for recreation are available on the Council's website.

The network measures quality, quantity and ecological health and has several objectives:

- Measure the state of the environment,
- Track condition and trends over time,
- Gather resource information and provide baselines,
- Act as triggers for limit setting and consent restrictions, and
- Flood management.

Council is responsible for freshwater under the Resource Management Act (RMA), ensuring it's used fairly while protecting its quality and quantity. An additional directive was provided by the Government in the first National Policy Statement for Freshwater Management (NPSFM) in 2011, which was then replaced or amended in 2014, 2017 and 2020. The Marlborough Environment Plan (MEP) reflects the 2014 and 2017 versions, with further work to meet the NPSFM 2020 requirements paused due to the Government planning further reforms to freshwater in 2026.

Once the new NPSFM is enacted, local rules and policies will be updated.

Responsible for water quantity, Council sets environmentally sustainable limits, and issues water take and use permits within set limits for each waterbody. Consent holders are monitored to make sure use doesn't exceed what has been allocated and, in an average year, actual use is less than what has been allocated. Freshwater management units (FMUs) are geographical areas, typically a catchment, to which provisions to manage allocation of water are applied. Many FMUs are now close to their allocation limits, and some are fully allocated (refer to the table on page 126). Some users store water during high-flow periods to supply water during the dry summer months. Today, there are over 1,000 small artificial reservoirs, mainly used for stock water and irrigation. Council is also responsible for water quality through its regional council functions and monitors water quality around the district.



Rai River Falls

Te nui o te waipapa
Surface water quantity

Surface water refers to the water in rivers, streams, lakes and wetlands. These bodies of water have unique ecological, environmental and recreational values. Water abstracted from rivers and streams is an important resource that enables economic activity. Surface water is particularly valuable in areas without aquifers, such as the Awatere Valley.

Council measures river flow and water levels at 31 permanent sites. This data is transmitted in real-time to Council and used for flood warning and to support water allocation regimes. Over the past 10 years, the rainfall and river monitoring network has expanded to improve coverage across the region, including two new river flow sites.

Flow monitoring has been undertaken at some sites for more than 60 years, and these longer records are analysed for trends. Due to climate variability year to year, it is useful to have at least 20 years of record for trend analysis.

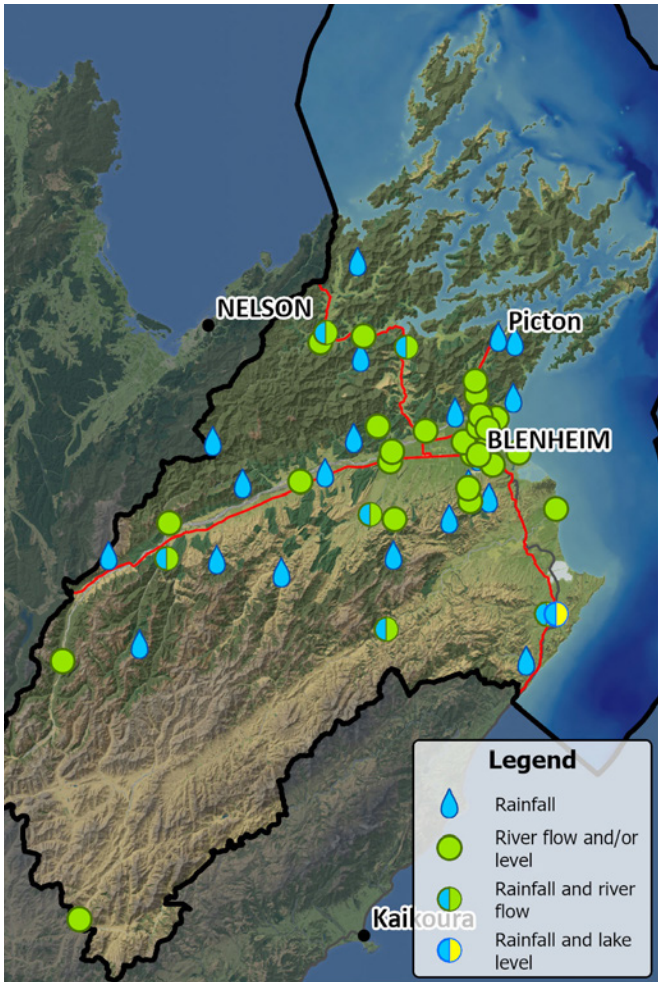


Figure 1: Rainfall and river flow and/or level monitoring sites in 2025

Pressures

A range of factors put pressure on surface water resources. Three key pressures for the region are water abstraction (water take), changing climate and land use change.

Water Abstraction

Abstracting surface water enables much of the region's economic activity. Council's role is to ensure that the region's water bodies and their ecosystems' values are protected and upheld while still enabling use of that water.

To achieve a balance ultimately involves the determination of an appropriate quantity of water to allocate for out-of-stream uses like irrigation. The RMA and the MEP guide this process. The larger rivers have an allocation limit, which determines the total amount of water that can be abstracted, and a minimum environmental flow, which signals when users must stop taking water.

While most water users need to apply for resource consent, exceptions such as domestic supply and stock water exist under certain volumes. Consent holders are required to install water meters to measure the water they take. This data is required to be provided to Council in real-time. Water meter data is necessary for compliance and improves understanding of the effects of water abstraction on the river flow regime.

Climate variability and climate change

Climate variability refers to short and medium-term changes in rainfall, temperature and other climate factors. It includes climate patterns like the El Niño Southern Oscillation (ENSO), which cycles between El Niño, La Niña and neutral phases, and accounts for some of the variation in seasonal rainfall.

Longer-term, climate change is predicted to impact surface water quantity as the frequency and intensity of storms and extreme rainfall events are likely to increase. The expected effects of climate change on Marlborough's river flows were detailed in a 2021 NIWA report:

- Average annual low flows are expected to decrease by up to 50% by the end of the century.
- Average summer river flows are expected to decrease, particularly in South Marlborough.
- Average winter river flows are expected to increase across the region.

Increasing temperatures and, therefore, evapotranspiration (water going back into the air from soil and plants) will also lead to greater irrigation water demand and an increasing mismatch between the timing of irrigation need and water availability in rivers. This means an increasing reliance on stored water in the future.

Land use changes

Adding or removing vegetation in a catchment affects the relationship between rainfall and runoff. For example, studies in New Zealand have found that when pasture is replaced by Pinus radiata or wilding conifer forest, annual surface water yields are reduced by between 30%–81%. This is primarily due to increased interception of rainwater and evaporation from the forest canopy. Variations in surface flow are more noticeable in small catchments where the entire catchment is often harvested within a few years.

Ngā meka matua
Key facts

Different river flow measures

Council measures and tracks river flows in a number of ways. Each of these measures is important for understanding what's going on in the natural environment. To avoid splitting a single spring/summer event across multiple years, Council uses a water year (July-June) for analyses. This report uses the following terms:

Annual low flow: A measure of the single lowest point of flow that occurs in each water year. The annual low flow is almost always recorded in summer or autumn for Marlborough, its driest seasons. The sequence of annual low flows over many years can show trends.

Average low flow: A long-term average (over many years) of annual low flow recordings. Average low flow is useful for water response planning.

Average flow: An average of all flow data over a certain time period. For example, an annual average flow, or long-term multi-decade average flow.

Baseflow: The portion of river flow that is sustained between rain events. This represents the normal, day-to-day flow moving through a river. Baseflow is generally higher in winter and lower in summer/autumn.

Different long-term trends can be experienced between flow measures. There is a clear pattern across the region with several rivers showing a declining trend in annual low flow. This means the lowest flow recording in these rivers during the driest time of year is decreasing over time. A summary of each catchment is discussed below.

Current state

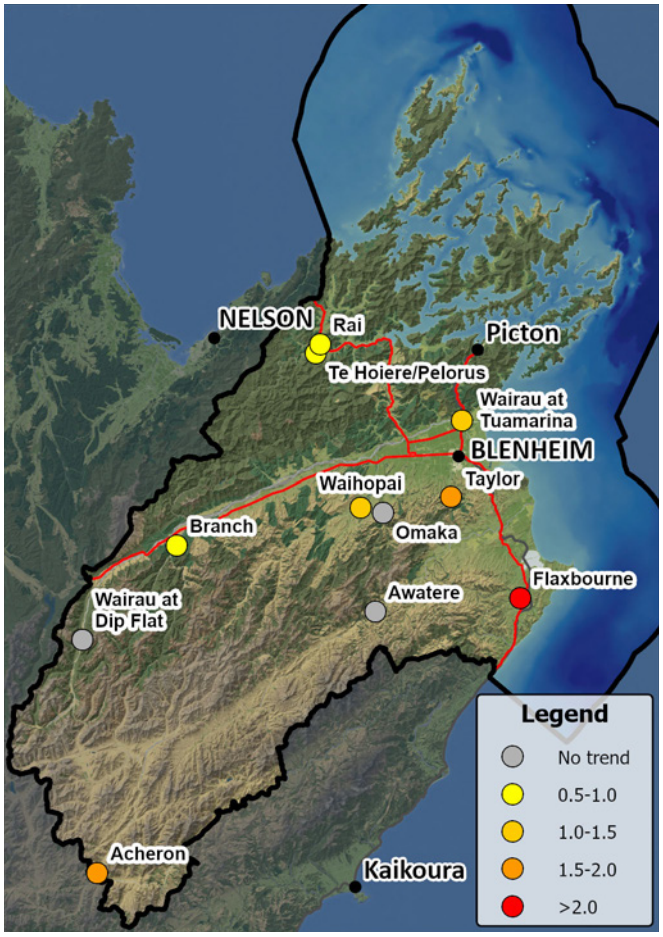


Figure 2: Percentage decline per year in annual low flow at sites across Marlborough. Trends have been calculated for the 30-year period 1995–2025, except for the Te Hoiere / Pelorus and Rai (36 years) and Flaxbourne (20 years) rivers.

Wairau Catchment

The Wairau River catchment covers 25% of Marlborough, and the braided river is a valuable resource for aquifer recharge, recreation, farming and viticulture.

Flow

Flow is monitored at sites along the main stem of the Wairau River and in the major tributaries. Most of the water taken from the Wairau River for irrigation is between Wash Bridge and the Waihōpai River confluence, which is about mid-catchment, so comparison of the flow trends from the upstream and downstream flow sites can improve our understanding of the effect of water abstraction on the flow regime. There is a flow site in the upper catchment at Dip Flat and one in the lower Wairau catchment site at Tuamarina, which measures flow just upstream of the State Highway 1 (SH1) bridge.

Flow analysis in the Wairau catchment provides differing trends depending on location. In the upper catchment (Dip Flat), average flows have increased by about 10% in the last 65 years but there is no defined trend in the annual lowest flow. In the lower catchment (Tuamarina), the average flow has decreased by about 15% in the last 65 years and the annual low flow has decreased by 28% over the last 30 years. The reason for the different flow trends between the upper and lower Wairau catchment is not yet known, and work is ongoing to better understand how the Wairau River functions.

Research has shown that while most river water is young, a portion is older. Council is working with Earth Sciences NZ (formerly NIWA) to understand where in the catchment this older water is stored. This has implications for maintaining baseflow in the river during drought events.

Another focus is to improve understanding of storage within the braided river system and how this moderates river flows. For example, when the minimum flow of 8 m^3/s is reached at the Tuamarina site, and all water users stop taking water, there is no 'bounce-back' or sudden increase in flow. More research is needed to understand the magnitude of the buffering effect and how it could improve management of water in the catchment.

Recently, Council assessed habitat during a period of low flow in the Wairau River during summer 2023/24, from Selmes Road to above the SH1 bridge. Flows are lowest near Selmes Road due to losses to the Wairau Aquifer, then steadily increase downstream as tributaries and groundwater join the river. Drone imagery, benthic LiDAR (Light Detection and Ranging) and drift dive trout counts were used across flows from 15.3 to 5.9 m^3/s. Wetted area gradually reduced, mainly in shallow margins, as flows declined, but deep pools persisted even at 5.9 m^3/s, providing important refuges, indicating habitat diversity is maintained. Trout also shifted their habitat use to cope with lower flows.



Wairau River, looking upstream

Allocation

Under the MEP surface water allocation is divided into classes A, B and C, where A has the greatest reliability, due to the lower restrictions, and C is for storage of surface water at high flows. Each class has a total amount of water that can be abstracted by all water uses and a minimum flow, below which irrigators must stop taking water (refer to the 'Different river flow measures' on page 123). The Wairau River allocation includes all three classes and a municipal take. With the requirement under the MEP for water meter data to be provided to Council, the actual amount of water being taken can be collated. Initial results are showing that actual use is less than that allocated by consents. Further work is planned to confirm these results.

Northern catchments

North Marlborough is the highest rainfall area in Marlborough, so rivers and streams in this area have good baseflows. Dairying is common due to the plentiful rainfall, and rivers provide irrigation water as backup.

Te Hoiere / Pelorus and Rai rivers both have long-term flow monitoring sites. The Te Hoiere / Pelorus site is located upstream of most irrigated pastoral land and represents the flow emerging from the native forest in the upper catchment. In contrast, the Rai flow site is located near the bottom of the catchment, with most water abstraction for irrigation of pasture occurring upstream.

Annual low flows have decreased at both flow sites over the last 30-plus years, by 19% in the Te Hoiere / Pelorus and 30% in the Rai rivers. There are multiple factors that could be contributing to the decline, including water abstraction in the Rai and climate variability in both the Rai and Te Hoiere / Pelorus.



An Environmental Monitoring Officer measuring river flow in the Rai River

Average flow has increased over the last 20 years in both catchments. There is a corresponding increasing trend in annual rainfall in the Rai and Te Hoiere / Pelorus catchments, mostly due to higher autumn and winter rainfall.

South Marlborough

South Marlborough is windswept and dry, with low rainfall and high evapotranspiration. Communities rely on extracted surface water for domestic, stock and irrigation purposes. The Awatere flow site, located in the mid-catchment at Awapiri, shows no trend in either annual low flow or average flow. This site is upstream of almost all water abstraction, so any future changes to the flow regime are likely to result from either climate or land-use changes.

At the Flaxbourne River flow site, annual low flows have decreased by about 50% over 20 years. This is a significant decrease, and further work will be done to quantify the effect of upstream abstraction on low flows, which is currently unknown. Average flow in the Flaxbourne shows a small increase of 6% over 20 years.

Further to the southwest, in the Rangitahi / Molesworth area, low flows in the Acheron River have decreased by about 40% over the last 30 years. Over the same period, average flow has decreased by about 7%. There is no water abstraction in the Acheron catchment, so the decreases observed in both low flows and average flows could be due to climate variability or an increase in vegetation. Vegetation increases include reverting marginal pasture to scrub or the invasion of wilding conifers into the headwaters of Acheron tributaries like the Severn and Saxton rivers.

Future response

Council will continue monitoring river flows and work towards improving understanding of actual water abstraction in each catchment and its effect on flows, which is currently the biggest knowledge gap. Collating water meter data is complex, as each record must be reviewed for accuracy. Storage dams further complicate accounting for dam inflows and outflows through water meters.

Council is also working to understand future water demand, considering climate change and land-use change. This will be assessed against the potential future supply of water to determine how surface water allocation will operate in the future in Marlborough.

Ngā meka matua
Key facts

Water allocations and efficient water use

Council's freshwater management framework manages the allocation of freshwater using Freshwater Management Units (FMUs) which define a geographical area, typically a catchment, to which provisions are applied.

Typically, these provisions are an allocation of volume limits and minimum flow cut-off thresholds. Within each FMU, allocation may be split into allocation classes; A, B and C. Class A has the greatest security of supply and Class C is solely for taking for storage during higher flows. The table below provides details of some key FMUs and highlights whether the FMUs have water available for allocation or not.

When water is allocated to water users, this is based on reasonable demand, given the intended use. Inefficient use of water (ie, using more than is actually required) represents water that could have been used for other productive purposes. In a limits-based regime, in which there is a limit on the total amount of water that can be taken from each water resource, efficient use of water maximises the benefit derived from the available water. Most of the water taken from rivers and aquifers in Marlborough is used for irrigating crops and pasture.

Since 2016, Council and water users have used a publicly available tool called IrriCalc to determine reasonable irrigation demand. Climate and soil characteristics are the main determinants of water demand. IrriCalc considers rainfall and soil types at any property and calculates a property-specific allocation of water, given the crop proposed to be grown.

This is done in accordance with the Proposed Marlborough Environment Plan (PMEP), which requires that water allocated meets irrigation requirements on a property nine years out of 10, and meets a large part of requirements in the very driest years. This is a high degree of reliability, as absolute reliability is not possible given the potential for extreme fluctuations in climate. It also reflects the value of the crop or pasture to the grower and the fact that the higher the reliability standard is set, the smaller the total area of land that can be irrigated within the allocation limits set for the resource.

The reasonable use calculation is then incorporated into water permits, authorising the use of water. Any person can access IrriCalc at mycatchment.info

Allocation availability status of some of Marlborough's Fresh Water Management Units at February 2026.

Freshwater Management Unit (FMU)	Class (if applicable)	Allocation availability
Awatere - Municipal		Not available
Awatere	A	Not available
	B	Available*
	C	Available
Benmorven	A	Not available
Brancott		Not available
Kaituna - Municipal		Not available

Table continued over page

Continued from previous page

Freshwater Management Unit (FMU)	Class (if applicable)	Allocation availability
Kaituna	A	Not available
	B	Available
Omaka Aquifer		Not available
Pelorus (Lower)	A	Not available
	B	Available
Rai (includes Ronga, Opouri and Tunakino)	A	Not available
	B	Available
Rarangi Shallow		Not available
Riverlands - Municipal		Not available
Riverlands		Available
Waihōpai	A	Not available
	B	Not available
	C	Available
Wairau Aquifer - Municipal		Not available
Wairau Aquifer		Available
Wairau River - Municipal		Not available
Wairau River	A	Available*
	B	Available
	C	Available
Tuamarina - Municipal		Not available
Tuamarina	A	Not available
	B1	Not available
	B2	Not available

*Signifies that the resource is close to fully allocated, with less than 10% of allocation remaining.



The Upper Awatere River

Te kounga o te wainuku
Groundwater quantity

Aquifers are nature's storage tanks: natural underground reservoirs that, when pumped from wells to the surface, supply groundwater for drinking, irrigation, food and industrial use. Aquifers also sustain spring flows, river baseflows, wetlands and prevent seawater intrusion.



Spring Creek is the largest spring-fed stream in the region

Groundwater in aquifers occupies the pore spaces of underground sediments and is 'recharged' (refilled) by rainfall or river losses. In Marlborough, aquifers form only in sands or gravels with pore spaces that hold and transmit water.

Marlborough has several different types of aquifers, which vary according to location and geology. The coastal aquifers are often confined within water-bearing gravels underneath an impermeable layer, which was laid down when sea level was higher. In contrast, unconfined aquifers, which are permeable from above, are found inland. The Wairau Aquifer is a unique area of thick gravel deposits in the lower Wairau Valley from which the groundwater is taken and relied upon for multiple activities on the Wairau Plain making this aquifer the most important one in the region.

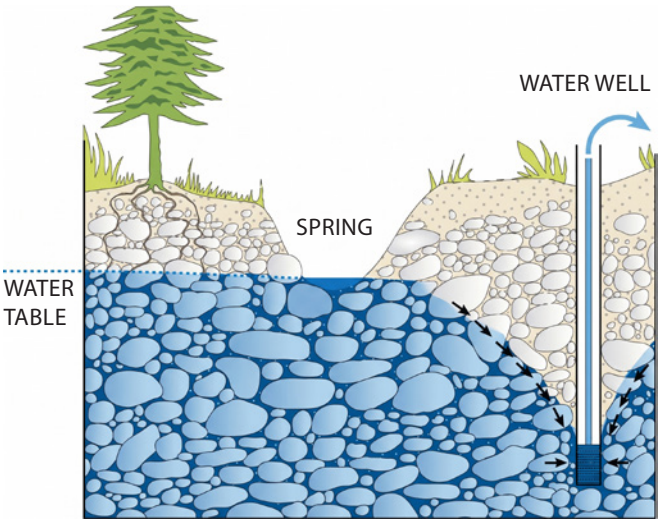


Figure 1: A cross-section of Marlborough gravel aquifer, showing groundwater filling pore spaces

Smaller, less productive aquifers are found in valley floors of the inland Marlborough Sounds catchments (Te Hoiere / Pelorus, Rai and Linkwater), as well as at Rārangi, Flaxbourne, Wairau Valley terraces and the lower Waimā River. The Awatere River Valley has minimal groundwater due to its low porosity mudstone geology.

The Wairau Aquifer is recharged by the Wairau River. This groundwater remains similar to the river water until reaching the springs, where some water returns to the surface and the rest continues east under a confining layer. This layer protects groundwater from land-use impacts but can also mineralise it, sometimes making it unsafe to drink.

Marlborough has New Zealand's oldest known groundwater at 40,000 years old, found 85 m below the land surface near Wairau Hospital. It contains high arsenic levels and isn't safe to drink. Most local groundwater, however, is young and of high quality.

Pressure

Most Marlborough groundwater is used for crop irrigation, then municipal supply, with smaller amounts for wineries and rural use. Crop demand peaks in summer, while municipal use is steady year-round, as shown in Figure 2 for the Wairau Aquifer.

The drinking water for Blenheim, Renwick, Picton, North Rārangi, South Rārangi, Tuamarina West, Ward, Woodbourne, Wairau Valley and Havelock comes from aquifers. Council has taken steps to enhance water-use efficiency by installing individual water meters in Renwick, Havelock, Seddon and Wairau Valley, thereby significantly reducing water consumption. Municipal water use in Blenheim remains above the national average.

Wairau aquifer metered water use

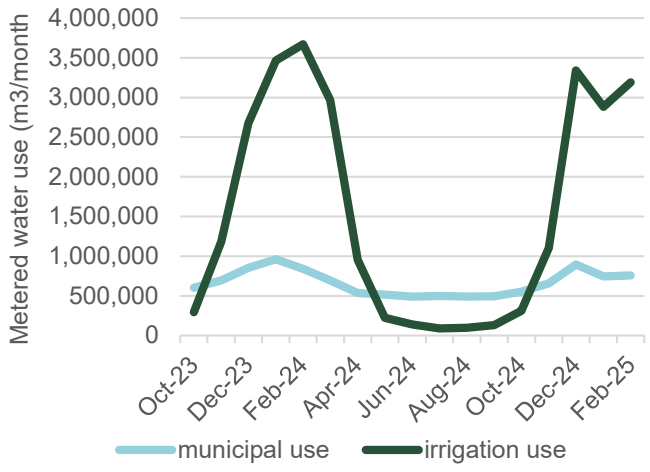


Figure 2: Wairau Aquifer metered municipal use versus crop irrigation use 2023–2025

Overall, groundwater usage across all sectors is currently stable, reflecting the unchanged irrigated vineyard area and improved urban water efficiency through metering. On the Wairau Plains, grape cultivation dominates land use, utilising only about 20% of the water used by pasture.

Response

Council issues resource consents for the take and use of groundwater. This requires an understanding of aquifer hydrology and the effects of abstraction on groundwater. Limits in the MEP are informed by science and community values and are refined over time as understanding of the effects of taking groundwater out of the aquifer and climate variability is detected through monitoring.

The MEP controls the effects of water abstraction on groundwater by permitting a set annual extraction volume and using seasonal controls based on water level or conductivity (salinity levels) to reduce impacts during droughts or high-demand periods.

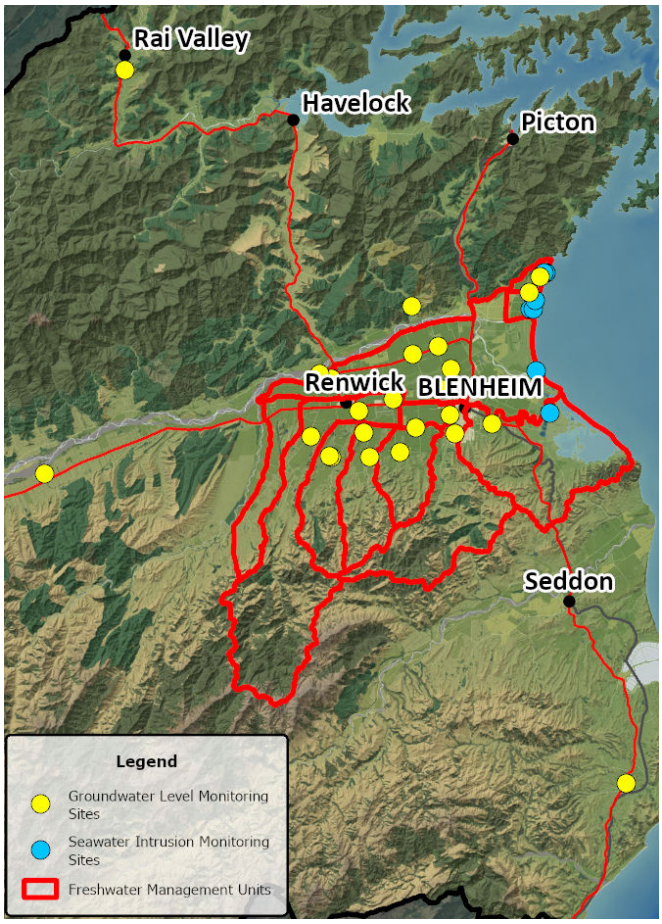


Figure 3: Council groundwater quantity State of the Environment monitoring network. Te Koko-o-Kupe / Cloudy Bay seawater intrusion warning network provides real-time groundwater level and electrical conductivity measurements every 15 minutes

Council maintains 31 groundwater level monitoring wells across the district, mainly on the Wairau Plains, with a higher density near Te Koko-o-Kupe / Cloudy Bay coast and Rārangi for real-time salinity and wetland alerts. These coastal sites also measure groundwater electrical conductivity which is a measure of the salinity of the water.

Council's monitoring data improves hydrogeological understanding and informs MEP aquifer limits and management of seasonal restrictions.

Until recently, total groundwater use per aquifer was unavailable due to data and meter issues. Now, Council has reasonably complete totals for some freshwater units, like the Riverlands and Wairau aquifers. More emphasis on water metering is needed for refining limits and providing certainty for users and the environment. For example, water meter data for the 2023/24 summer shows that from the Wairau Aquifer, irrigation use accounted for around 15.9 million m^3 (67%) of extraction, versus municipal use at just over 7.6 million m^3 (33%).

Current state

Wairau Aquifer

The Wairau Aquifer, Marlborough's largest, has been extensively monitored for longer than other aquifer systems. The Wairau Aquifer is experiencing a long-term decline in levels, which new research has found is being driven by falling Wairau River bed levels relative to the most permeable aquifer layers nearest the surface. These findings on the Wairau River and Aquifer exchange are groundbreaking and relevant to other braided river–gravel aquifer systems in New Zealand.

The fall in riverbed levels reflects both natural and human activities, including river control works and reduced gravel supply. An example of structural change is the narrowing of the Wairau River at Pauls Road since 1948 (Figure 4). Since the early 1970s, the inland Wairau Aquifer level has dropped about 1 m, reducing water storage by 10% and decreasing the ability to transmit Wairau River recharge water, leading to declining spring flows.

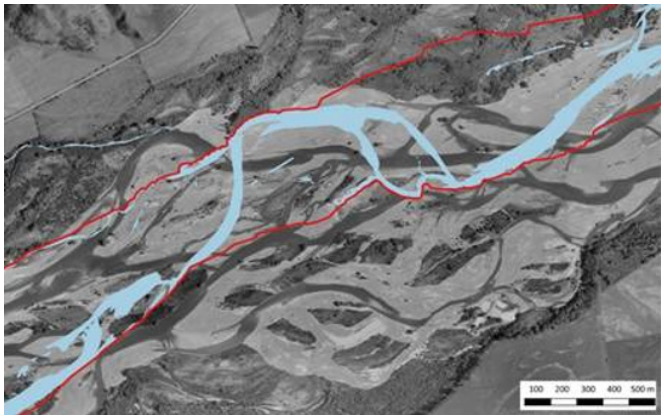


Figure 4: View of the Wairau River opposite Pauls Road in 1948 (black and white) versus the 2020 floodway (blue/red). This section loses flow into gravels, recharging the Wairau Aquifer

Spring Creek has the largest flow of any Wairau Spring. Water takes 100 days to move from Wairau River near Pauls Road through the aquifer to Spring Creek flow, which is fast and shows the dynamic nature of the aquifer. The early 2024 headwater recession was the worst Council has seen, mainly due to drought and declining aquifer levels (bottom photo). The top photo shows higher flows during the 2000/01 drought.



Severe recession of Spring Creek headwaters at the tennis club in early 2024 (bottom) and at the height of the 2000/2001 summer drought (top)

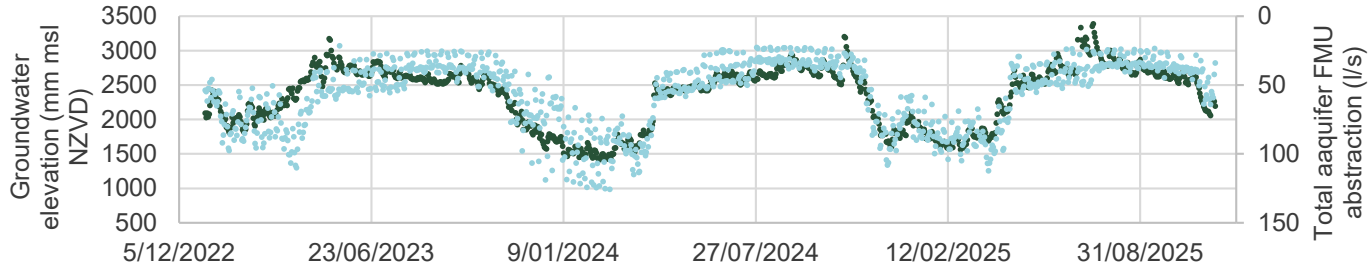
Riverlands Aquifer

This low-yielding, deep coastal aquifer requires careful, real-time management due to the potential for saline intrusion, the movement of salt water from the sea into a freshwater aquifer due to natural hydraulic pressure). Saline intrusion can be accelerated due to excessive pumping from the aquifer, pulling more saltwater into the aquifer and causing contamination.

The Riverlands Aquifer is under pressure in dry summer seasons, with minimum levels approaching the MEP cutoff and a small but steadily increasing trend in groundwater salinity.

These symptoms prompted a hydrological review of MEP limits, supported by the most complete metered annual groundwater-use data for any Marlborough aquifer. When water is abstracted from the Riverlands Aquifer, the level of the groundwater changes quickly to reflect the water being taken. This means the aquifer is demand-driven, unlike the Wairau Aquifer which is driven by Wairau River activity (Figure 5).

Figure 5: Riverlands Aquifer Freshwater Management Unit total metered groundwater use (blue) versus groundwater elevation (green).



Southern Valleys (Ben Morven Aquifer, Brancott Aquifer, Omaka Aquifer and Omaka River)

Groundwater once supplied irrigation in these Southern Valleys catchments, but the aquifers are low yielding and recover slowly, causing water levels to drop quickly with ongoing use. To counter this effect while providing users with certainty, Council developed the Southern Valleys Irrigation Scheme (SVIS) in 2004 which provides piped Waihōpai River irrigation water to this area. Having SVIS as the primary irrigation source means the local aquifers are used only as backup. This has allowed many of groundwater levels in the aquifers to return to pre-2000/01 conditions. However, some, such as Ben Morven Aquifer, have not recovered (Figure 6).

Ben Morven aquifer elevation 1993 to 2025

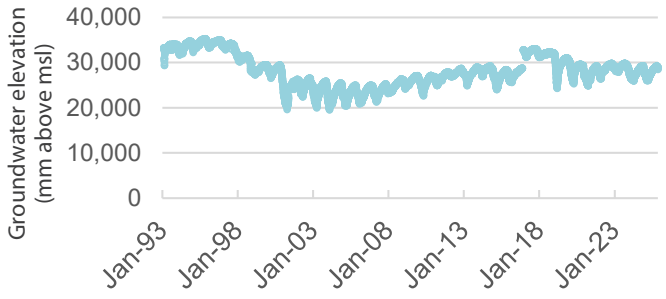


Figure 6: Ben Morven Aquifer FMU groundwater elevation 1983–2025 in millimetres above mean sea-level (NZVD2016)

Groundwater levels have been stable since 2015 and stay above MEP thresholds. However, when SVIS is turned off during periods of low flow, demand on the Southern Valleys Aquifers may lower levels, especially after multiple drought years that can deplete local aquifers used for irrigation.

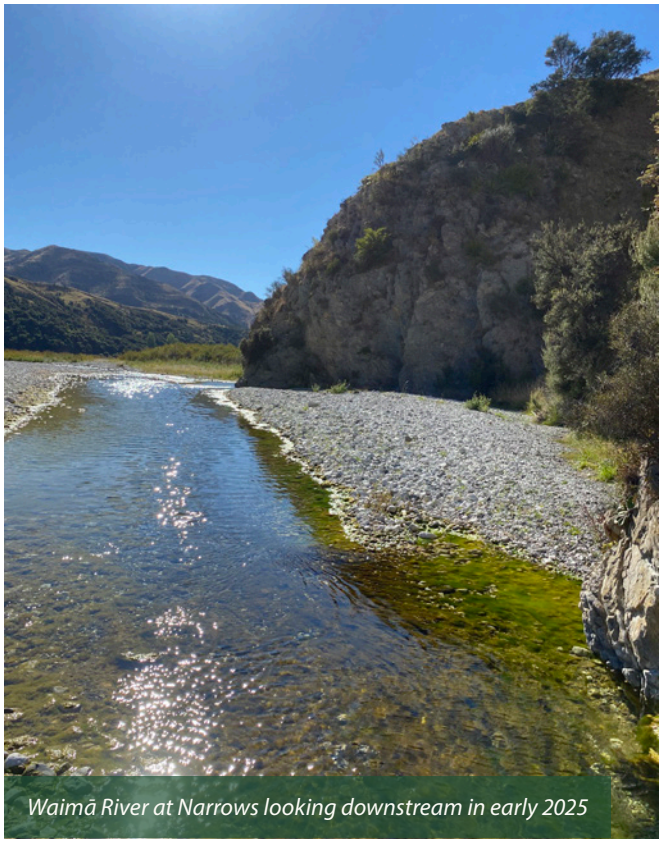
Rārangi Shallow Aquifer

The local community at Rārangi is totally dependent on the Rārangi Shallow Aquifer (RSA) for its water supply, but of equal importance are the environmental services it provides, maintaining wetlands and balancing the natural seawater interface with freshwater. The RSA responded to the droughts and floods since 2022 in ways not seen before, with groundwater crossing Rārangi Road for extended periods and high-water tables swamping septic tank systems. Many hydrological lessons were learnt during these extreme events.

RSA levels rise about 8 mm/year, slightly above local sea-level effects, with no seawater intrusion observed since 2000 when the well network was established. The exact position of the seawater–freshwater boundary isn't known, as these inland wells are beyond its influence.

The council is collaborating with researchers to develop new ways to map its location in real-time. This illustrates the evolution of monitoring networks from 2000 onward, making refinements that reflect new risks, pressures and available technologies.

East Coast Groundwater



Waimā River at Narrows looking downstream in early 2025

The 2016 Kaikōura earthquake uplifted the East Coast by about 2 m, and the local hydrology reached a new equilibrium at the higher elevation. The original monitoring bore was destroyed so a new bore was drilled nearby and the groundwater level record was corrected for earthquake effects. Continued monitoring is aimed at understanding the earthquake's impact on local hydrology.

Since 2007, increased interest in using water from the Waimā River catchment has led Council to seek a permanent flow measurement station for limit-setting and seasonal management. The Narrows site, 8 km from the coast, is being considered for this, as it can measure both river flow and groundwater underflow.

Te Hoiere / Pelorus groundwater

Groundwater level measurements started at Rai Valley in 2025 to define seasonal range and support environmental and land-use modelling.

In 2024/25, a baseline study on Te Hoiere / Pelorus groundwater quality involved drilling six test bores and seasonal water sampling, enhancing understanding of land-use impacts and natural aquifer chemistry on nutrient levels. The Council is assessing the need for a monitoring well at Havelock due to potential sea level rise and seasonal consent management.

The study found that groundwater nitrate levels were higher than in neighbouring rivers and streams and that groundwater quality varied between sites, despite having the same land use, indicating differences in groundwater chemistry are influenced by natural processes, rather than land use at these sites.

Much remains to be learned about groundwater north of the Wairau River, highlighting reliance on surface water and limited research on underground water.

Wairau Valley groundwater

Council has monitored shallow groundwater at Mill Road in Wairau Valley since 2007. Groundwater and surface water are highly interconnected here, shown by their similar chemistry and groundwater-fed streams. The Wairau Fault influences water chemistry, with elevated sodium and chloride levels detected originating as naturally occurring fluids that well upwards from the fault.

Trends

Figure 7 shows the regional groundwater level trends for each Council monitoring well, except the Ward and Rai sites due to short records. The record lengths vary, but one spans nearly 90 years.

As discussed above, the Wairau and Riverlands aquifers are showing a declining trend. The Southern Valleys Aquifers are rising due to lower demand and the introduction of the SVIS. Rārangi Shallow Aquifer levels in the north are rising at levels consistent with the rate of sea-level rise but declining in the south where a deeper part of the aquifer is monitored which has a slower recharge rate.

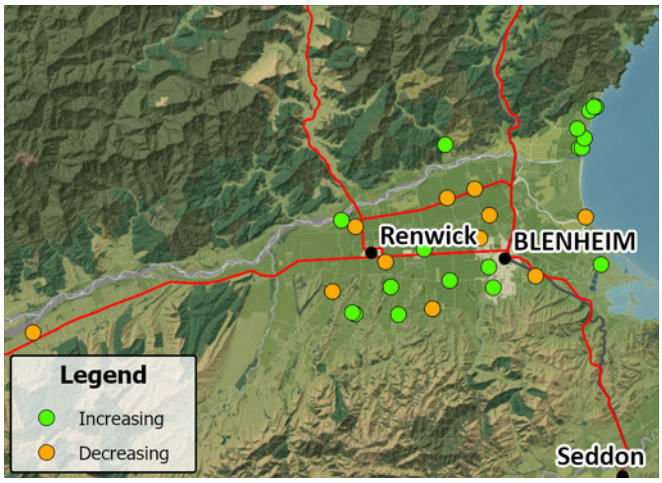


Figure 7: Groundwater level trends for Council monitoring sites with aquifer Freshwater Management Unit boundaries shown

Future response

Floods and increased groundwater volatility, worsened by climate change-driven demand, will necessitate expanding the Council's environmental monitoring network for real-time awareness.

Understanding environmental cause-and-effect depends on ongoing knowledge of drivers. Long term hydrological records are vital for spotting future trends. New sites are needed to understand the impacts of sea level rise and urban groundwater flooding.

CHANGES SINCE 2015

- Advances in hydrological knowledge, like understanding Wairau Aquifer recharge and travel times.
- More metered groundwater data now allows more accurate water balances, though still insufficient.
- Environmental volatility in the Wairau Aquifer peaked between 2021 and 2025 due to climate variability.
- Responses to sea-level rise appeared for the first time.
- Awareness of surface-groundwater interdependence increased, leading to collaborative networks. Long-term environmental data provides valuable insights.



Ponding Wairau River water where the braidplain aquifer surfaces

Gravel Bed Rivers National Research Project

The Wairau Aquifer is the largest groundwater system under the Wairau, providing drinking, irrigation, winery and town water for Blenheim, Renwick and Woodbourne, as well as supplying springs on the lower Wairau Plains. It mainly recharges from natural losses of Wairau River water between Waihōpai River and Wratts Road, which remain steady regardless of flow.

It's often taken for granted as a limitless supply of water, but monitoring shows that, since at least 1973, Wairau Aquifer levels have dropped by about one metre. Council staff have been working with scientists in New Zealand and internationally to understand why.

Starting in 2019, Council participated in a five-year Gravel Bed Rivers National Research Project with case studies of Hawke's Bay, Canterbury and Marlborough braided rivers and their aquifers. The groundbreaking research showed that, over time, Wairau River bed levels have declined relative to the most permeable Wairau Aquifer gravels, indicating that the natural recharge pathway has been disrupted and the recharge rate has declined.

Several factors have contributed to the gradual decline in riverbed level over the past 50 years. The most significant influences include reduced gravel supply, either from quarrying or from reduced catchment inputs. Additionally, the river's narrowing for flood control has led to incision.

The research recognised the braided bed of the Wairau River acts as a natural storage area affecting how the aquifer is recharged and led to the idea of the 'braidplain aquifer' (Figure 1). The diagram shows that the layer of highly permeable gravels is quite thin, meaning water from the Wairau Aquifer can flow back into or be absorbed by the river. The ponded water shown on the left side of the photo (facing page) marks where the braid plain aquifer reaches the surface opposite Rock Ferry.

The significance of the Wairau Aquifer for both commercial and domestic water supply, and environmental functions, has been recognised through planned actions, such as a trial expansion of the Wairau River rock lines opposite Jeffries Road and an assessment of the MEP gravel plan to ensure adequate gravel in the vital recharge area. A key lesson from this research is that all hydrological interventions affect other parts of the water cycle.

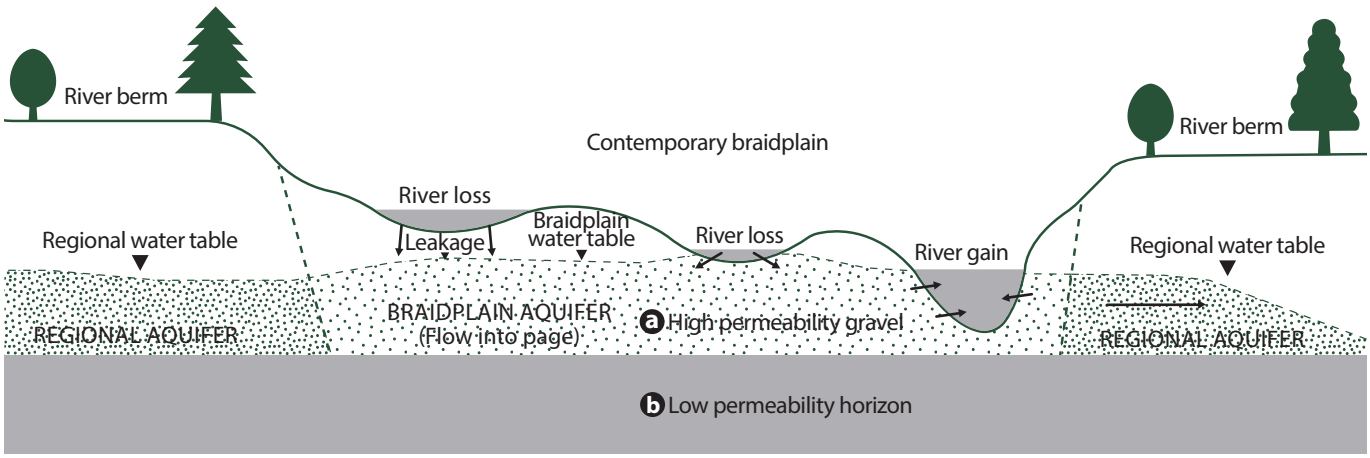


Figure 1: Conceptual understanding of the hydrological interaction between the Braidplain Aquifer, Wairau River and Wairau Aquifer based on research carried out as part of the national Gravel Bed Rivers National Research Project.



Upper Wairau River

Te oranga o ngā awa
River health

Marlborough features a diverse range of rivers and streams, from expansive catchments spanning the region to small coastal waterways. Healthy rivers and streams are vital to Marlborough's social, economic and cultural well-being.



Acheron River at Clarence

Each catchment experiences different rainfall, land use, land cover and terrain. All of these factors have an impact on river health.

River health has gained national attention, prompting major legislative reforms. Regular Council water quality reporting informs the public and supports the development of both regulatory and non-regulatory management tools.

Pressure

The northern part of Marlborough benefits from extensive native forest cover, which helps buffer the impacts of intensive land uses, such as dairy farming, on larger rivers. However, smaller tributaries are more vulnerable, especially where livestock have direct access.

Stream modifications, including channel straightening, to accommodate more intensive land uses and support urban, residential and industrial development can affect water quality and habitat availability. For example, Council's Tuamarina Catchment Water Quality Report 2018 identified areas within the Para Wetland where the original channel had been straightened over time. The straightening of the channel has reduced the water supply to the wetland area. The soil removed during the creation of the artificial channel was deposited alongside the river, creating a bund which further decreases the hydrological connection.

The lower rainfall in the southern parts of the region, combined with comparatively little native vegetation cover, means that even comparatively low-intensity land uses, such as beef and sheep farming, can significantly impact rivers and streams in these areas.

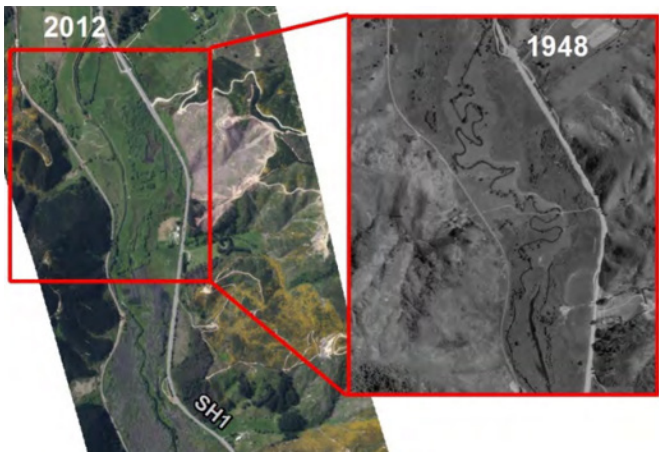


Figure 1: Aerial photographs of the Para Wetland in 2012 and 1948

Response

Council has monitored 34 river water quality sites monthly for over a decade.

Following a recent review, additional sites were added to increase regional coverage, which will improve understanding of natural resources. In catchments where monitoring shows river health is degrading, Council conducts more intensive monitoring to determine the causes of degradation. Using that information, Council then supports local landowners in improving their waterways through the Catchment Care programme.

Current state

Alongside reporting attribute states under the National Policy Statement for Freshwater Management (NPSFM 2020), Council uses a Water Quality Index (WQI) that ranks rivers and classifies them into Good, Fair, Marginal or Poor categories.

The WQI is calculated using monthly data from nine parameters over three years, comparing monitoring results against guidelines that are generally based on NPSFM limits. Rivers with a WQI in the Good or Fair categories support ecological health and recreational, economic and cultural uses. Marginal or Poor ratings indicate degraded states under the NPSFM 2020.

Catchments in the western and northwestern parts of Marlborough, which retain large areas of native vegetation, generally have Good or Fair water quality. In contrast, streams and rivers in the lower reaches of major rivers such as the Wairau and Awatere tend to have poorer water quality due to intensive land use and associated runoff, as well as cumulative inputs of nutrients and organic material. Urban streams, such as the Taylor River in Blenheim, also exhibit poorer water quality, partly due to stormwater discharges (Figure 2).

Pastoral land use in the wider Wairau catchment contributes to slightly elevated nitrate levels in groundwater. These nitrate levels are well below levels affecting human health limits for drinking water and mostly remain below values that are toxic to aquatic animals.

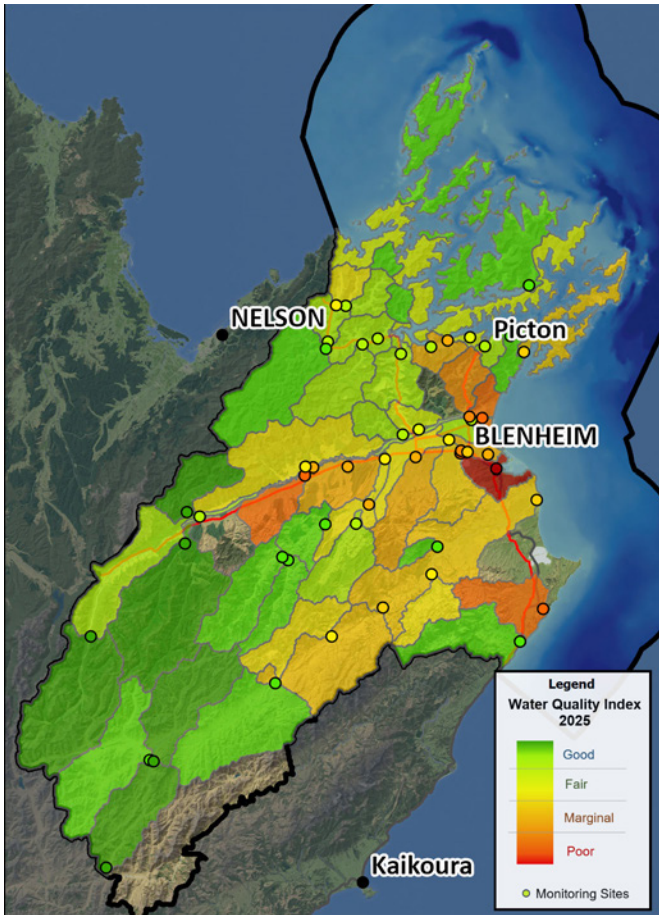


Figure 2: Water Quality Index for the catchments in Marlborough

The NPSFM 2020 sets limits for various parameters, which are used to define water quality state bands ranging from A to D or E. States in the A band indicate minimal ecological impact, while those in the D or E bands are generally considered 'below the national bottom line,' requiring improvement unless the cause is naturally occurring. Currently, only the 34 long-term sites have sufficient data for these assessments.

Figure 3 (over page) shows a summary of the river attribute states for Marlborough and the rest of New Zealand. While Macroinvertebrate Community Index (MCI) state bands, based on the sensitivity of small aquatic animals to contamination and habitat availability, for Marlborough's river health are similar to the national picture, for all other attributes, rivers within the Marlborough have comparatively good water quality.

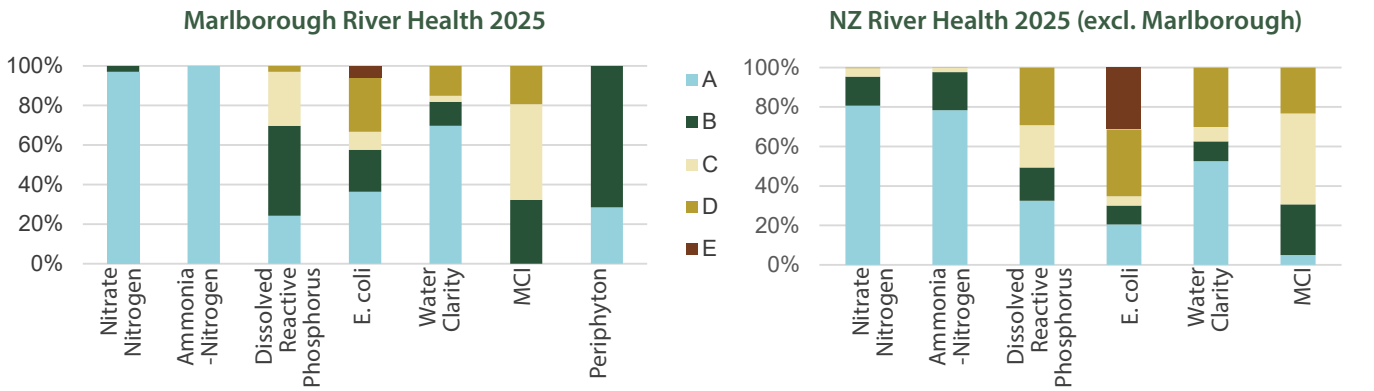


Figure 3: Percentage of river monitoring sites within the NPSFM 2020 state band as of 2025 for Marlborough (left) and the rest of New Zealand (right). Source: LAWA.org.nz; no national periphyton data set is publicly available.

Almost all sites fall within the A band for nitrate and ammonia concentrations, and water clarity is also generally good. However, dissolved reactive phosphorus and *E. coli* concentrations vary widely across the region. Elevated levels of both *E. coli* and dissolved reactive phosphorus are often associated with livestock access to waterways but can also be caused by improperly maintained private sewage treatment systems.

In Marlborough, most sites fall within the B or C band for MCI; however, scores in the region are naturally mostly within the B band. This is illustrated by MCI attributes within the B band for sites with minimal human impacts, such as the Goulter River and Black Birch Stream. Nationally, very few sites fall into the A band for the MCI attribute.

Periphyton is a measure of algae growth, but due to high monitoring costs and method limitations, it is not measured at all sites. Those sites that are monitored fall within the A or B bands.

Trends

Most sites at a regional scale show no changes in ammonia and *E. coli* concentrations over the last 10 years (figure 4). This is also the case for MCI scores. However, a significant number of sites show improving trends in nitrate nitrogen concentrations and water clarity. The reduction in nitrogen is largely due to the conversion of pasture to vineyards, which leach less nitrogen due to a combination of factors including lower nitrogen fertiliser inputs and the targeted nature of drip-line irrigation.

Improvements in water clarity are likely linked to reduced livestock access to streams due to fencing and riparian planting.

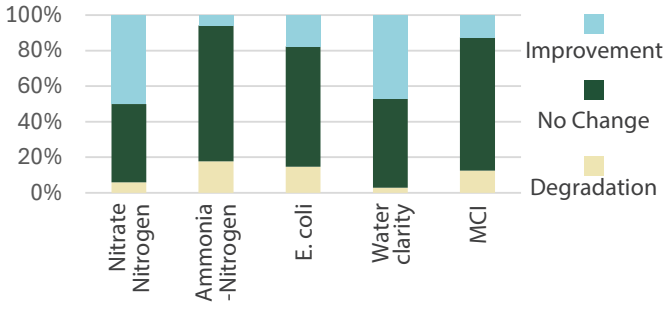


Figure 4: Trends in river health parameters over the last 10 years. For some parameters we have insufficient data or changes in methodology that prevent calculation of 10-year trends.

Future response

Ongoing monitoring is essential to detect changes in river health and guide targeted interventions.

This supports both regulatory and non-regulatory approaches and helps track progress towards improved outcomes.

Council will continue investigating degraded catchments and working with landowners to restore waterways. For example, recent monitoring in Te Hoiere / Pelorus catchment has indicated some sub-catchment improvements in water quality (refer to the case study on page 103). Fine-scale monitoring will be key to evaluating the effectiveness of mitigation efforts.

Emerging contaminants, such as microplastics, and organic pollutants, such as discharges from storing large amounts of organic material like grape marc, will need to be included in future monitoring as scientific understanding evolves.

With improved spatial data availability, local water quality modelling will become an increasingly valuable tool for understanding and managing freshwater resources.

Te kounga o te wai rēhia - ngā awa
Recreational water quality - rivers

Marlborough has several popular swimming spots at the lower reaches of the two largest rivers, the Wairau River and Te Hoiere / Pelorus River.



Te Hoiere / Pelorus River

While the Wairau River is popular with the community, with numerous access routes to the water, two sites on the Te Hoiere / Pelorus River attract the most visitors each year from both locals and visitors to the region.

Smaller rivers, such as the Ōhinemahuta and Waihōpai rivers, also offer swimming opportunities, though these spots are primarily used by the local community.

Pressure

Most river swimming sites are affected by diffuse runoff from rural land use during rainfall, which can introduce contaminants and increase health risks from waterborne diseases.

In urban waterways, such as the Taylor River, stormwater contamination is a major contributor, along with droppings from wildfowl and dogs.

Response

To assess health risks for swimmers, Council collects weekly water samples during the warmer months of November–March.

In total, there are 10 river monitoring sites. Samples are tested for E. coli concentrations, and results are compared with national guidelines to determine the risk of waterborne illness. Where sites consistently show unacceptable recreational water quality, Council conducts additional investigative monitoring to identify sources of contamination and work towards improving water quality.

Current state

Data from five consecutive summer seasons is combined to calculate the Suitability for Contact Recreation Grade, which provides an overall assessment of recreational water quality. Grades range from Very Good to Very Poor, with Fair or better considered acceptable for swimming.

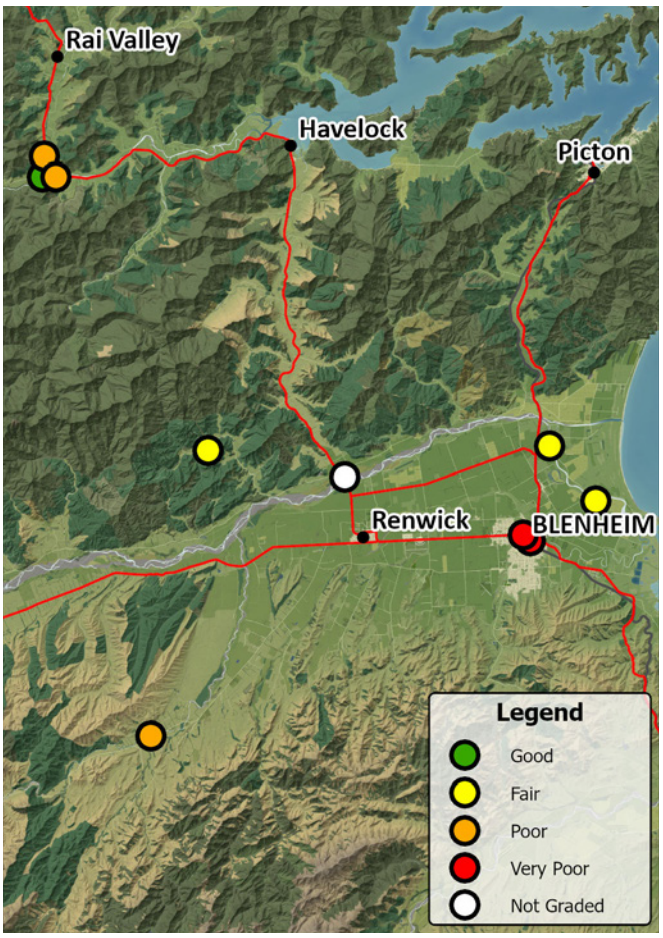


Figure 1: Suitability for Contact Recreation Grades for monitored river swimming sites in 2025

Figure 1 shows the grades for monitored river swimming sites in 2025. About half of the sites meet acceptable standards, including the most popular locations, Pelorus Bridge on the Te Hoiere / Pelorus River and the Wairau River sites.

Several sites are graded Poor or Very Poor. For sites graded Poor, unsafe bacteria levels are typically linked to rainfall runoff from rural land use, but during dry weather, health risks to swimmers are low. For example, during the 2024/25 summer, 80%–95% of samples from sites graded as Poor had safe bacterial levels. Including previous years results, these sites have been safe for swimming more than 75% of the time during summer. This means Council can develop models that predict if swimming is safe based on the latest rainfall data. The models provide up-to-date information and are updated several times a day during the summer season. They can be viewed on Council's website.

Two sites on the Taylor River are in the Very Poor category, primarily due to urban contamination sources. This is representative of their unsuitability for swimming, particularly as human sewage is likely contributing to the bacterial contamination, which poses a greater risk to swimmers than contamination from other sources.

Trends

Analysis of changes over the summer seasons from 2015–2025 shows that the recreational water quality at 40% river swimming spots is improving. These include the Wairau River at Ferry Bridge and the Taylor River. Sixty percent of other sites show no statistically significant change over this period. Importantly, no sites are showing a degrading trend.

Future response

Council will maintain summer-season monitoring at popular swimming spots and collaborate with landowners and stakeholders to improve water quality where needed.

With the development of better tools to identify the sources of faecal contamination, such as reliable genetic markers and high-frequency or on-site measurement options, additional monitoring to better understand the causes of poorer recreational water quality will enable more targeted improvement actions.



Ferry Bridge

Te oranga o ngā roto
Lake health

Marlborough has over 1,000 lakes, dams and ponds, the latter of which are primarily small artificial reservoirs used for stock drinking water or irrigation. Unlike other parts of New Zealand, the region has relatively few large natural lakes, and many of these are located in remote areas or linked to coastal wetlands.



Tarndale Lakes

Only 14 lakes have an official or locally recognised name. Natural freshwater lakes in Marlborough include deep high-country lakes like Lake McRae, an oxbow lake such as Grovetown Lagoon, and shallow lakes like Lake Elterwater and Lake Moawhitu.

The Tarndale Lakes in the upper Clarence and Wairau catchments are habitat for the Tarndale bully, an indigenous fish species endemic to these lakes and found nowhere else in New Zealand or the world.

Pressure

Regular monitoring of lake health began only recently and currently focuses on larger natural freshwater lakes. Two lakes are monitored monthly, while remote lakes with fewer pressures are assessed during one-off summer visits.

During site visits, water samples are taken and analysed for a number of parameters, including nutrients, *E. coli*, sediment concentrations and potentially toxic algal levels.

Once per year, near the deepest part of the lake, a profile of parameters is collected from the lakebed to the surface. This provides important information about the availability of oxygen to aquatic species and the potential release of phosphorus from the lakebed, which can drive algal blooms. Where lakes are degraded, Council supports catchment groups and other initiatives such as the Grovetown Lagoon Project in improving lake health.

Council also conducts investigations into sources of contamination or hydrological dynamics to help inform mitigation actions.

Response

Regular monitoring of lake health began only recently and currently focuses on larger natural freshwater lakes. Two lakes are monitored monthly, while remote lakes with fewer pressures are assessed during one-off summer visits. During site visits, water samples are taken and analysed for a number of parameters, including nutrients, E. coli, sediment concentrations and potentially toxic algal levels.

Once per year, near the deepest part of the lake, a profile of parameters is collected from the lakebed to the surface. This provides important information about the availability of oxygen to aquatic species and the potential release of phosphorus from the lakebed, which can drive algal blooms. Where lakes are degraded, Council supports catchment groups and other initiatives such as the Grovetown Lagoon Project in improving lake health.

Council also conducts investigations into sources of contamination or hydrological dynamics to help inform mitigation actions.

Current state

The Trophic Lake Index (TLI) provides an overall measure of lake ecosystem health based on annual median concentrations of Total Nitrogen, Total Phosphorus, and Chlorophyll-a.

Figure 1 shows the trophic state of monitored lakes in Marlborough. Conditions vary significantly: Lake McRae and Lake Chalice are in good condition, while Lake Elterwater is severely degraded. Bowscale Tarn and the Grovetown Lagoon are categorised as having marginal lake health.

Figure 2 (over page) shows the NPSFM 2020 attribute states of the lakes currently being monitored based on data collected in 2024.

Lake McRae is the only lake with all attributes in the A band. Lake Chalice and Bowscale Tarn are mostly in A and B band states. Lake Elterwater has the poorest health due to high nutrient and chlorophyll-a concentrations, indicating a shift toward an algae-dominated state. Although Grovetown Lagoon remains dominated by submerged plants, elevated chlorophyll-a concentrations indicate occasional high algae abundance. This is driven by high phosphorus concentrations.

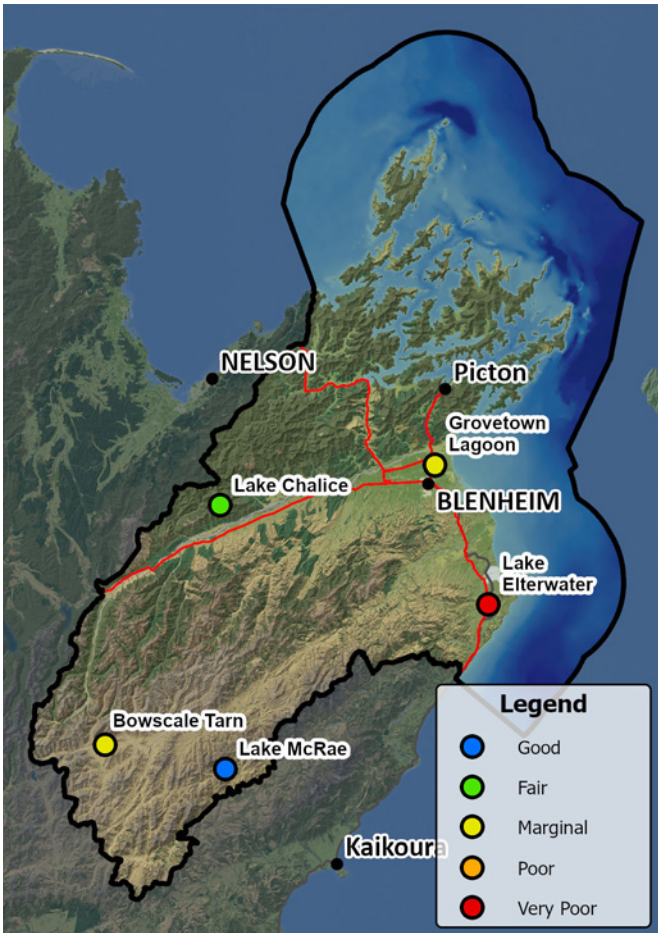


Figure 1: Lake health based on the Trophic Lake Index

Future response

Continued regular monitoring is essential to ensure land use pressures are managed sustainably and to inform improvement actions for lakes that are currently degraded.

The monitoring programme could be extended to include other water bodies, such as coastal lakes and large artificial lakes, particularly if they are of cultural or recreational value.

	Grovetown Lagoon	Lake Elterwater	Lake McRae	Lake Chalice	Bowscale Tarn
Ammoniacalnitrogen	**A**	**B**	A	A	A
Total nitrogen	**A**	**D**	A	A	A
Total phosphorus	**C**	**D**	A	A	B
Chlorophyll-a	**C**	**C**	A	B	B
Cyanobacteria	**A**	**A**	A	A	A
E. coli	**A**	**A**	A	A	A
Lake bottom dissolved oxygen	A	D	A	B	B
Mid hypolimnetic dissolved oxygen	N/A	N/A	A	B	N/A
Submerged native plants	D	D	A	D	B
Submerged invasive plants	D	B	A	A	B

Figure 2: NPSFM 2020 states based on data from 2024. States in bold indicate states with complete datasets.



Monitoring lake health at Bowscale Tarn

Te kounga o te wainuku
Groundwater quality

All of Marlborough's municipal water and most rural drinking water on the Wairau come from aquifers. High-quality groundwater is crucial, especially since some contaminants are hard to treat in large volumes. The Wairau's groundwater is usually of high quality, evident by treatment for Blenheim's supply only being introduced in 2009.



Council hydrologist sampling Rai Valley well 10323


Council hydrologist sampling Wratts Rd monitoring well 3009

Aquifers are natural water filters, removing microbial and sedimentary impurities, which is why springs like Murphys Creek and Spring Creek have clear water even during storms. However, dissolved compounds from a range of sources can be present in varying amounts and can affect groundwater quality.

Land use, crop type, climate, hydrology and aquifer structure influence groundwater quality, and quality also varies with depth and proximity to land surface activities.

Deeper groundwater undergoes natural processes that absorb nutrients. Shallow groundwater is more affected by surface activities and is the primary focus of Council monitoring.

Young, dilute groundwater near an aquifer surface is similar to river water and of high quality. Marlborough's confined aquifers have a barrier of impermeable material that isolates them from land use and contaminants, but the downside is groundwater becomes more mineralised through longer interaction with the natural rock.

Pressure

Land-use activities mainly influence groundwater quality under Marlborough's agricultural valley floors, terraces or floodplains. Vineyards dominate the land use over main aquifers and have low nutrient leaching rates compared to other crops.

Human settlements also affect groundwater quality, especially regarding microbes, arsenic, manganese, and organic compounds like PFAS, petroleum products or pesticides.

Most groundwater in Marlborough's aquifers is young and/or fast moving, so legacy issues from past land uses are unlikely as water continually turns over and drains to the coast. In mid-2025, a storm caused the highest Rārangi Shallow Aquifer (RSA) levels recorded, which resulted in flooding of Rārangi Road and some septic tanks, risking cross-contamination of wells sharing the aquifer.

Emerging organic contaminants like pharmaceuticals, sweeteners, caffeine, veterinary products, preservatives, detergents, sunblocks and plasticisers have likely been in groundwater for decades but testing only began in 2018. Mainly from rural wastewater treatment systems, they pose uncertain risks due to a lack of thresholds.

Response

State of the Environment monitoring is used to assess land-use impacts and natural contaminants to help evaluate MEP effectiveness and manage seasonal issues such as seawater intrusion.

Council's monitoring samples 25 wells across main aquifers, contamination-prone areas, and some municipal wellfields to monitor groundwater quality trends (Figure 1).

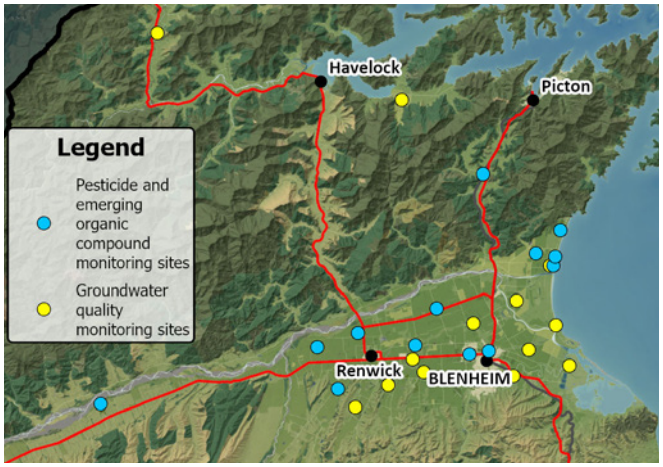


Figure 1: Council groundwater quality and pesticide and emerging organic contaminants monitoring network

Historically, water quality monitoring focused on elements, nutrients and microbes, but has expanded to man-made organic compounds. Council also tests for problem species like arsenic and manganese known to be present in local groundwaters.

The National Groundwater Pesticide Survey (NGPS) assesses pesticides and emerging compounds at selected wells every four years. Since 2000, Council has also participated in the National Groundwater Monitoring Programme, offering a national perspective on Marlborough's groundwater quality, land use, geology and biochemistry. Some Council data is available on the Land and Water Aotearoa (LAWA) website.

The Ministry of Defence (MoD) monitors PFAS levels in monitoring and drinking water wells between Woodbourne and Blenheim, including municipal supply wells. MoD coordinates surveys with Council based on hydrological conditions and shares results with public water operators.

Current state

Overall, Marlborough groundwaters have low contaminant levels like nutrients, soil conditioners, animal waste and pesticides by national standards, indicating minimal impact from land use and human settlement. Groundwater quality varies due to local land uses, natural contaminants and biochemical processes, which change over time and location.

Groundwater near land activities generally contains higher element concentrations than river waters, which tend to have greater diluting capacity (Figure 2).

For example, groundwater and springs have relatively higher nitrate levels than river water, and levels in groundwater match those of nearby connected springs, like Spring Creek and Wairau Aquifer at Wratts Road. The MEP requires groundwater quality in Marlborough aquifers to remain suitable for drinking, and this standard is presently being achieved.

Averaged median nitrate-nitrogen concentrations for different water sources in Marlborough

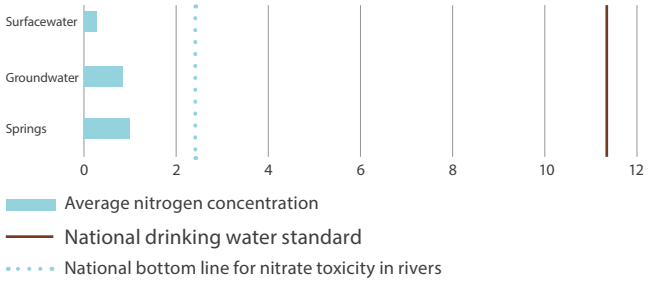


Figure 2: Averaged median nitrate nitrogen concentrations for Marlborough water sources

An emerging contaminant detected in groundwater, PFAS, was found at very low concentrations in wells downstream of Woodbourne in 2017 by MoD. PFAS, a suite of man-made persistent organic compounds, was contained in firefighting foam used historically at Royal New Zealand Air Force Base Woodbourne. The use of this firefighting foam ceased in 2002. It contaminated soil and subsequently leached to groundwater, generating a plume extending downstream to the outskirts of Blenheim which is likely to exist for decades. MoD regularly tests for PFAS across selected wells, shares results with Council and public water supply operators and provides affected properties with drinking water alternatives if levels are found to be above health thresholds. Based on surveys by the MoD since 2018, PFAS levels in groundwater and springs downstream of Woodbourne are stable but are close to or exceed the Maximum Allowable Value in the Drinking Water Standards.

Pesticides are detected in Marlborough groundwater, but levels rarely exceeded health limits since 1992. The only pesticide detected in the 2014, 2018 and 2022 national surveys was the herbicide terbuthylazine, a grass or broadleaf weedkiller, but at concentrations well below the human health threshold. Past detections don't seem linked to land use, except for persistent chemicals like dieldrin, associated with sheep dips.

Water chemistry helps us understand how Marlborough's aquifers are functioning. After the 2016 Kaikōura earthquake, tests showed lasting changes in the Wairau Aquifer, including higher chloride levels and more variable dissolved oxygen.

These shifts suggest the aquifer has become less permeable and is receiving less recharge from the Wairau River, with more recharge now coming from rainfall instead. This affects groundwater availability and the performance of some wells.



Council hydrologist checking irrigation well 2651 west of Renwick

Trends

Minor time trends include rising chloride in groundwaters at Wairau Valley and Rārangi. There is also a long-term decrease in nitrate-nitrogen in the Wairau Aquifer. Figure 3 shows this decline from early 1970s measurements at three wells, coinciding with the shift from mixed farming to vineyard.

Nitrate-nitrogen concentration trends

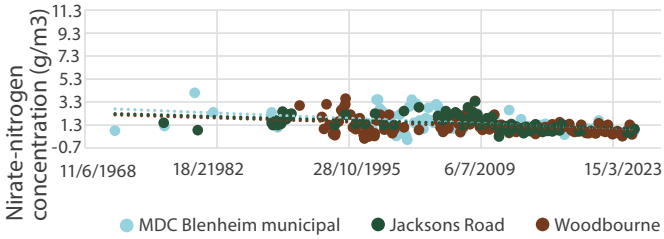


Figure 3: Nitrate-nitrogen concentration trends for Blenheim and Woodbourne 1971–2025, showing a declining trend over time

The 2025 groundwater quality report focused on the impacts of rural settlements. A Rārangi case study showed small increases in nitrate-nitrogen levels, occasional microbial contamination (mostly from onsite wastewater treatment systems, often linked with high rainfall) and ongoing high arsenic levels at a hotspot. Centralised or household treatment, or an alternative water source, are methods currently used to manage the health risk from arsenic at this location.

Figure 4 shows arsenic levels at Council Rārangi well 4442 have been above the 0.01 g/m3 drinking water threshold since 2005, peaking in winter with more reducing aquifer conditions. The threshold is marked by a red line.

Arsenic concentration at Rārangi

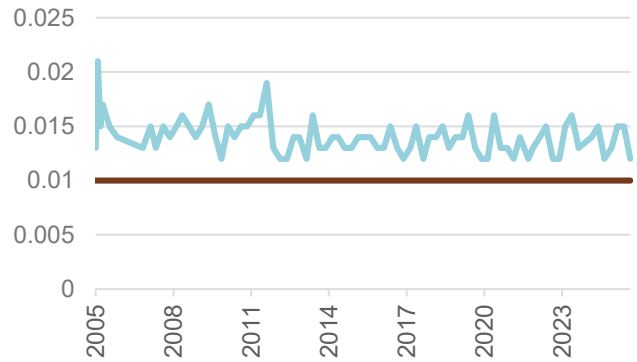


Figure 4: Arsenic concentration at Rārangi Shallow Aquifer well 4442 with the maximum allowable value in the Water Services (Drinking Water Standards for NZ) Regulations 2022 for human health of 0.01 g/m3, marked by red line.

Microbial contamination Rārangi

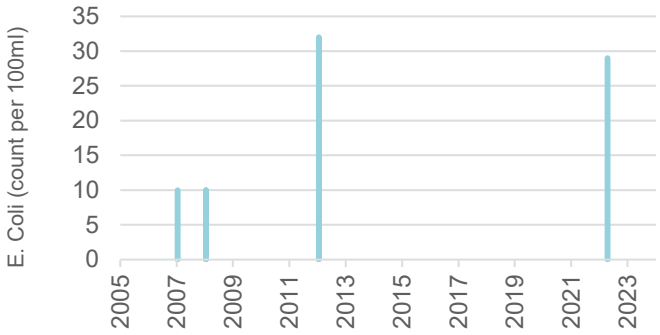


Figure 5: Occurrence of microbial contamination at well 3668 Rārangi 2005–2025.

E. coli or faecal coliforms have occurred occasionally at well 3668 since 2005 (Figure 5). This highlights the need for effective human effluent treatment and the usefulness of monitoring for defining safe lot sizes for waste in Marlborough.

Future response

Ongoing comprehensive reviews of groundwater state of the environment monitoring will continue, so the programme remains representative and provides the building blocks for contributing to the national picture.

Evolution of environmental monitoring towards a combined approach across all catchment waters reflects the physical interconnectivity of Marlborough FMUs and prevents duplication. The linkages between hydrology and water quality deserve more attention and are likely to provide new insights for unified catchment management.

This includes parameters for tracking pathways and geochemical processes affecting water quality. A focus on real-time observations aims to understand short-term groundwater changes better than seasonal measures. Automated nitrate-nitrogen sensors, tested in Marlborough, show promise but face challenges due to natural chemical conditions. Hopefully, useful data will soon result from this monitoring.

CHANGES SINCE 2015

- Groundwater is generally high quality due to diluted recharge water and minimal impact from vineyard land use over the Wairau aquifer systems.
- Nitrate-nitrogen levels have declined largely due to land-use changes from mixed farming to vineyards in the Wairau Valley and Wairau Plains.
- Coastal and inland Wairau Valley chloride levels have exhibited upward trends, but the exact causes remain uncertain.
- Greater awareness of human compounds like PFAS and emerging organic compounds in groundwater based on evolving monitoring programmes.



Council hydrologist dipping at Murphys Well