2025

River Water Quality in Tāmaki Makaurau: Annual Data Summary

Auckland Council's online interactive Water Quality and River Ecology Data Explorer presents State of the Environment (SoE) monitoring data for rivers, lakes, groundwater and the coast. River water quality can be compared across the region, by season, and over time.

This report provides a summary of **river water quality** monitoring results for **July 2020 to June 2025** and includes the first information summary for 12 sites added to the programme in 2022.

Key messages

Land use and seasonal patterns

- Water quality was generally poorest in urban streams and best in native forest streams.
- Streams within native forest catchments had smaller fluctuations in temperature, pH, and dissolved oxygen levels and lower concentrations of nutrients and faecal indicator bacteria compared with other streams, and metal contaminants were rarely detected.
- There were clear seasonal patterns in several water quality measures although these patterns can vary between locations and peak concentrations may occur in different seasons.

12 new sites expand representation

- New sites were added to improve regional network representation across land cover and biophysical classes, with a focus on wider Kaipara and Manukau Harbour areas and future urban areas.
- Kaipara - Three new sites in the Hōteo River catchment including two large rural tributaries, one of which is within a future urban area the Kumeū River catchment. The third site (Waiwhiu Stream, in Dome Valley) is a lower impact site, the least-impacted local reference site available in the Kaipara area.
- Manukau - Four new sites in the wider Otūwairoa Stream/Slippery Creek catchment across a broader pressure gradient, that will provide a baseline for future urban development. Two new sites in the southern Pukekohe area which may be influenced by groundwater nitrate contamination. In combination these provide better coverage of the Manukau catchment.
- Hauraki - One new site in Ōrewa and one in the Mahurangi River catchment, both near future urban areas.

Our river water quality monitoring programme

See the 'Water Quality and River Ecology Data Explorer User Guide and Methodology' report for more information on the water quality parameters we monitor, how we collect and analyse samples, how we analysed the data, and how to use the data explorer.

Where	When	How	What
•49 water quality sites. •Monitoring networks are broadly representative of a range of river and catchment sizes, biophysical classes, and dominant land cover pressures across the region.	•Monthly, undertaken in groups of sites over a two week period. •Each site sampled at approximately the same time of day each month.	•Water quality measures directly in stream using a hand held meter. •Bottles of stream water collected and sent for laboratory analysis.	•Different measures of water quality including physical factors, nutrients, bacteria, sediments and water clarity, and metals.

Figure 1: Land cover category, catchment boundary and location of river water quality monitoring sites.

Sediment and Turbidity

Total suspended solids (TSS) measure the weight of solids in the water column, which can come from sediment and organic matter. Turbidity is an index of water cloudiness, or how suspended solids in the water column scatter light. Turbidity in rivers is measured in two complementary ways: in the field (FNU) and in the laboratory (NTU). Direct measures of visual clarity (using black disc or clarity tube) have been recorded since 2022 and are reported here for the first time. These measures are inverse: when clarity is high, turbidity is low.

Storm events can trigger soil erosion and landslides, adding sediment into streams, leading to higher TSS and turbidity levels. Spikes in TSS and turbidity were observed at some (but not all) locations after the extreme weather events in 2023, though these spikes were not above the range previously measured.

Biophysical units based on climate and geology provide better insights to describe variation in turbidity and TSS than land cover classes. Streams with the highest median turbidity and TSS typically had soft-sediment stream beds; soft-sediment streams are the most common in the Auckland region.

Median turbidity (FNU) ranged from 1.8 FNU in Waitangi Stream to 12.7 FNU in Ōkura River. Similar patterns were observed for direct visual clarity with the clearest water at volcanic spring-fed streams in the southern Pukekohe area (including Waitangi Stream), and the poorest median water clarity at Ōkura River. In the southern Pukekohe streams, water clarity can exceed 7 m while at Ōkura River, the greatest clarity recorded was only 0.7 m. Among soft sediment streams, median visual clarity typically ranged from 0.5 m to 1 m.

Other sites with poorer water clarity included the larger rural streams Rangitōpuni River and Kumeū River, upper Papakura Stream, and the urban Avondale Stream.

Nutrients

Nitrogen and phosphorus are essential nutrients that influence ecosystem functions in streams. High concentrations of nutrients can change the growth and composition of algae and plants, which can have further impacts on macroinvertebrate and fish communities and other measures of water quality like dissolved oxygen levels. Dissolved forms of nutrients (dissolved inorganic nitrogen, DIN and dissolved reactive phosphorus, DRP) are particularly important as they can be more readily taken up by plants. The highest concentrations of dissolved inorganic nitrogen (DIN) were found in the five monitored streams in the wider Pukekohe area. The median DIN concentration at all five sites exceeded 2 mg/L, with most of the nitrogen being in the form of nitrate. The highest concentrations were observed at Whangamaire Stream and Whangapōuri Stream (a recently added site) where median DIN exceeded 10 mg/L. At these two sites, nitrate concentrations tended to be lower in winter than summer while most other sites showed peak concentrations in winter. Interactions with the shallow volcanic aquifers in this area greatly influence these waterways[1].

Median DIN concentrations in other rural streams were less than 0.65 mg/L. Concentrations were even lower at native forest streams (<0.07 mg/L). Some urban catchments also showed higher median DIN concentrations (ranging from 0.05 to 1.4 mg/L).

At Pakuranga Creek ammoniacal nitrogen made up a larger share of DIN than at other sites. Investigations in this catchment have identified a point source discharge to the stream, connected to the Greenmount landfill.

Dissolved reactive phosphorus concentrations were highly variable across the region, with median concentrations ranging from 0.003 to 0.04 mg/L in rural and urban streams. An exception was Newmarket Stream which was nearly double the next highest site (at 0.075 mg/L). DRP concentrations were notably lower at three of the five sites in the Pukekohe area however the two new

[1] See data explorer or groundwater annual report: Buckthought, L. (2025) Groundwater quality in Tāmaki Makaurau: Annual data summary 2025. Auckland Council.

sites in this area showed higher concentrations of phosphorus. DRP concentrations were five times higher at the downstream Ngākōroa site than upstream. DRP concentrations were notably higher at Wairoa Tributary than at other reference native forest sites. There were no clear seasonal patterns in DRP at any monitoring site.

Within the past year, some sporadic events were recorded with high concentrations of nutrients.

Indications of a sustained pollution event were observed at Ōtara Creek (South) over December 2024 to May 2025 including elevated DRP, nitrite, and ammonia concentrations. Nutrients were much higher over these months than in November 2024 when a likely sewage overflow was observed on site. A pulse in sediment, metal contamination, and *E. coli* was also observed during this November event. Investigations in the catchment identified a broken wastewater pipe discharging untreated sewage in the upper catchment which was resolved by Watercare in June 2025.

At Botany Creek there was major spike in several nutrients and *E. coli* in December 2024. There was a wastewater (sewage) overflow occurring at the time of sampling which has since ceased and no further events have been detected.

Higher concentrations of ammonia were observed at Whangamaire Stream, and at Mangapū Stream in October 2024. At Whangamaire Stream other measures of water quality including DRP and copper and zinc concentrations were also elevated. At both sites, there were no visible signs of pollution and there was no rainfall in the preceding days.

Within the past five years other sporadic events also occurred at Newmarket Stream, Botany Creek, Avondale Stream, Ōteha River and Ōkura River[2].

Physico-chemical results

Water temperature, dissolved oxygen and other physico-chemical water quality parameters vary over daily, seasonal, and annual cycles.[3] Peak temperatures, and the lowest dissolved oxygen levels, may not be recorded by monthly monitoring.

Temperature and dissolved oxygen were more stable at native forest sites whereas rural and urban streams showed larger fluctuations over time. At native forest sites, the difference between the lowest and highest dissolved oxygen levels was no more than 3 mg/L. In contrast, urban sites varied by up to 9 mg/L. The highest temperature at a native forest site was 19.1°C, while at an urban site (Botany Creek (East)), it exceeded 30°C. Botany Creek flows through a shallow, unshaded concrete channel. Very high dissolved oxygen levels were also observed at Botany Creek. These are likely linked to photosynthesis (producing oxygen) by the dense periphyton (algae) mats that cover the channel's shallow waters. As photosynthesis switches to respiration (consuming oxygen), it is possible that hypoxic (low oxygen) conditions could occur overnight at this location.

Hypoxic conditions (<2 mg/L) were observed on some occasions across five rural streams (including at a new site at Kumeū Tributary) and one urban stream (Vaughan Stream). The lowest dissolved oxygen levels were typically recorded in summer but also occurred in autumn in some locations.

pH indicates how acidic or alkaline the water is. It can affect the health of aquatic life and the solubility of certain contaminants. Median pH levels across all streams ranged from 6.4 to 7.7 pH units pH at any single site varied by less than 0.6 pH units between the 25th to 75th percentiles. However, outliers (both higher and lower) were common at most sites. The greatest variability in pH over time was observed at urban streams, particularly Botany Creek (East) and Ōtara Creek (South).

Native forest streams and streams in the Wairoa catchment had soft water. Most rural streams had soft to moderately hard water, and most urban streams had moderately hard to hard water. Pakuranga Creek had hard to very hard water.

Dissolved organic carbon (DOC) is a form of organic matter in streams that provides food for aquatic

[2]See data explorer or previous river water quality annual report: Ingley and Dikareva (2025) River water quality in Tāmaki Makaurau: Annual data summary 2024. Auckland Council.

[3] Continuous monitoring of dissolved oxygen and temperature is undertaken at a subset of locations to further understand diurnal and seasonal patterns. For further information see https://knowledgeauckland.org.nz/media/kyzbxfem/dissolved-oxygen-and-ecosystem-metabolism-in-auckland-rivers-2021-24-cawthron-january-2025.pdf

life. It can affect light, colour, and water clarity in streams and the bioavailability of metal contaminants. Median DOC levels were <2.8 mg/L in native forest reference streams, while median concentrations ranged from 1.3 to 7.4 mg/L in urban and rural streams. The five streams monitored in the Pukekohe area had lower DOC compared to other rural and urban streams. Extreme outliers have occurred on multiple occasions at Pakuranga Stream over the past five years coinciding with observed pollution events where the water appeared cloudy and foamy. No other water quality parameters notably spiked during these events.

Metals

Soluble metals are the most ecologically relevant fraction although uptake depends on other water chemistry factors (bioavailability). Metal concentrations on the data explorer are **not** adjusted for bioavailability.

Both copper and zinc were typically undetectable at most native forest reference and exotic forest sites confirming low background levels. The native forest site Cascades Stream (Waitākere) had slightly higher copper concentrations, and the exotic forest site Ararimu Tributary (Riverhead forest) had notably higher zinc.

Soluble copper and zinc were higher in urban streams than most rural streams. Newmarket Stream and Ōmaru Creek showed the highest levels, with zinc concentrations at these sites double other urban streams. Copper concentrations were very high at Newmarket Stream, nearly double the level observed at Ōmaru Creek. Zinc concentrations were typically higher in winter across urban sites.

High concentrations of both copper and zinc were observed at one new rural site – Kumeū Tributary. The median copper concentration was more than double the concentration at the next highest rural site. Zinc levels were nearly five times higher at this site than the next highest rural stream. The catchment upstream of Kumeū Tributary has a high proportion of horticultural (mostly viticulture) land use.

In contrast, other streams with high horticultural land use in the upstream catchment, located in the southern Pukekohe area have very low metal concentrations. Concentrations of copper were also very low at the new site, Whangapōuri Stream in the Pukekohe area despite the large urban area upstream of this location. Zinc concentrations were higher at Whangapōuri Stream than the rural Pukekohe sites but still relatively low compared to other urban catchments. It is likely that this reflects the influence of groundwater baseflow at this site.

E. coli

Escherichia coli bacteria indicate possible faecal contamination from humans and animals.

At native forest reference stream sites, median *E. coli* levels were typically less than 50 cfu/100 mL. *E. coli* levels were also typically in this range for the new site at Waiwhiu stream in the Dome Valley (mixed exotic and native forest), and also for streams on Waiheke Island despite influences from rural and urban land uses.

In urban and rural streams, median *E. coli* concentrations generally ranged from 50 cfu/100 mL to 1200 cfu/100 mL however some urban sites had much higher concentrations. The most impacted site was Newmarket Stream with median concentrations exceeding 5000 cfu/100 mL.

The highest *E. coli* levels recorded in urban and rural streams were commonly >10,000 cfu/100 mL. Some samples obtained during observed wastewater overflow events (at Botany Creek, and Newmarket Stream) reached the millions.

The Data Explorer should not be used to make decisions about entering water for recreational activities. Visit Safeswim for real-time information on recreational water quality, swimming conditions, and safety hazards for popular swimming locations around the region.

Disclaimer

Find out more:

Visit the Data Explorer: https://environmentauckland.org.nz/Data/Dashboard/456

Read the user guide and methodology report: https://www.knowledgeauckland.org.nz/publications/water-quality-and-river-ecology-data-explorer-methodology-supplementary-report/

Read the detailed state and trend analysis report for more information: https://www.knowledgeauckland.org.nz/publications/river-water-quality-current-state-and-trends-in-tamaki-makaurau-auckland-to-2024-state-of-the-environment-reporting/

For more information and data, contact: EnvironmentalData@aucklandcouncil.govt.nz

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