



WEST COAST
REGIONAL COUNCIL

Lake Kaniere Drain and Stream *E. coli* Survey: 2025-2026

July 2026



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Executive summary

This report presents the results of a targeted programme measuring *E. coli* in the drains and streams that could carry contamination toward Lake Kaniere, prompted by community and iwi concern about septic tanks, farm drainage and public toilets. Nine primarily wet-weather-weighted rounds (Aug 2025–Feb 2026) sampled 15 sites across three types: urban drains, farm streams and forest streams.

Farm streams carried the highest and most consistent *E. coli*, while urban drains were variable and forest streams were mostly low (Dorothy Falls the cleanest). Rainfall acted in two ways: farm-stream *E. coli* spiked with recent rain, whereas urban and forest sites changed less, potentially diluting with sustained rain. Flow volume mattered as much as concentration when estimating bacterial load.

These source concentrations do not necessarily translate into lake risk: dilution, distance and sunlight die-off explain why the lake's swimming sites have stayed "very low risk" for five years. Other studies have indicated that Lake Kaniere has high water quality.

Introduction

Lake Kaniere is a highly valued waterbody on the West Coast of New Zealand. It supports boating, canoeing, waka ama, swimming and other primary and secondary contact recreation. It holds significant cultural value to Poutini Ngai Tahu, and is the source of municipal drinking water for the Hokitika township. The West Coast Regional Council (WCRC) has monitored recreational water quality at Sunny Bight and Hans Bay weekly from November to March for the past five years. Over that period the lake has consistently returned a "very low risk" rating for *E. coli* - among the best results of any WCRC-monitored contact recreation site on the Coast.

Despite this positive record, concern has been raised by iwi and the wider community about the potential for faecal contamination to affect the lake's swimming and drinking-water values. Key drivers of this concern include the growth in residential development at Hans Bay, which relies on septic tank disposal, and the presence of farmland and public toilet facilities within the catchment. While treated drinking water and the substantial dilution offered by the lake mean any pathogen risk to these end uses is expected to be low, the community wanted a clearer picture of what is actually entering the lake from these potential sources, regardless of whether it is likely to pose a measurable risk.

This report presents the results from a targeted drain and stream sampling programme. The programme's focus is deliberately narrow: it measures *E. coli* in the drains and small streams that could carry contamination from urban and farmland use toward the lake, so that the significance of these vectors can be better understood. It is not a study of general lake or stream ecological health, and it does not attempt to model of how contamination from these sources is diluted, timed or otherwise attenuated once it reaches the lake itself - though a screening-level estimate of that dilution is presented later in this report. Sampling to date has intentionally been weighted toward wetter conditions, since most of the drains around Hans Bay and Sunny Bight only flow

during and shortly after rain, with additional dry-weather and reference-site sampling included for comparison.

Methods

Study area and sites

Sampling covers three groups of sites around Lake Kaniere, classified by source "type" for comparison. This scheme distinguishes constructed drains from natural streams and creeks, rather than simply grouping sites by which settlement they are near:

- Urban drain (9 sites) - constructed stormwater drains serving the Sunny Bight and Hans Bay settlements, including the DOC public toilet areas at both locations and the road stormwater intake drain.
- Farm stream (3 sites) - North, Mid and South Farm Drain, serving the farm at the top (southern/eastern) end of the lake.
- Forest stream (3 sites) - Middle Creek Sunny Bight, Main Stream Sunny Bight Toilets, and Dorothy Falls. These are natural watercourses.

A sample from a tank near the Sunny Bight Toilets was omitted from analysis. It was a direct sample of the public toilet holding tank rather than an environmental drain or stream sample; because it reflects raw, undiluted effluent (*E. coli* up to 73,000 cfu/100 mL) rather than a comparable diffuse source, it was excluded from all figures and statistical analysis in this report and is not discussed further. The remaining 15 sites are the basis for all results presented below.

The Main Stream Sunny Bight Toilets site is sampled specifically downstream of the DOC toilet septic system, to check whether any spike in *E. coli* at the toilet tank itself is detectable in the receiving stream. Access to some Hans Bay sites was occasionally affected by lake levels rising into the low-lying road culverts the drains pass through, which required the use of alternative sampling points further up the same drains on occasion.

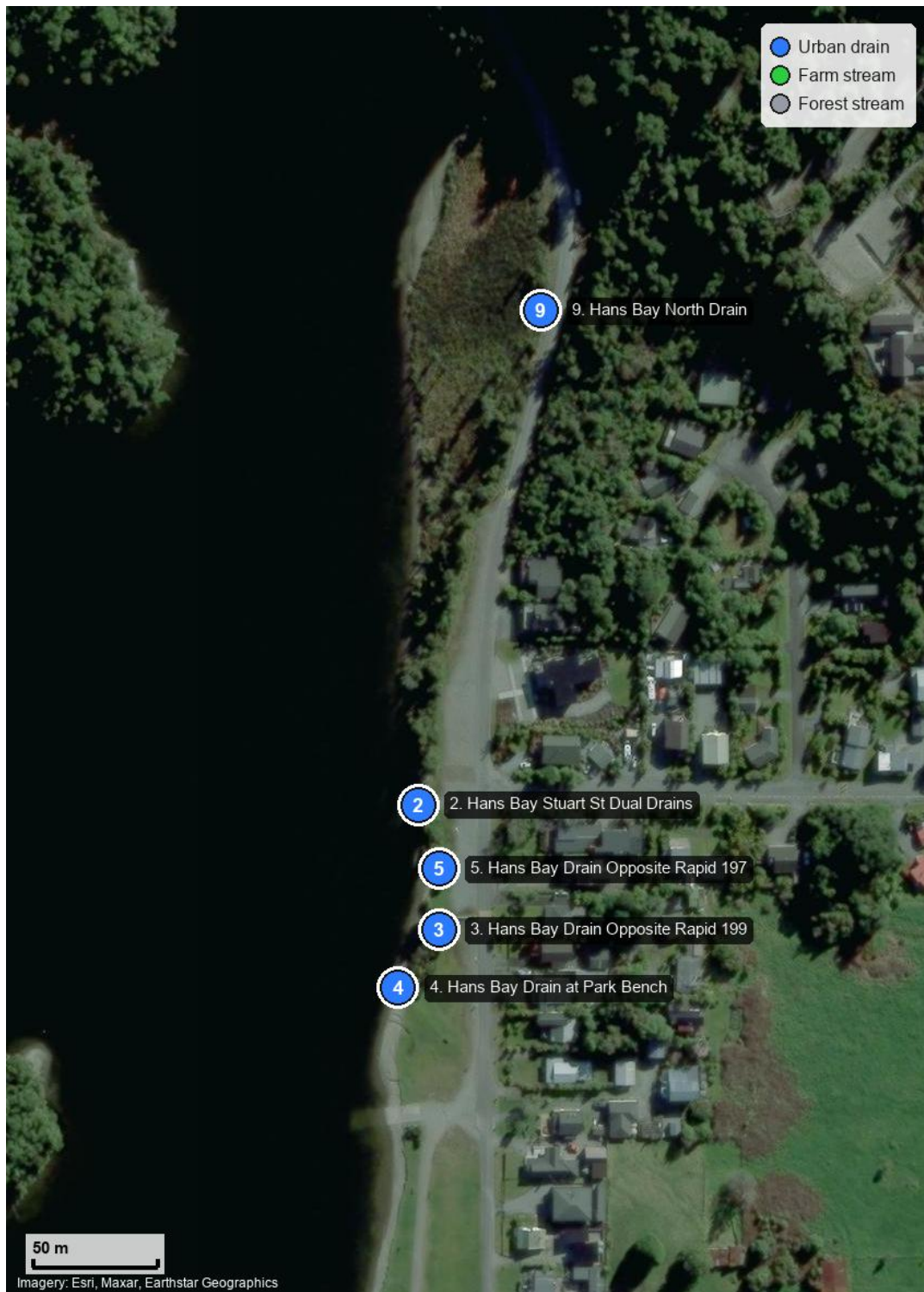
Table 1 lists the location of the 15 sample sites. Sites are numbered and coloured by type (blue = urban drain, green = farm stream, grey = forest stream). Map 1 shows all sites across the whole lake; Maps 2-4 give close-up detail for the three site clusters. Site numbers on the maps correspond to the numbers in Table 1.

Table 1: Sample site coordinates (WGS84 decimal degrees). The site number (#) labels each site on the maps below.

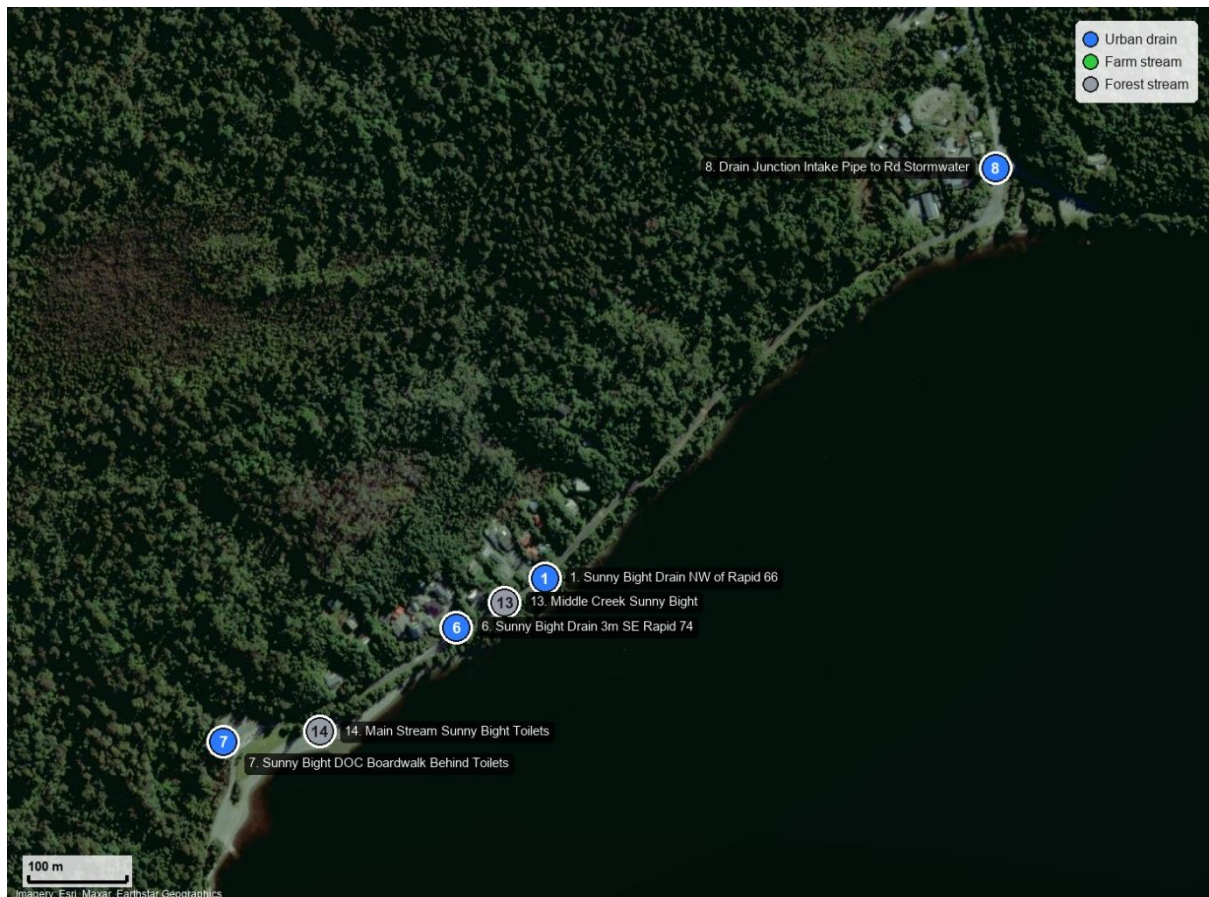
#	Site	Type	Latitude	Longitude
1	Sunny Bight Drain NW of Rapid 66	Urban drain	-42.80208	171.13260
2	Hans Bay Stuart St Dual Drains	Urban drain	-42.80556	171.15490
3	Hans Bay Drain Opposite Rapid 199	Urban drain	-42.80601	171.15500
4	Hans Bay Drain at Park Bench	Urban drain	-42.80622	171.15480
5	Hans Bay Drain Opposite Rapid 197	Urban drain	-42.80579	171.15500
6	Sunny Bight Drain 3m SE Rapid 74	Urban drain	-42.80253	171.13150
7	Sunny Bight DOC Boardwalk Behind Toilets	Urban drain	-42.80357	171.12860
8	Drain Junction Intake Pipe to Rd Stormwater	Urban drain	-42.79834	171.13820
9	Hans Bay North Drain	Urban drain	-42.80378	171.15550
10	South Farm Drain	Farm stream	-42.86794	171.16850
11	Mid Farm Drain	Farm stream	-42.86316	171.16630
12	North Farm Drain	Farm stream	-42.85196	171.16700
13	Middle Creek Sunny Bight	Forest stream	-42.80230	171.13210
14	Main Stream Sunny Bight Toilets	Forest stream	-42.80348	171.12980
15	Dorothy Falls	Forest stream	-42.842725	171.16468



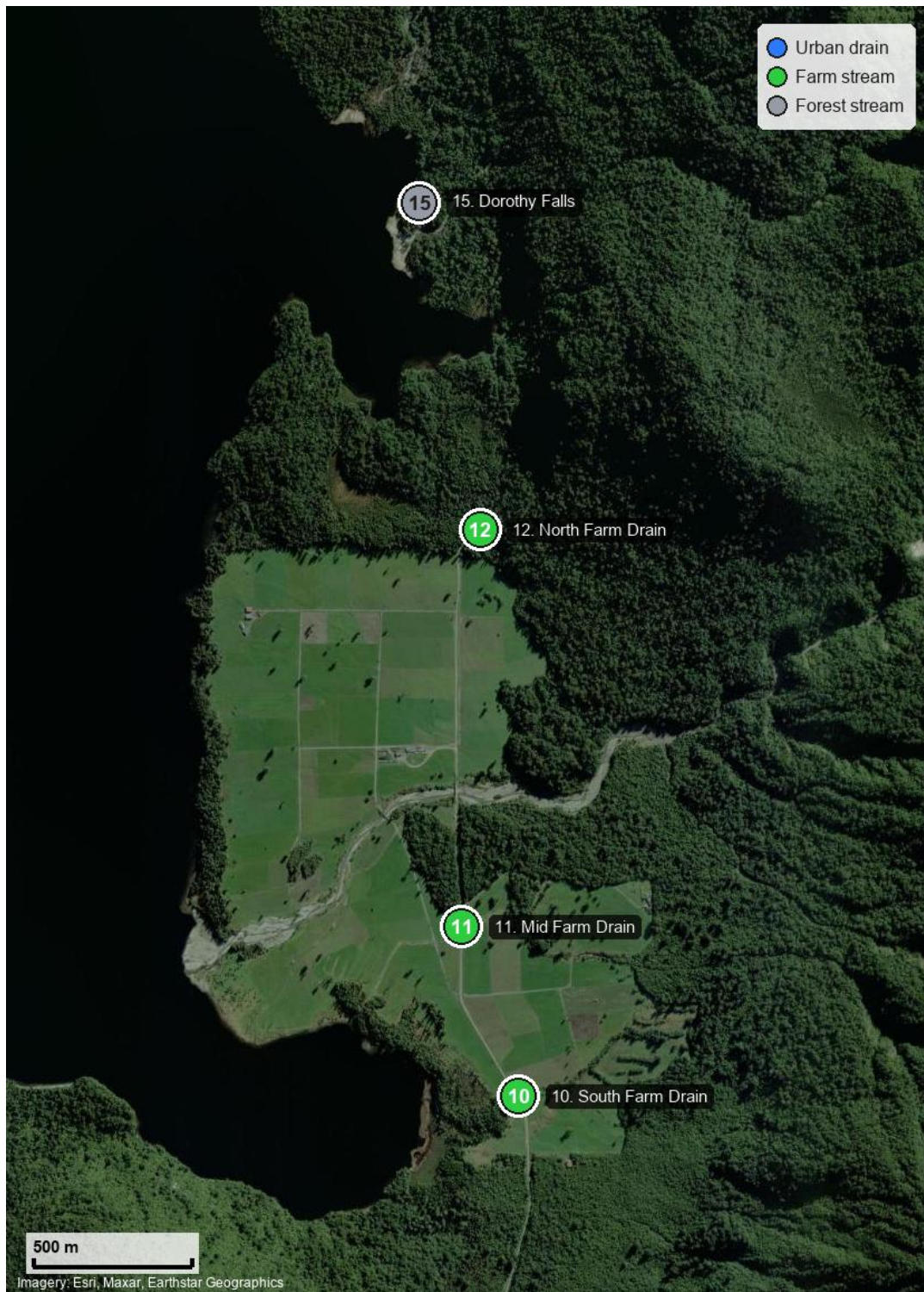
Map 1: Overview of all 15 sample sites around Lake Kaniere, coloured by site type (blue = urban drain, green = farm stream, grey = forest stream). Detail for each cluster is shown in Maps 2-4.



Map 2: Hans Bay urban drain sites (site numbers 2-5 and 9, per Table 1).



Map 3: Sunny Bight sites - urban drains (1, 6-8) and the two Sunny Bight forest streams (13, 14).



Map 4: Farm stream sites (10-12) at the southern end of the lake, and the Dorothy Falls forest-stream reference site (15).

Sampling rationale and timing

Many of the urban drains at Hans Bay and Sunny Bight only flow during and shortly after rain, so sampling rounds were deliberately targeted at wet (but not torrential) weather in order to catch these drains actively flowing. This is a different sampling philosophy to WCRC's routine Surface Water Quality State of the Environment monitoring, which samples on predetermined dates irrespective of rainfall. This difference matters when interpreting the rainfall results presented below. A smaller number of rounds specifically targeted dry weather, to allow comparison between dry and wet conditions at both farm and reference sites.

The programme included 10 sampling rounds over the 7 months from late August 2025 to mid-March 2026 (the end of the summer recreation season). Nine sampling rounds were completed between 29 August 2025 and 17 February 2026, yielding 81 individual *E. coli* results across the 15 sites (sample sizes per site range from 2 to 9, reflecting both the addition of new sites partway through the programme and the practical difficulty of getting a flowing sample from every drain on every round - several Sunny Bight sites are prone to blockage by debris, and Hans Bay sites are occasionally inaccessible when lake levels rise into the road culverts).

Parameters measured

E. coli (cfu/100 mL) was measured at every site on every round and was the focus of this report. Antecedent rainfall was calculated for three windows - the preceding 6 hours, 24 hours and 96 hours - to separate the influence of very recent rainfall (surface wash-off and drain flow), recent rainfall (short-term catchment wetness) and longer-term rainfall (soil saturation / baseflow conditions). The WCRC Butcher Ck rain gauge was used as the rainfall reference site. Flow and turbidity were recorded opportunistically where practical; flow measurements are sparse (7 of the 15 sites have at least one reading, most with only one or two).

Data analysis

E. coli results span several orders of magnitude (0.5-10,000 cfu/100 mL among the 15 analysed sites) and are, as is typical for microbiological data, strongly right-skewed. All *E. coli* figures in this report therefore use a logarithmic y-axis. Box-and-whisker figures show the 25th, 50th (median) and 75th percentiles as the box, whiskers extending to the 5th and 95th percentiles, and any individual results beyond the 5th/95th percentiles plotted as outlier points, calculated from all available samples in each site or category shown. Two reference lines are shown on *E. coli* figures: an amber "Alert" level (260 cfu/100 mL) and a red "Action" level (550 cfu/100 mL), consistent with the trigger levels used in New Zealand recreational water quality guidance¹.

Figure 2 to Figure 6 group results into finer subdivisions than Figure 1 - by rainfall category and type, or by flow-paired sampling round - which leaves some groups with very few underlying samples. Rainfall category choice was guided more by the nature of rainfall regimes measured than any specific scientific rationale associated with run-off or dilution. Rather than compute a full box-and-whisker from as few as one or two results, these figures scale back which elements are drawn according to the sample count for each group: a single result is shown as a median tick

¹ Ministry for the Environment. 2003. Microbiological Water Quality Guidelines for Marine and Freshwater Recreational Areas. Ministry for the Environment Manatu Mo Te Taiao. PO Box 10-362, Wellington, New Zealand

only; two as a whisker spanning them with no median or box; three as a whisker with a median tick; four as a box and whisker with no separately marked median; and five or more as the full box-and-whisker with outliers, as in Figure 1. The underlying percentile calculations are unchanged throughout - this is a presentational choice intended to avoid a box or whisker implying more precision than one or two results can support.

Results and Discussion

Weather regimes encountered

The nine sampling rounds captured a range of antecedent conditions, from dry short-term weather (no rain at all in the preceding 6 or 24 hours on three rounds - 4 September 2025, 9 February 2026 and 17 February 2026 - though even the driest of these, 17 February, still followed 10 mm of rain in the preceding 96 hours) through to substantial recent rain (up to 22 mm in the preceding 6 hours on 26 September 2025, 79.5 mm in 24 hours on 18 September 2025, and 155.5 mm in 96 hours on 24 October 2025).

E. coli by site

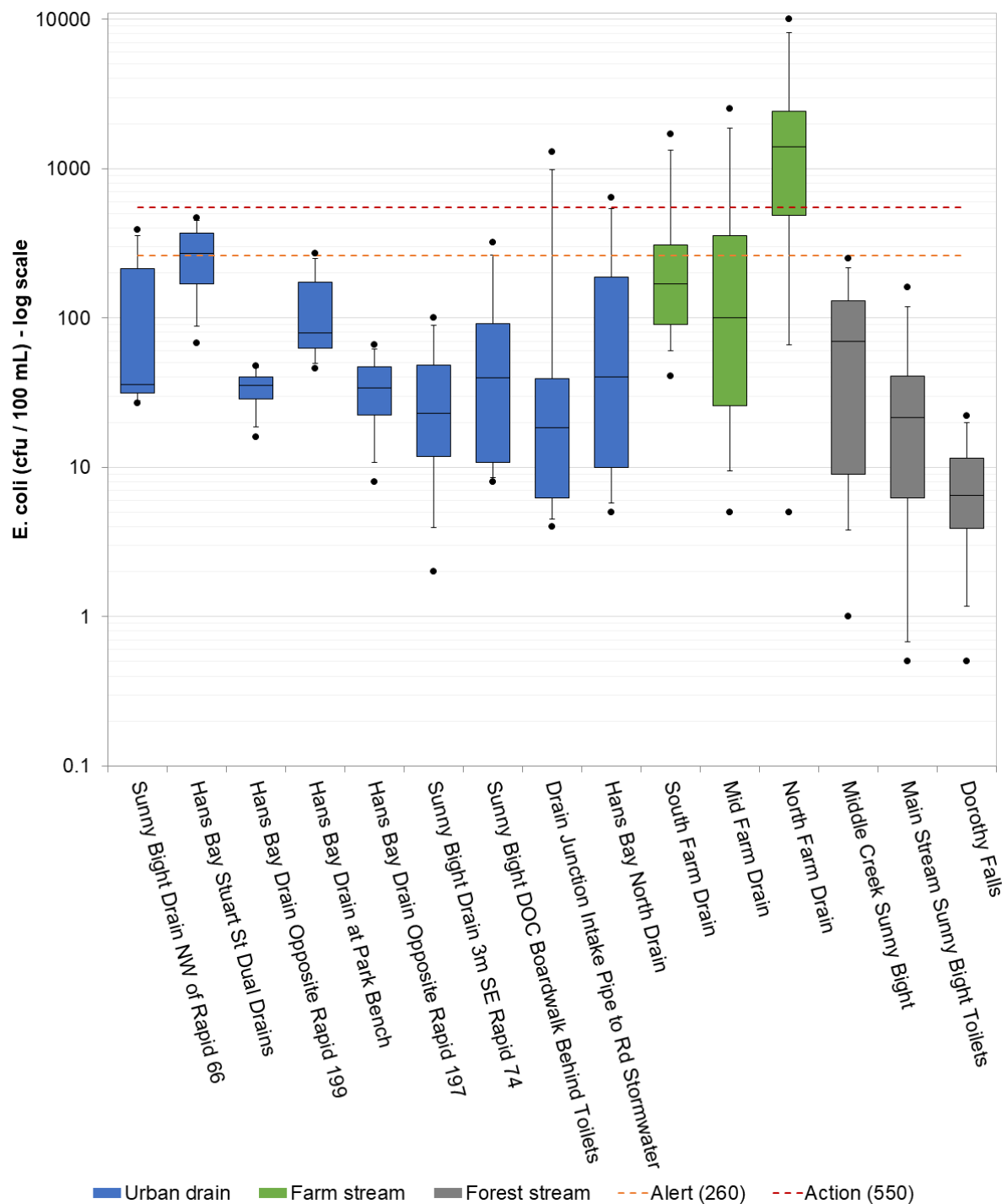


Figure 1: *E. coli* by site (box = 25th-75th percentile, line = median, whiskers = 5th/95th percentile, dots = outliers beyond the whiskers), grouped and coloured by type.

Figure 1 shows the full distribution of *E. coli* results at each of the 15 sites, grouped and coloured by type. North Farm Drain (Farm stream) had the highest *E. coli* concentrations: its median (1,400 cfu/100 mL) and 75th percentile (2,425 cfu/100 mL) both exceeded the Action level, and its 95th percentile reached 8,175 cfu/100 mL. The other two Farm stream sites sat lower but still showed elevated upper quartiles - South Farm Drain and Mid Farm Drain both had 75th percentiles above

the Alert level (310 and 355 cfu/100 mL respectively) even though their medians (170 and 100 cfu/100 mL) did not reach it. These farm streams were in the 'D' to 'E' band for human Health (*E. coli*) under the NPSFM 2020².

Among the nine Urban drain sites, only Hans Bay Stuart St Dual Drains had a median (269 cfu/100 mL) above the Alert level, based on just two samples; most other Urban drain sites have medians well below it. The NPSFM 2020 *E. coli* Human Health attribute is not applicable to stormwater drains so has not been applied.

The three forest stream sites were more mixed than their natural-stream classification might suggest. Dorothy Falls has the lowest median of any site (6.5 cfu/100 mL) and never approached either trigger level, consistent with its undeveloped catchment. Middle Creek Sunny Bight (median 70 cfu/100 mL) and Main Stream Sunny Bight Toilets (median 21.5 cfu/100 mL), however, showed more moderate and variable levels. All forest streams were in the 'A' band for human Health (*E. coli*) under the NPSFM 2020.

Role of rainfall

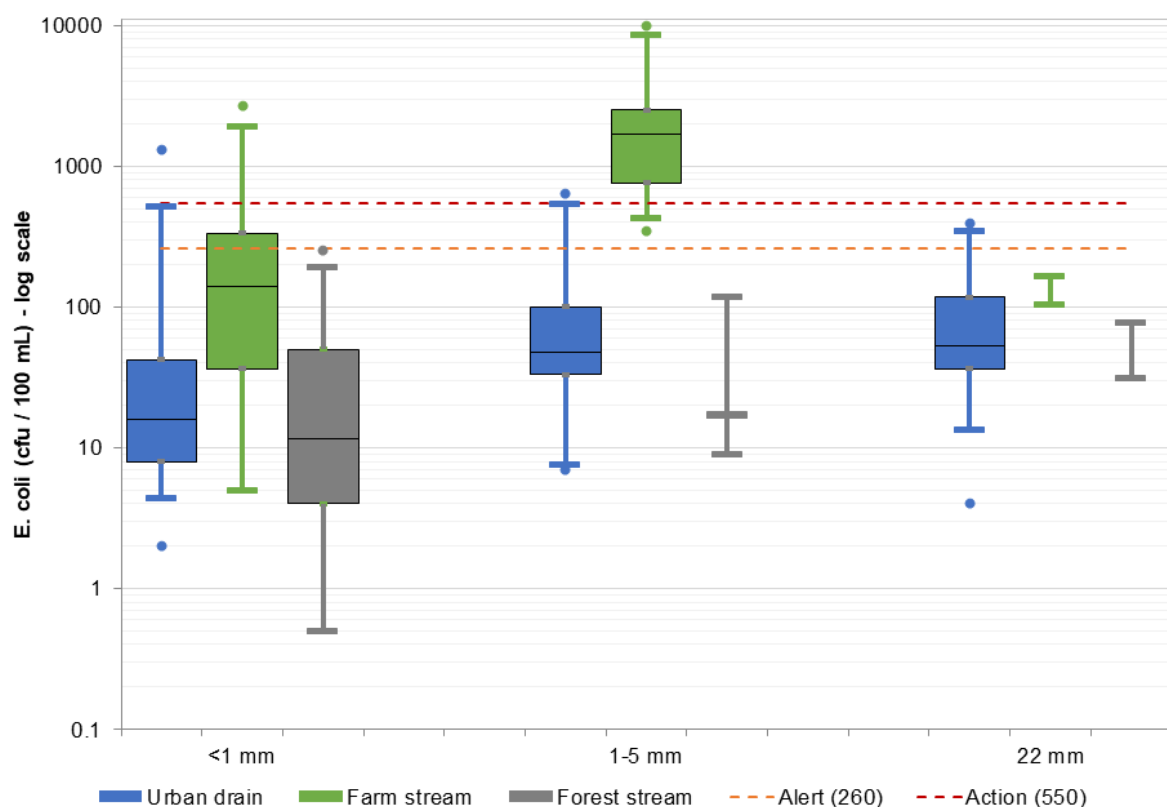


Figure 2: *E. coli* by rainfall in the preceding 6 hours (three categories), grouped and coloured by type.

² Ministry for the Environment (2020, as amended). National Policy Statement for Freshwater Management. environment.govt.nz.

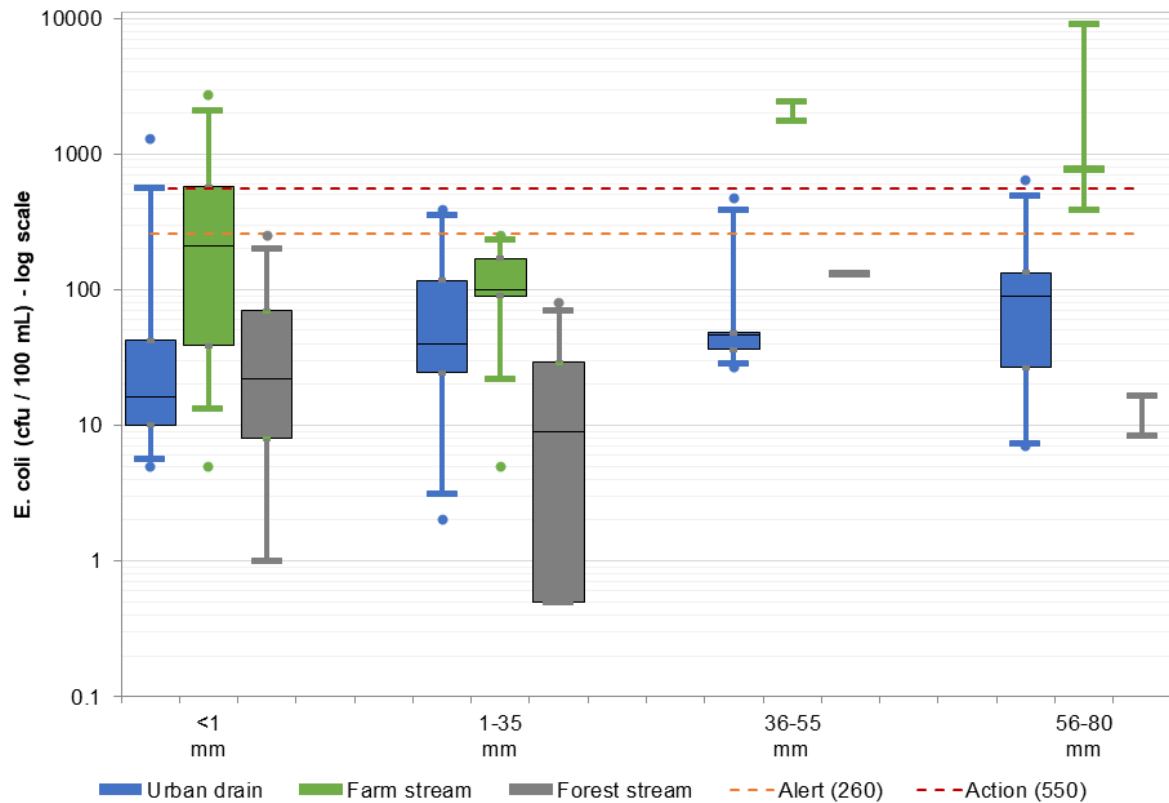


Figure 3: *E. coli* by rainfall in the preceding 24 hours (four categories), grouped and coloured by type.

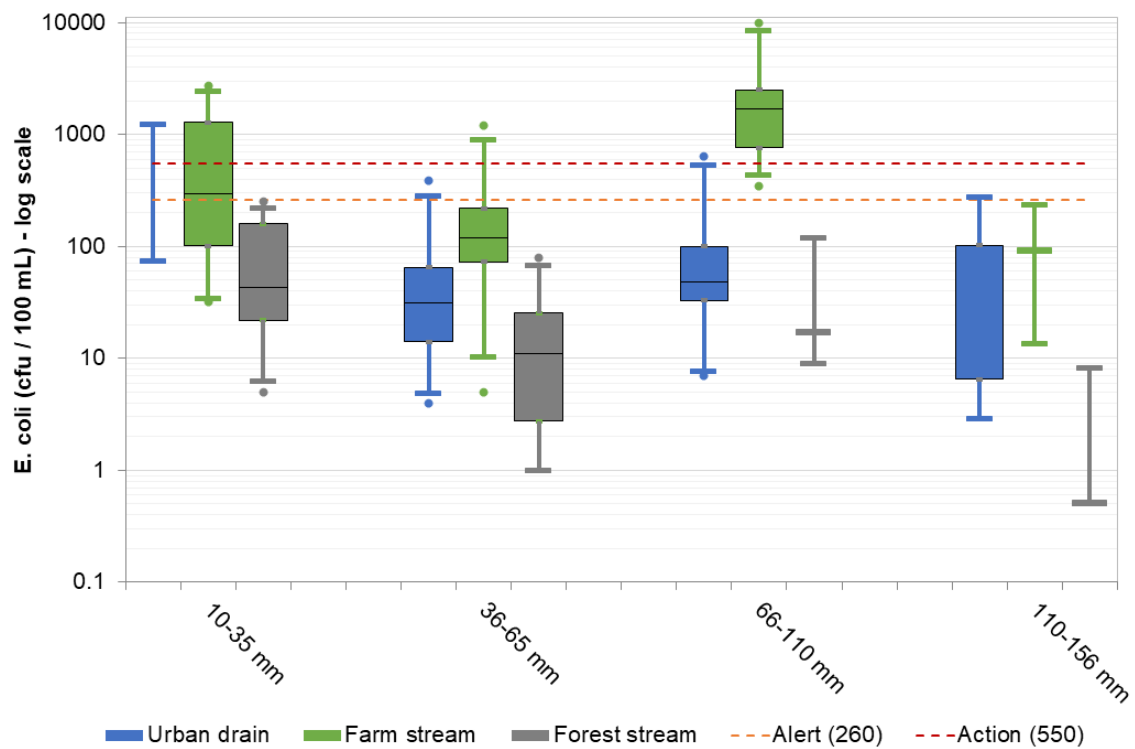


Figure 4: *E. coli* by rainfall in the preceding 96 hours (four categories), grouped and coloured by type.

Figure 2, Figure 3 and Figure 4 group results by antecedent rainfall category - 6-hour, 24-hour and 96-hour totals respectively - with Urban drain, Farm stream and Forest stream boxes shown side by side within each rainfall category. The picture that emerges depends on both the type of source and the rainfall time window considered.

Farm stream *E. coli* responded positively to rainfall (Figure 2 and Figure 3), but the response was not always consistent; the 24-hour window showed a similar pattern, with samples collected in farm streams having higher *E. coli* when 24hr rainfall totals exceeded 35 mm. Urban drains and forest stream showed comparatively little systematic change across these 6 hour and 24-hour categories, although there was a slight increase in median *E. coli* among urban drains when rainfall increased.

Longer-term (96-hour) rainfall told a different story (Figure 4): Urban drains showed a dilution response, with median *E. coli* falling from 655 cfu/100 mL in the driest category (10-35 mm, only 2 samples) to a 19-48 cfu/100 mL range across all categories above 35 mm, and forest streams showed a broadly similar decline, from a median of 43 cfu/100 mL in the driest category to 11-17 cfu/100 mL in the middle categories and just 0.5 cfu/100 mL in the wettest (110-156 mm). Farm streams did not show a consistent trend against 96-hour rainfall, with a highest median (1,700 cfu/100 mL) occurring in the third (66-110 mm) rather than the wettest category.

Taken together, these figures suggest that short-term rainfall drives higher *E. coli* specifically from farm run-off, while longer-term wetness, if significant enough, was instead associated with potential dilution in the urban drains and natural streams.

Flow and estimated load

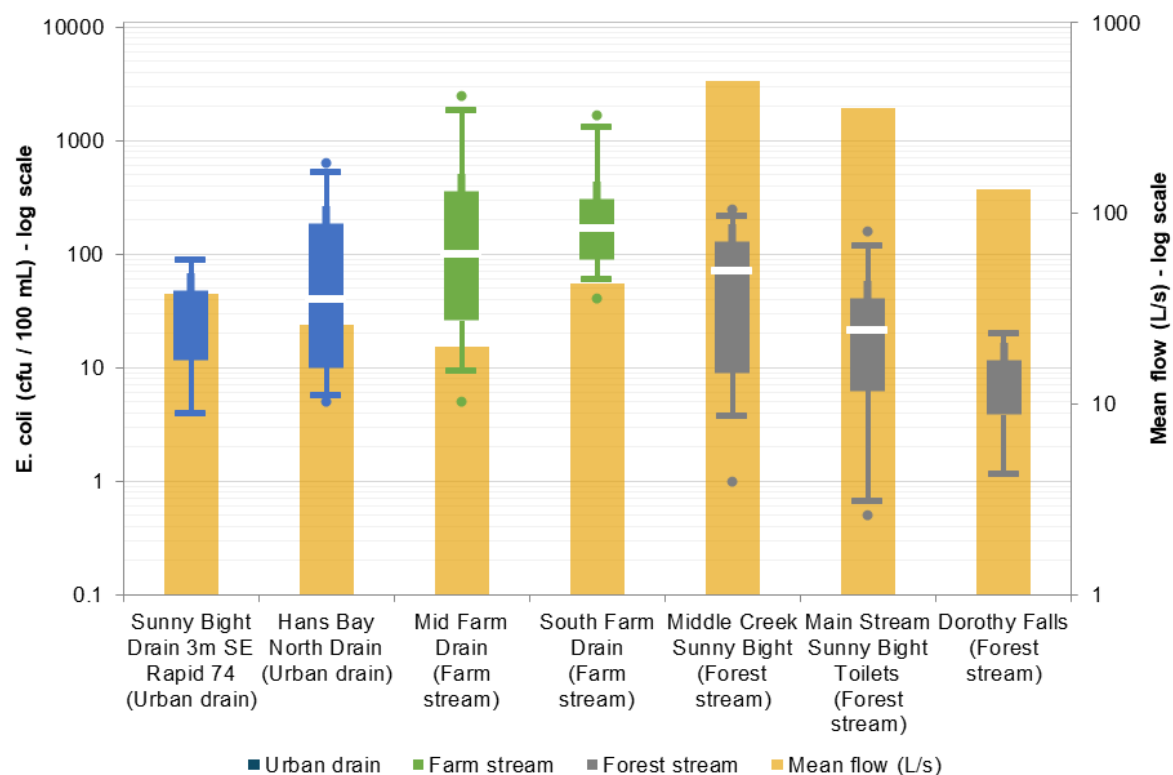


Figure 5: *E. coli* distribution by site (box-and-whisker, coloured by type) and mean flow by site (amber bars), for the 7 sites with at least one flow reading (both axes log scale).

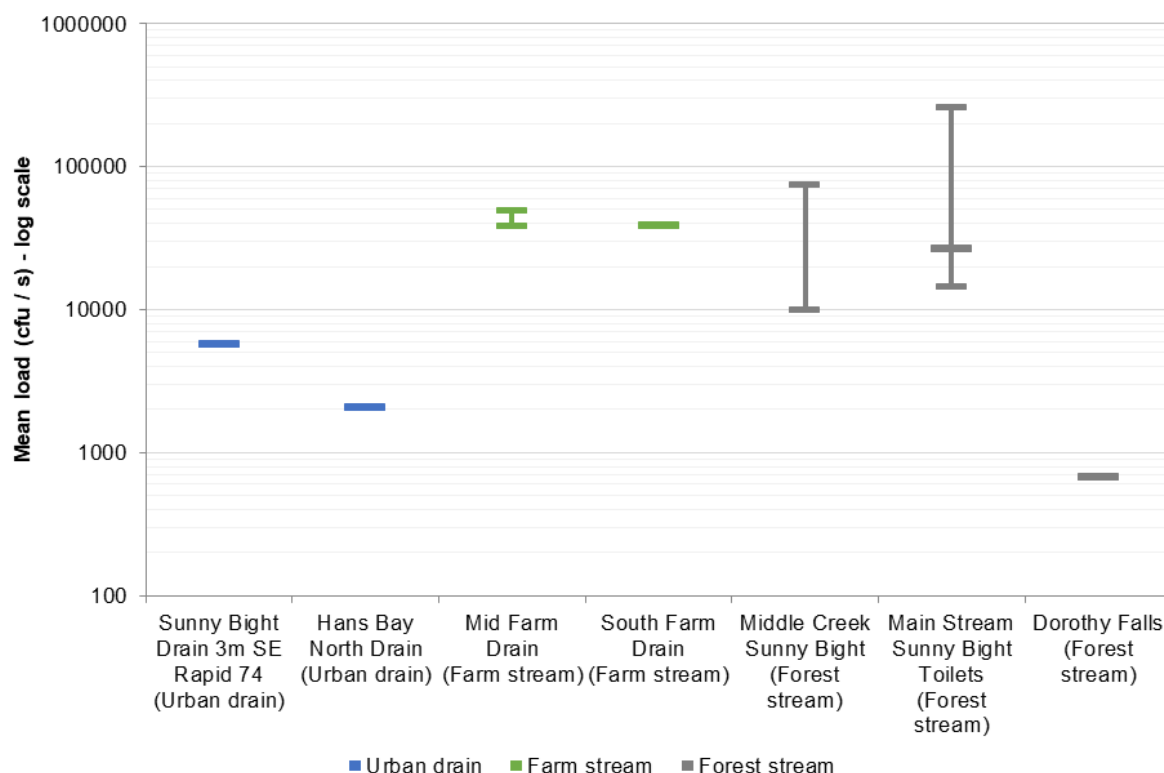


Figure 6: Distribution of estimated *E. coli* load ($\text{cfu/s} = 10 \times E. coli \text{ concentration per } 100 \text{ mL} \times \text{flow L/s}$, calculated per sampling round from rounds with a paired flow and *E. coli* measurements) by site, coloured by type (log scale).

Figure 5 and Figure 6 compare the *E. coli* distribution, mean flow, and estimated load (*E. coli* concentration multiplied by flow, converted to cfu/s) at the seven sites with at least one flow reading, ordered and coloured by type as in Figure 1. Figure 5 uses each site's full *E. coli* distribution (as in Figure 1), so a site's typical concentration can be read directly against its mean flow. Figure 6's load is instead calculated per sampling round, from only the rounds where flow and *E. coli* were both measured together - one to three rounds per site - so most sites show a two-point range or a single value rather than a full distribution; this sparsity means Figure 6 is best read as illustrating how concentration and flow combine, not as a precise or stable estimate of any site's typical load.

Read this way, Figure 6 shows why concentration alone can be misleading. Middle Creek Sunny Bight has a modest median *E. coli* concentration (70 cfu/100 mL, Figure 5) but by far the largest flow of the seven sites (491 L/s), giving it an estimated load reaching 78,160 cfu/s in its higher-flow round. Main Stream Sunny Bight Toilets showed the widest load range of any site (13,330-283,330 cfu/s across three rounds), despite a similarly modest median concentration (21.5 cfu/100 mL) - again a function of its comparatively high flow (358 L/s) combined with round-to-round variability in concentration. By contrast, South Farm Drain had one of the higher typical concentrations among the seven sites (median 170 cfu/100 mL, 75th percentile 310 cfu/100 mL) but only modest flow (43 L/s), giving a single estimated load (38,700 cfu/s) of the same order as sites with much lower concentration but higher flow. Sites should therefore not be ranked on concentration alone if the aim is to understand total bacterial input to the lake.

Overall pattern by type

Taken together, the results show a more nuanced picture than a single "source X is worst" ranking. By site (Figure 1), the farm streams carried the highest and most consistently elevated *E. coli* concentrations, especially North Farm Drain. Urban drain sites were variable, with only Hans Bay Stuart St Dual Drains exceeding the Alert level on a typical sample. Forest stream sites were mixed - Dorothy Falls remained the cleanest site sampled, but Middle Creek Sunny Bight and Main Stream Sunny Bight Toilets showed more moderate, occasionally elevated levels despite being natural watercourses. The farm streams were in the 'D' to 'E' band for human Health (*E. coli*) under the NPSFM 2020, compared to 'A' band for all forest streams.

Rainfall's effect depended on both the type of source and the time window considered (Figure 2 to Figure 4). Farm streams responded most clearly to recent rainfall, while urban drains and forest streams instead show dilution with longer-term rainfall. Factoring in flows and loads added a further dimension, showing that flow volume can matter as much as concentration when estimating total bacterial input. These findings are consistent with WCRC's continued in-lake monitoring showing no measurable water quality issues at the recreational sites themselves, given the distance and dilution between these drain/stream sources and the swimming areas at the far end of the lake.

Contact recreation in the regional context

This report's own results describe drains and streams, not the lake itself. WCRC's separate, longer-running primary contact recreation monitoring programme measures *E. coli* directly at the swimming sites people actually use, weekly through summer, and reports results³ as the percentage of samples in each of three risk categories (Very Low, Low, Moderate-High Risk) using Ministry for the Environment guidelines. Figure 7 reproduces this result from Council's 2024 Surface Water State of the Environment report⁴, covering the five years 2020-2025 across all monitored West Coast rivers, lakes and ocean beaches.

³ <https://www.lawa.org.nz/explore-data/west-coast-region/lakes/kaniere>

⁴ West Coast Regional Council (2025). Surface water state of the environment monitoring: Waterway health and quality, State. Prepared by WCRC Environmental Quality Team, November 2025.

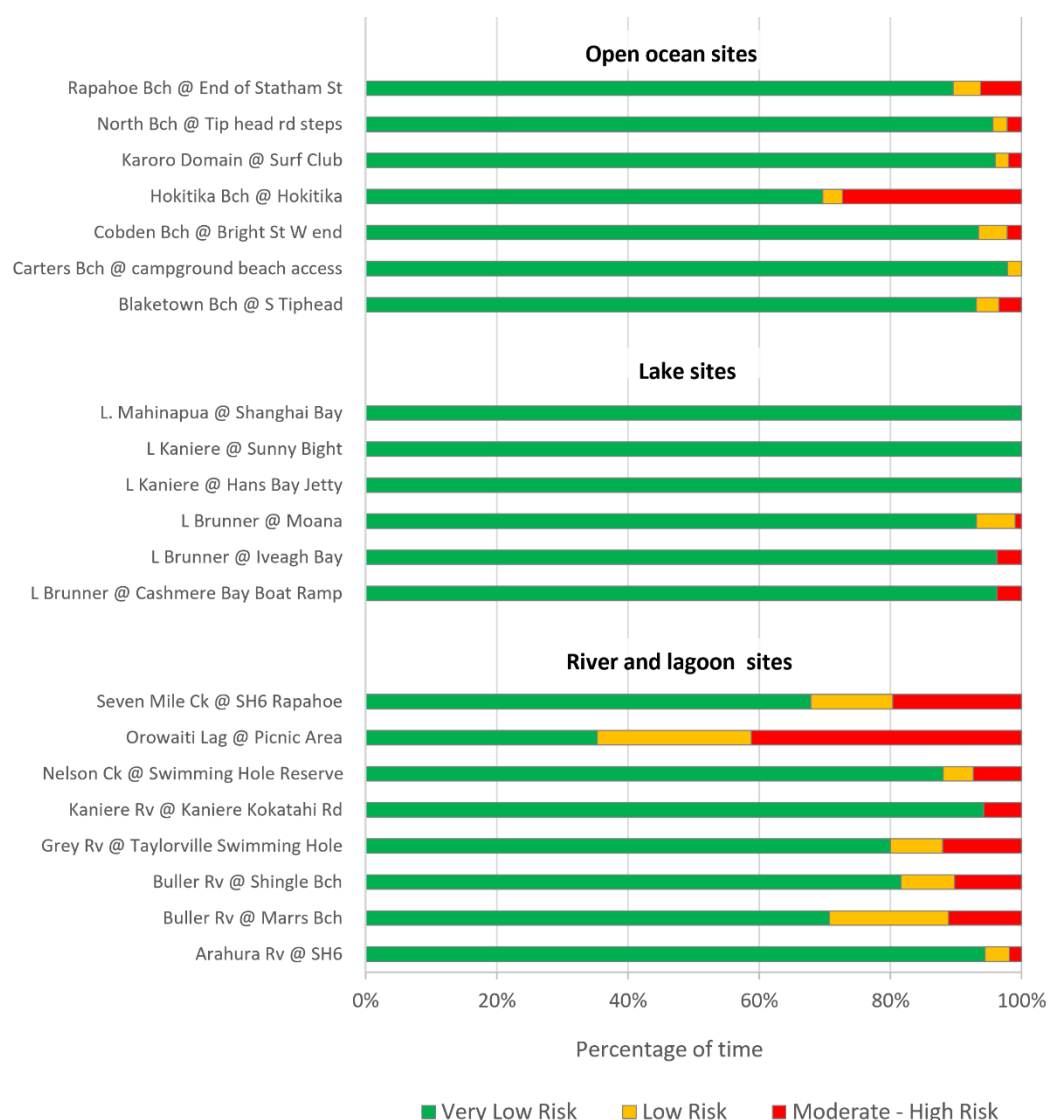


Figure 7: Contact recreation monitoring data from 2020-2025, all West Coast river, lake and ocean beach sites (source: WCRC Surface Water State of the Environment report, 2024).

Lake Kaniere's two monitored sites, Sunny Bight and Hans Bay Jetty, both returned Very Low Risk results for 100% of samples over the full five-year record - zero Low Risk and zero Moderate-High Risk samples at either site. Among all lake sites on the Coast, only Lake Mahinapua matched this. For comparison, Lake Brunner's three sites each had a small proportion of Low or Moderate-High Risk samples. River and lagoon sites were markedly more variable and, at several sites, substantially worse.

This is useful context for the drain and stream results elsewhere in this report: whatever *E. coli* levels are measured close to their source (Figure 1; Figure 2 to Figure 4), the lake itself, measured where people actually swim, has recorded no Low or Moderate-High Risk result at either long-term site in five years. Dilution and die-off is one plausible explanation for that gap.

Historical water quality and lake health

Beyond contact recreation, WCRC has periodically assessed Lake Kaniere's general water quality directly. On every measure recorded, it compared favourably to the other West Coast lakes assessed: the clearest water of any lake surveyed (Secchi depth 7.2 m, versus 0.78-6.8 m elsewhere), the lowest total nitrogen and total phosphorus of any lake surveyed, very low turbidity (0.1 NTU) and low chlorophyll-a. A NIWA report in 2008⁵, summarised for Kaniere: "Overall Lake Kaniere has had consistently good water quality and has shown little apparent effects from agricultural or urban landuse in the catchment."

Using the National Objectives Framework-style grading (A to D bands) applied consistently across the surveyed lakes, Kaniere scored A on six of seven water quality measures (ammoniacal nitrogen, total nitrogen, total phosphorus and chlorophyll-a), with a single B for hypolimnetic (deep-water) dissolved oxygen - one of only three West Coast lakes with an all-A-but-one profile⁶.

Conclusions

This study shows that the drains and streams around Lake Kaniere differed markedly in their *E. coli* concentrations. Farm streams had the most consistently elevated sources, exceeding recreational trigger levels on typical samples. Urban drains were variable and generally lower, with the forest streams, especially Dorothy Falls, being the lowest. Rainfall 6-24 hours prior to sampling caused spikes from farm run-off but had a less meaningful effect on urban and forest sources, given that their range of *E. coli* concentrations were normally at low risk levels. Dilution in urban and forest sources was observed over longer wet periods, but these changes were not meaningfully in terms of pathogen risk.

Despite these elevated source concentrations, the likely risk to the lake's two principal end uses — drinking water and swimming — appeared to be low. For drinking water, the Hokitika supply is drawn from a large, oligotrophic lake, removed and heavily diluted from any single drain or stream input, and is treated before supply. The combination of dilution, distance, die-off and treatment means the faecal-indicator levels measured in these sources are very unlikely to translate into a meaningful pathogen risk at the tap. Monitoring of other water quality attributes in the lake indicate low levels of nutrients and high water quality.

For swimming, the lake's designated contact-recreation sites at Sunny Bight and Hans Bay have returned "very low risk" for *E. coli* in every sample over five years. These are the best results on the West Coast and they support the inference that dilution and die-off significantly ameliorates *E. coli* inputs. One qualification would be localised and short-lived risk, in the lake, immediately at a drain or stream mouth during and shortly after heavy rain. However, during this study the

⁵ Spigel, B., Chague-Goff, C., Horrox, J., O'Driscoll, M., Halstead, I. (2008). Water quality survey of Lake Kaniere and Lake Haupiri: December 2007. NIWA Client Report CHC2008-009, prepared for West Coast Regional Council.

⁶ West Coast Regional Council. West Coast lakes surface water quality survey (internal WCRC draft report; Lake Kaniere field data collected 25 March 2025).

sources located near popular and accessible swimming locations normally presented low pathogen risk for swimming themselves.

Limitations

- Sample sizes per site are small (2-9), so individual site percentile estimates (particularly the 5th/95th percentile whiskers) should be treated as indicative rather than precise.
- The deliberate weighting of sampling toward wet weather limits how confidently the rainfall relationships in this report can be generalised.
- Flow data are too sparse to support a proper contaminant-loading comparison between sites; the load estimates in Figure 6 should be read as illustrative rather than precise.
- This programme measured *E. coli* only; it provides no direct information on nutrients, heavy metals, hydrocarbons or other contaminants that can co-occur with the same land uses.