

# Otago Rivers & Lakes

## Water Quality Results 2017 to 2022



Assessed against Schedule 15 limits/targets of the Regional Plan: Water

### Introduction

The Otago Regional Council (ORC) is responsible for managing Otago's surface-water resources. ORC regularly monitors water quality as part of its State of Environment (SoE) programme. This report card summarises monitoring undertaken between July 2017 and June 2022. Further discussion of results is presented in regular State of Environment reports. The last report can be found here:

<https://www.orc.govt.nz/media/9781/state-and-trends-of-lake-and-river-water-quality-in-the-otago-region-2000-to-2020.pdf>

### Water Quality Monitoring Limits and Targets

114 SoE sites were monitored every month, with three sites monitored monthly by NIWA (as part of the National River Water Quality Network). The parameters measured are:

- **Nutrients** - Nitrite-nitrate nitrogen (NNN) and dissolved reactive phosphorus (DRP) are the biologically available algae and plant growth nutrients. NNN is a form of nitrogen, mainly derived from land drainage, and DRP is a form of phosphorus, primarily sourced from effluent and fertiliser. Ammoniacal nitrogen (NH<sub>4</sub>-N) can indicate the presence of effluent in water. Total nitrogen (TN) and total phosphorus (TP) are the nutrients used to monitor lakes' eutrophication potential.
- **Escherichia coli** (*E. coli*) - a bacterium used to indicate the presence of harmful micro-organisms in water (e.g., human or animal faeces). This indicator is used to gauge whether water is suitable for stock water, swimming, surfing or other recreational activities.
- **Turbidity** - a measure of the cloudiness of water and assesses how much light is scattered by suspended particles. Streams with 'high turbidity' often have high suspended sediment loads. High turbidity can reduce light penetration and affect photosynthesis. High sediment loading also can smother the streambed, which reduces macroinvertebrate and fish-spawning habitat.

Schedule 15 of the Regional Plan: Water for Otago sets out the numerical limits and targets for achieving acceptable water quality for all catchments in the Otago region. Specific limits and targets set for each group are outlined in Table 1.

**Table 1. Water quality limits and targets (5-year 80th percentile, when flows are at or below median flow)\***

| Schedule 15 | NH <sub>4</sub> -N mg/l | <i>E. coli</i> cfu/100ml | Turbidity NTU | DRP mg/l | NNN mg/l | TP mg/l | TN mg/l |
|-------------|-------------------------|--------------------------|---------------|----------|----------|---------|---------|
| Group 1     | 0.10                    | 260                      | 5             | 0.026    | 0.444    |         |         |
| Group 2     | 0.10                    | 260                      | 5             | 0.010    | 0.075    |         |         |
| Group 3     | 0.01                    | 50                       | 3             | 0.005    | 0.075    |         |         |
| Group 4     | 0.10                    | 126                      | 5             |          |          | 0.033   | 0.55    |
| Group 5     | 0.01                    | 10                       | 3             |          |          | 0.005   | 0.10    |

\* **5-year 80<sup>th</sup> percentile** – Results are based on 5 consecutive years of monthly monitoring data. A percentile indicates the value below which a percentage of observations fall. The 5-year 80th percentile is the value below which 80 % of all samples taken over the 5 years will lie (and 20 % of samples will exceed).

\* **when the flow is at or below median flow** – The median flow is the value in the 'middle' of the flow record. For our analysis, samples taken at higher flows (above median) are removed from the data set to exclude the effects of flood events on water quality when contaminant levels often peak. The results are more reflective of 'normal' conditions, and of water quality at flows when recreational use is most popular.

Rivers are categorised as Group 1 (more flushing flows) or Group 2 (fewer flushing flows), with Upper Clutha/Mata-Au sites in Group 3 based on the exceptional water quality in this area. Groups 4 and 5 represent small and large lakes, respectively.

## Water Quality Results - Overview

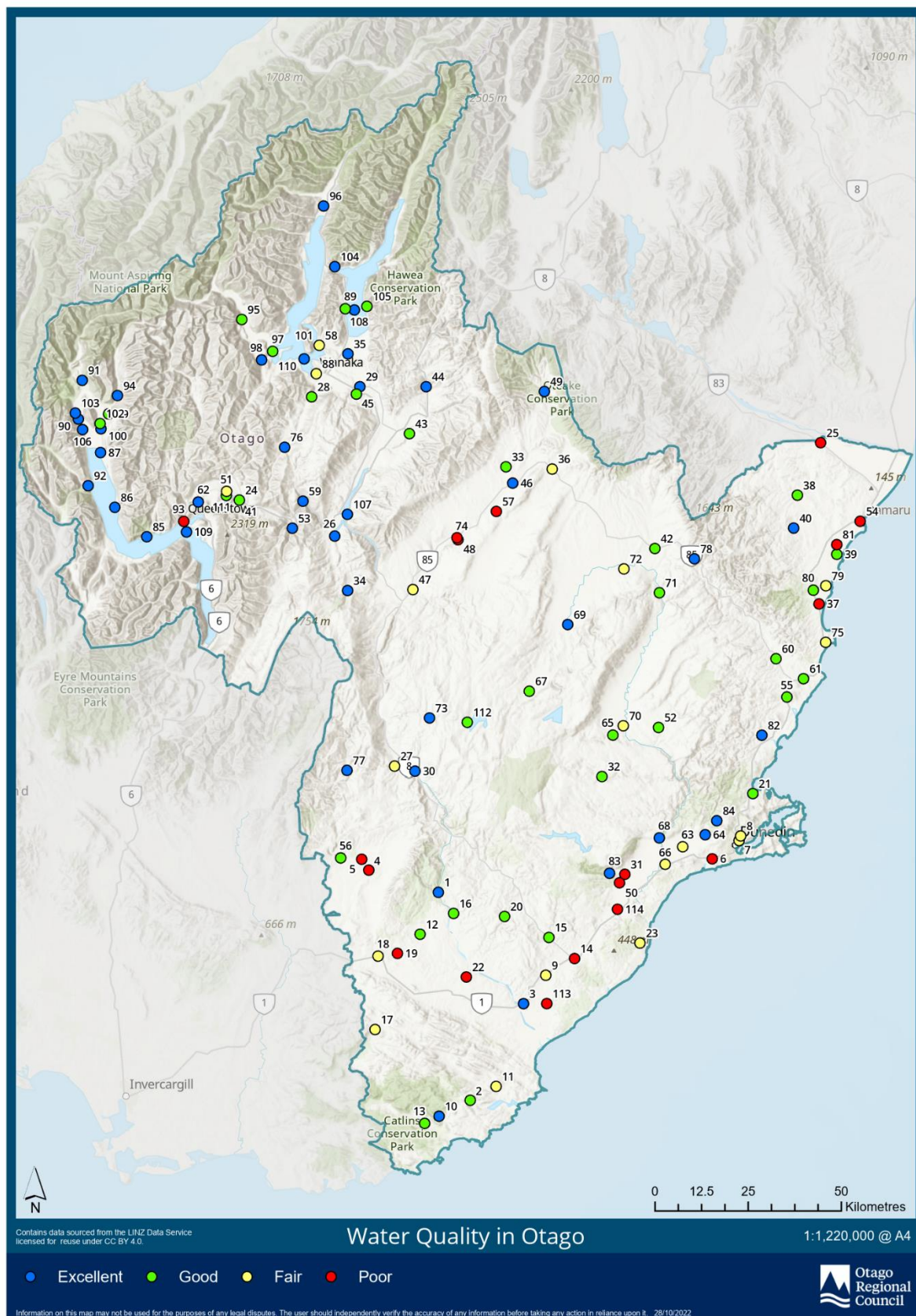


Figure 1. SoE water-quality monitoring results 2017-2022. Site numbers (and parameter values) are shown in Tables 3-7.

**Table 2. ORC Water Quality Reporting Index**

| Grade     | Number of parameters complying with Schedule 15 limits and targets |
|-----------|--|
| Excellent | All five parameters comply   |
| Good      | Four (of the five) values comply                                   |
| Fair      | Three (of the five) values comply                                  |
| Poor      | Two or fewer (of the five) values comply                           |

Monitoring results for each parameter are assessed against the Schedule 15 limits. ORC uses a water quality index to classify each site into one of four groups based on the number of parameters that comply with the limits (Table 2). A summary of the results for the Otago Region is shown in Figure 1.

## Water Quality Results – Group 1

- Excellent or Good water quality at 11 of 23 sites (48 %)
- Fair water quality at 6 sites
- Poor water quality at 6 sites
- Sites with poor water quality include tributaries of the Pomahaka, the Waiwera River, and Dunedin urban streams
- Schedule 15 limits were most often exceeded for *E. coli* and NNN

**Table 3. Water quality results for Group 1 (more flushing flows) sites,   = parameter non-compliant with Schedule 15; \* = sites monitoring < 5 years, grade is interim; N = site monitored by NIWA.**

| Site # | Name | Grade                              | Schedule 15 limit or target |                          |               |          |          |       |
|--------|------|------------------------------------|-----------------------------|--------------------------|---------------|----------|----------|-------|
|        |      |                                    | NH4-N mg/L                  | <i>E. coli</i> cfu/100ml | Turbidity NTU | DRP mg/L | NNN mg/L |       |
|        |      |                                    | 0.1                         | 260                      | 5             | 0.026    | 0.444    |       |
| 1      | *    | Blackcleugh Burn at Rongahere Rd   | Excellent                   | 0.003                    | 34            | 1.1      | 0.020    | 0.072 |
| 2      |      | Catlins at Houipapa                | Good                        | 0.012                    | 223           | 3.8      | 0.012    | 0.475 |
| 3      | N    | Clutha at Balclutha                | Excellent                   | 0.005                    | 98            | 4.1      | 0.001    | 0.07  |
| 4      |      | Crookston Burn at Kelso Rd         | Poor                        | 0.024                    | 1404          | 5.5      | 0.044    | 1.376 |
| 5      |      | Heriot Burn at Park Hill Rd        | Poor                        | 0.021                    | 1232          | 5.3      | 0.041    | 1.574 |
| 6      |      | Kaikorai Stream at Brighton Rd     | Poor                        | 0.017                    | 4974          | 9.1      | 0.014    | 0.546 |
| 7      |      | Leith at Dundas Street Bridge      | Fair                        | 0.012                    | 1553          | 3.5      | 0.025    | 0.599 |
| 8      |      | Lindsay's Creek at North Rd Bridge | Fair                        | 0.014                    | 1341          | 3.8      | 0.020    | 0.765 |
| 9      |      | Lovells Creek at Station Rd        | Fair                        | 0.017                    | 581           | 3.2      | 0.014    | 0.984 |
| 10     | *    | Maclennan at Kahuiku School Rd     | Excellent                   | 0.012                    | 220           | 2.2      | 0.013    | 0.030 |
| 11     |      | Owaka at Katea Rd                  | Fair                        | 0.012                    | 435           | 2.7      | 0.019    | 1.040 |
| 12     |      | Pomahaka at Burkes Ford            | Good                        | 0.012                    | 163           | 3.3      | 0.010    | 0.604 |
| 13     | *    | Tahakopa at Tahakopa               | Good                        | 0.010                    | 647           | 3.7      | 0.008    | 0.327 |
| 14     |      | Tokomairiro at Blackbridge         | Poor                        | 0.046                    | 3262          | 7.6      | 0.028    | 0.380 |
| 15     |      | Tokomairiro at West Branch Bridge  | Good                        | 0.014                    | 438           | 2.4      | 0.011    | 0.224 |
| 16     |      | Tuapeka at 700m u/s bridge         | Good                        | 0.009                    | 294           | 2.3      | 0.024    | 0.114 |
| 17     |      | Waipahi at Cairns Peak             | Fair                        | 0.018                    | 355           | 4.4      | 0.016    | 0.660 |
| 18     |      | Waipahi at Waipahi                 | Fair                        | 0.012                    | 307           | 2.3      | 0.026    | 1.175 |
| 19     |      | Wairuna at Millar Rd               | Poor                        | 0.088                    | 1162          | 14.9     | 0.150    | 1.465 |
| 20     |      | Waitahuna at Tweeds Bridge         | Good                        | 0.012                    | 435           | 2.9      | 0.014    | 0.139 |
| 21     | *    | Waitati at Mt Cargill Rd           | Good                        | 0.004                    | 313           | 1.2      | 0.004    | 0.084 |
| 22     |      | Waiwera at Maws Farm               | Poor                        | 0.017                    | 421           | 2.9      | 0.047    | 0.947 |

## Water Quality Results – Group 2

- Excellent water quality at 24 of 62 sites, and Good water quality at a further 19 sites (69 % of sites graded Excellent or Good)
- Most sites with Excellent water quality were upper catchment sites spread across Otago, including the Taieri, Manuherekia, Pomahaka, Lindis and Waikouaiti in the Taieri and Clutha river catchments.
- Fair water quality at 9 sites
- Poor water quality at 10 sites
- Schedule 15 limits most frequently exceeded for **NNN**

**Table 4. Water quality results for Group 2 (fewer flushing flows) sites,  = parameter non-compliant with Schedule 15; \* = sites monitoring < 5 years, grade is interim; N = site monitored by NIWA.**

| Site # | Name | Grade                             | Schedule 15 limit or target |                             |                  |             |             |       |
|--------|------|-----------------------------------|-----------------------------|-----------------------------|------------------|-------------|-------------|-------|
|        |      |                                   | NH4-N<br>mg/L               | <i>E. coli</i><br>cfu/100ml | Turbidity<br>NTU | DRP<br>mg/L | NNN<br>mg/L |       |
|        |      |                                   | 0.1                         | 260                         | 5                | 0.01        | 0.075       |       |
| 23     | *    | Akatore Creek at Akatore Creek Rd | Good                        | 0.011                       | 216              | 2.0         | 0.006       | 0.545 |
| 24     | *    | Arrow at Morven Ferry Rd          | Good                        | 0.003                       | 55               | 1.7         | 0.002       | 0.156 |
| 25     |      | Awamoko at SH83                   | Poor                        | 0.008                       | 579              | 1.3         | 0.079       | 0.751 |
| 26     |      | Bannockburn at Lake Dunstan       | Excellent                   | 0.004                       | 141              | 3.9         | 0.004       | 0.001 |
| 27     |      | Benger burn at Booths             | Fair                        | 0.004                       | 246              | 1.1         | 0.019       | 0.302 |
| 28     |      | Cardrona at Mt Barker             | Good                        | 0.005                       | 155              | 2.0         | 0.002       | 0.086 |
| 29     | N    | Clutha at Luggate Bridge          | Excellent                   | 0.004                       | 5                | 1.1         | 0.001       | 0.044 |
| 30     | N    | Clutha at Millers Flat            | Excellent                   | 0.003                       | 37               | 4.8         | 0.001       | 0.041 |
| 31     |      | Contour Channel at No. 4 Bridge   | Poor                        | 0.069                       | 984              | 7.3         | 0.036       | 0.265 |
| 32     |      | Deep Stream at SH87               | Good                        | 0.004                       | 269              | 0.8         | 0.003       | 0.001 |
| 33     |      | Dunstan Creek at Beattie Rd       | Good                        | 0.004                       | 164              | 0.9         | 0.003       | 0.105 |
| 34     | *    | Fraser at Old Man Range           | Excellent                   | 0.003                       | 13               | 0.4         | 0.003       | 0.010 |
| 35     |      | Hawea at Camphill Bridge          | Excellent                   | 0.001                       | 7                | 0.64        | 0.002       | 0.021 |
| 36     | *    | Hills Creek at SH85               | Fair                        | 0.003                       | 548              | 1.5         | 0.004       | 0.198 |
| 37     | *    | Kakaho Creek at SH1               | Poor                        | 0.084                       | 458              | 4.6         | 0.052       | 0.189 |
| 38     |      | Kakanui at Clifton Falls Bridge   | Good                        | 0.003                       | 736              | 0.4         | 0.003       | 0.049 |
| 39     |      | Kakanui at McCones                | Good                        | 0.008                       | 174              | 0.5         | 0.003       | 0.628 |
| 40     |      | Kauru at Ewings                   | Excellent                   | 0.004                       | 202              | 0.3         | 0.003       | 0.027 |
| 41     | N    | Kawarau at Chards                 | Excellent                   | 0.007                       | 12               | 3.5         | 0.002       | 0.026 |
| 42     |      | Kye Burn at SH85 Bridge           | Good                        | 0.004                       | 158              | 1.0         | 0.004       | 0.100 |
| 43     |      | Lindis at Ardgour Rd              | Good                        | 0.005                       | 178              | 1.1         | 0.002       | 0.107 |
| 44     |      | Lindis at Lindis Peak             | Excellent                   | 0.004                       | 222              | 2.1         | 0.002       | 0.020 |
| 45     |      | Luggate Creek at SH6 Bridge       | Good                        | 0.004                       | 189              | 1.6         | 0.010       | 0.010 |
| 46     |      | Manuherekia at Blackstone Hill    | Excellent                   | 0.003                       | 218              | 4.1         | 0.005       | 0.006 |
| 47     |      | Manuherekia at Galloway           | Fair                        | 0.005                       | 291              | 2.4         | 0.014       | 0.064 |
| 48     |      | Manuherekia at Ophir              | Poor                        | 0.015                       | 665              | 3.5         | 0.031       | 0.143 |
| 49     | *    | Manuherekia downstream of Fork    | Excellent                   | 0.003                       | 29               | 0.4         | 0.004       | 0.003 |
| 50     | *    | Meggat Burn at Berwick Rd         | Poor                        | 0.011                       | 438              | 3.6         | 0.011       | 0.115 |
| 51     |      | Mill Creek at Fish Trap           | Poor                        | 0.009                       | 318              | 5.4         | 0.004       | 0.441 |
| 52     |      | Nenthorn at Mt Stoker Rd          | Good                        | 0.006                       | 146              | 1.4         | 0.013       | 0.004 |
| 53     |      | Nevis at Wentworth Station        | Excellent                   | 0.002                       | 78               | 1.2         | 0.003       | 0.003 |
| 54     | *    | Oamaru Creek at SH1               | Poor                        | 0.022                       | 613              | 2.7         | 0.353       | 0.699 |

## Water Quality Results – Group 2 (continued)

Table 4 (continued). Water quality results for Group 2 (fewer flushing flows) sites,  = parameter non-compliant with Schedule 15; \* = sites monitoring < 5 years, grade is interim; N = site monitored by NIWA; + = site exempt from Turbidity limit.

| Site # | Name | Grade                               | Schedule 15 limit or target |                             |                  |             |             |       |
|--------|------|-------------------------------------|-----------------------------|-----------------------------|------------------|-------------|-------------|-------|
|        |      |                                     | NH4-N<br>mg/L               | <i>E. coli</i><br>cfu/100ml | Turbidity<br>NTU | DRP<br>mg/L | NNN<br>mg/L |       |
|        |      |                                     | 0.1                         | 260                         | 5                | 0.01        | 0.075       |       |
| 55     | *    | Pleasant at Patterson Rd Ford       | Good                        | 0.008                       | 58               | 5.6         | 0.003       | 0.024 |
| 56     |      | Pomahaka at Glenken                 | Good                        | 0.005                       | 383              | 1.1         | 0.006       | 0.021 |
| 57     | *    | Poolburn at Cob Cottage             | Poor                        | 0.011                       | 376              | 2.6         | 0.061       | 0.150 |
| 58     | *    | Quartz Reef Creek at SH8            | Excellent                   | 0.003                       | 229              | 2.2         | 0.003       | 0.007 |
| 59     | *    | Roaring Meg at SH6                  | Excellent                   | 0.003                       | 109              | 0.9         | 0.009       | 0.030 |
| 60     |      | Shag at Craig Rd                    | Good                        | 0.004                       | 104              | 0.8         | 0.004       | 0.141 |
| 61     |      | Shag at Goodwood Pump               | Good                        | 0.010                       | 212              | 0.7         | 0.006       | 0.283 |
| 62     | N +  | Shotover at Bowens Peak             | Excellent                   | 0.003                       | 7.2              | exempt      | 0.001       | 0.156 |
| 63     | *    | Silverstream at Taieri Depot        | Fair                        | 0.010                       | 290              | 0.9         | 0.007       | 0.715 |
| 64     |      | Silverstream at Three Mile Hill Rd  | Excellent                   | 0.003                       | 123              | 0.7         | 0.003       | 0.013 |
| 65     |      | Sutton Stream at SH87               | Good                        | 0.005                       | 526              | 1.4         | 0.007       | 0.010 |
| 66     |      | Taieri at Allanton Bridge           | Fair                        | 0.014                       | 394              | 4.9         | 0.009       | 0.093 |
| 67     |      | Taieri at Linnburn Runs Rd          | Good                        | 0.004                       | 273              | 1.6         | 0.003       | 0.004 |
| 68     |      | Taieri at Outram                    | Excellent                   | 0.005                       | 111              | 2.3         | 0.007       | 0.051 |
| 69     |      | Taieri at Stonehenge                | Excellent                   | 0.007                       | 140              | 1.5         | 0.007       | 0.016 |
| 70     |      | Taieri at Sutton                    | Fair                        | 0.007                       | 699              | 3.3         | 0.011       | 0.064 |
| 71     |      | Taieri at Tiroiti                   | Good                        | 0.005                       | 161              | 3.5         | 0.017       | 0.063 |
| 72     |      | Taieri at Waipiata                  | Fair                        | 0.010                       | 281              | 3.3         | 0.029       | 0.061 |
| 73     | *    | Teviot at Bridge Huts Rd            | Excellent                   | 0.005                       | 109              | 4.2         | 0.002       | 0.007 |
| 74     |      | Thomsons Creek at SH85              | Poor                        | 0.028                       | 1813             | 7.6         | 0.101       | 0.496 |
| 75     |      | Trotters Creek at Mathesons         | Fair                        | 0.037                       | 334              | 2.8         | 0.005       | 0.463 |
| 76     | *    | Upper Cardrona at Tuohys Gully Rd   | Excellent                   | 0.003                       | 128              | 1.4         | 0.001       | 0.018 |
| 77     | *    | Upper Pomahaka at Aitchison Runs Rd | Excellent                   | 0.003                       | 217              | 0.6         | 0.006       | 0.021 |
| 78     | *    | Upper Shag at SH85 Culvert          | Excellent                   | 0.003                       | 161              | 0.4         | 0.002       | 0.031 |
| 79     |      | Waianakarua at Browns               | Fair                        | 0.005                       | 290              | 0.4         | 0.003       | 0.395 |
| 80     | *    | Waianakarua at South Branch SH1     | Good                        | 0.005                       | 215              | 0.4         | 0.002       | 0.633 |
| 81     |      | Waiareka Creek at Taipo Rd          | Poor                        | 0.010                       | 514              | 2.2         | 0.257       | 0.702 |
| 82     |      | Waikouaiti at 200 m d/s DCC intake  | Excellent                   | 0.003                       | 82               | 0.7         | 0.002       | 0.056 |
| 83     |      | Waipori at Waipori Falls Reserve    | Excellent                   | 0.006                       | 41               | 2.5         | 0.005       | 0.071 |
| 84     | *    | Whare Creek at Whare Flat Rd        | Excellent                   | 0.003                       | 23               | 1.4         | 0.003       | 0.045 |

## Water Quality Results – Group 3

- Excellent water quality at 14 sites and Good water quality at 5 sites (86 % of Group 3 sites)
- Fair water quality at 2 sites
- Poor water quality at 1 site – Horn Creek exceeds limits for multiple parameters, similar to urban sites elsewhere in Otago.
- Horn Creek is the only site in the SoE network to exceed the ammoniacal nitrogen limit was not met.
- Schedule 15 limits were most often exceeded for *E. coli* and NNN

**Table 5. Water quality results for Group 3 sites, █ = parameter non-compliant with Schedule 15; \* = sites monitoring < 5 years, grade is interim; + = site is exempt from Turbidity limit.**

| Site # | Name                                       | Grade     | Schedule 15 limit or target |                                 |                  |             |             |
|--------|--|-----------|-----------------------------|---------------------------------|------------------|-------------|-------------|
|        |  |           | NH4-N<br>mg/L               | <i>E. coli</i><br>cfu/<br>100ml | Turbidity<br>NTU | DRP<br>mg/L | NNN<br>mg/L |
|        |  |           | 0.01                        | 50                              | 3                | 0.00<br>5   | 0.075       |
| 85     | * 12 Mile Creek at Glenorchy Queenstown Rd | Excellent | 0.003                       | 6                               | 0.3              | 0.004       | 0.007       |
| 86     | * 25 Mile Creek at Glenorchy Queenstown Rd | Excellent | 0.003                       | 24                              | 0.5              | 0.004       | 0.007       |
| 87     | * Buckler Burn at Glenorchy Queenstown Rd  | Excellent | 0.003                       | 5                               | 2.0              | 0.002       | 0.031       |
| 88     | * Bullock Creek at Dunmore St Footbridge   | Fair      | 0.003                       | 959                             | 0.5              | 0.002       | 0.793       |
| 89     | * Craig Burn at SH6                        | Good      | 0.003                       | 62                              | 1.0              | 0.003       | 0.010       |
| 90     | + Dart at The Hillocks                     | Excellent | 0.003                       | 10                              | exempt           | 0.002       | 0.035       |
| 91     | * Dundas Creek at Mill Flat                | Excellent | 0.003                       | 2                               | 0.4              | 0.003       | 0.050       |
| 92     | * Greenstone at Greenstone Station Rd      | Excellent | 0.003                       | 23                              | 0.4              | 0.002       | 0.020       |
| 93     | * Horn Creek at Queenstown Bay             | Poor      | 0.015                       | 322                             | 2.1              | 0.010       | 0.197       |
| 94     | * Invincible Creek at Rees Valley Rd       | Excellent | 0.003                       | 2                               | 1.3              | 0.001       | 0.010       |
| 95     | * Leaping Burn at Wanaka Mt Aspiring Rd    | Good      | 0.001                       | 115                             | 0.5              | 0.002       | 0.028       |
| 96     | * Makarora at Makarora                     | Excellent | 0.003                       | 34                              | 1.1              | 0.002       | 0.062       |
| 97     | + Matukituki at West Wanaka                | Good      | 0.006                       | 29                              | exempt           | 0.003       | 0.081       |
| 98     | * Motatapu at Wanaka Mt Aspiring Rd        | Excellent | 0.003                       | 31                              | 0.8              | 0.001       | 0.047       |
| 99     | * Ox Burn at Rees Valley Rd                | Excellent | 0.003                       | 7                               | 2.4              | 0.002       | 0.022       |
| 100    | * Precipice Creek at Glenorchy Paradise Rd | Excellent | 0.003                       | 15                              | 0.3              | 0.002       | 0.007       |
| 101    | * Quartz Creek at Maungawera Valley Rd     | Fair      | 0.003                       | 179                             | 0.5              | 0.002       | 0.133       |
| 102    | * Rees at Glenorchy Paradise Rd Bridge     | Good      | 0.003                       | 8                               | 10.0             | 0.002       | 0.018       |
| 103    | * Scott Creek at Routeburn Rd              | Excellent | 0.003                       | 17                              | 0.6              | 0.002       | 0.031       |
| 104    | * The Neck Creek at Meads Rd               | Excellent | 0.001                       | 11                              | 0.2              | 0.002       | 0.004       |
| 105    | * Timaru at Peter Muir Bridge              | Good      | 0.003                       | 10                              | 23.1             | 0.005       | 0.015       |
| 106    | * Turner Creek at Kinloch Rd               | Excellent | 0.003                       | 10                              | 0.3              | 0.002       | 0.053       |

## Water Quality Results – Group 4

- Lake Hayes and Lake Onslow had ‘good’ water quality based on Schedule 15, despite the nutrient-enriched state of these sites - Trophic Level Index scores for Lake Hayes indicate the lake is eutrophic/poor water quality and Lake Onslow is mesotrophic/average water quality <https://www.lawa.org.nz/explore-data/otago-region/lakes>
- Lake Hayes did not meet the Schedule 15 limits for total phosphorus.
- Lake Onslow did not meet the turbidity limit (although only by a very small margin)
- Lake Tuakitoto and Lake Waihola had ‘poor’ water quality, and these sites failed to meet the limits for all Schedule 15 measures except ammonical nitrogen, consistent with the respective supertrophic/very poor water quality/ and eutrophic/poor water quality trophic status of these sites <https://www.lawa.org.nz/explore-data/otago-region/lakes>

**Trophic Level Index (TLI)** is a commonly used measure of overall lake water quality. The TLI score is calculated using four water quality measures – nutrients (total nitrogen, total phosphorus), water clarity and chlorophyll-*a* (the pigment that causes the green colour of plants which indicates how much algae a lake has) For more information see <https://www.lawa.org.nz/learn/factsheets/lake-trophic-level-index/>

**Table 6. Water quality results for Group 4 (small lakes) sites.**   = non-compliant with Schedule 15.

| Site # | Name                        | Grade | Schedule 15 limit or target |                             |                  |            |            |
|--------|-----------------------------|-------|-----------------------------|-----------------------------|------------------|------------|------------|
|        |                             |       | NH4-N<br>mg/L               | <i>E. coli</i><br>cfu/100ml | Turbidity<br>NTU | TP<br>mg/L | TN<br>mg/L |
|        |                             |       | 0.1                         | 126                         | 5                | 0.033      | 0.55       |
| 107    | Lake Hayes at Mid Lake 10m  | Good  | 0.030                       | 2.7                         | 3.53             | 0.055      | 0.451      |
| 108    | Lake Onslow at Boat Ramp    | Good  | 0.007                       | 11                          | 5.05             | 0.028      | 0.29       |
| 109    | Lake Tuakitoto at Outlet    | Poor  | 0.074                       | 155.5                       | 9.17             | 0.144      | 1.482      |
| 110    | Lake Waihola at Waihola Mid | Poor  | 0.008                       | 143.3                       | 14.77            | 0.0566     | 0.626      |

## Water Quality Results – Group 5

- Water quality was ‘excellent; at all the large lake sites (Group 5)
- For Lake Dunstan, *E. coli* and total phosphorus levels were close to the Schedule 15 limit, and notably higher than for the other sites in this group.
- These results reflect the trophic status of these lakes; microtrophic/very good water quality <https://www.lawa.org.nz/explore-data/otago-region/lakes>

**Table 7. Water quality results for Group 5 (large lakes) sites,**   = non-compliant with Schedule 15.

| Site # | Name                             | Grade     | Schedule 15 limit or target |                             |                  |            |            |
|--------|----------------------------------|-----------|-----------------------------|-----------------------------|------------------|------------|------------|
|        |                                  |           | NH4-N<br>mg/L               | <i>E. coli</i><br>cfu/100ml | Turbidity<br>NTU | TP<br>mg/L | TN<br>mg/L |
|        |                                  |           | 0.01                        | 10                          | 3                | 0.005      | 0.1        |
| 111    | Lake Dunstan at Dead Man’s Point | Excellent | 0.004                       | 9.00                        | 1.03             | 0.005      | 0.088      |
| 112    | Lake Hawea South Open Water 10m  | Excellent | 0.003                       | 0.25                        | 0.75             | 0.002      | 0.043      |
| 113    | Lake Wakatipu Open Water 10m     | Excellent | 0.003                       | 0.50                        | 0.60             | 0.002      | 0.065      |
| 114    | Lake Wanaka Open Water 10m       | Excellent | 0.001                       | 0.50                        | 0.53             | 0.002      | 0.064      |

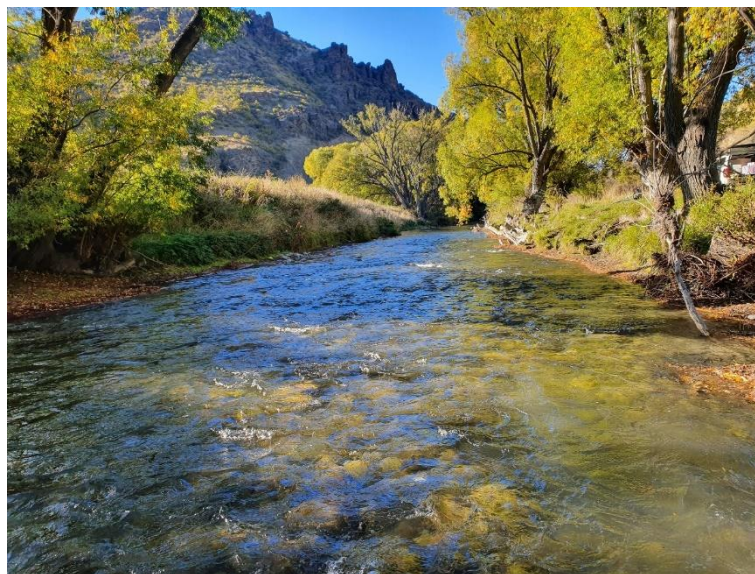
## Summary

Table 8 shows the variation in water quality grades over the past four years. In 2017-2022 65 % of the SoE river sites were classified as having 'excellent' or 'good' water quality. Most sites with 'excellent' river water quality were in Central Otago and the Upper Clutha. In these areas, land-use tends to be low-intensity sheep farming and/or dominated by tussock lands. Poorer water quality was found in river catchments with higher-intensity farming or in streams draining urban environments.

**Table 8. Summary of water quality index results for Otago rivers and lakes for the last four reporting periods (2019-2022)**

| Grade     | 2014-19       |              | 2015-20       |              | 2016-21       |              | 2017-2022     |              |
|-----------|---------------|--------------|---------------|--------------|---------------|--------------|---------------|--------------|
|           | <i>Rivers</i> | <i>Lakes</i> | <i>Rivers</i> | <i>Lakes</i> | <i>Rivers</i> | <i>Lakes</i> | <i>Rivers</i> | <i>Lakes</i> |
| Excellent | 37            | 3            | 37            | 3            | 41            | 4            | 39            | 4            |
| Good      | 32            | 2            | 34            | 3            | 32            | 2            | 31            | 2            |
| Fair      | 18            | 0            | 19            | 0            | 17            | 0            | 18            | 0            |
| Poor      | 19            | 3            | 16            | 2            | 17            | 2            | 17            | 2            |
| Total     | 106           | 8            | 106           | 8            | 107           | 8            | 106           | 8            |

Compared to 2020-2021 water quality results, 102 (of 114) sites retained the same grade; 6 sites moved up one grade, and 6 sites moved down one grade. Most grade changes involved small changes in median values close to the limit value and therefore do not generally indicate any significant change (improvement or degradation in water quality). The most recent analysis of long trends in Otago Region water quality (2000-2022) is available at <https://www.orc.govt.nz/plans-policies-reports/reports-and-publications/water-quality>.



*Lindis at Lindis Peak*

The data reported here were current as of 30 June 2023.

For more information about the State of Environment monitoring and reporting or the data presented here, contact [science.enquiries@orc.govt.nz](mailto:science.enquiries@orc.govt.nz) or see the ORC website:

<https://www.orc.govt.nz/plans-policies-reports/reports-and-publications/water-quality>

Water quality information for the Otago Region is also available at LAWA (Land Air Water Aotearoa)

<https://www.lawa.org.nz/explore-data/otago-region/>