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Waikato River Water Quality Monitoring Programme: Data report 2015

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Te Kaunihera ā Rohe o Waikato

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Hydrological flow data were provided by Mercury Energy (Hydro Lakes, Waiotapu stream and Waikato River at Reids Farm), Contact Energy (Ohaaki Bridge) and Genesis Power (Huntly) through agents Opus and NIWA. The Environmental Monitoring Programme, Waikato Regional Council, Hamilton provided hydrological flow data for two sites.

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1 Introduction

1.1 Background

This report covers the calendar year of 2015 and follows the format of the previous data report (Tulagi, 2015).

To effectively manage water quality, the Waikato River monitoring programme addresses the following questions:

1. What is the quality of the water now?
2. Why is the water of the observed level of quality?
3. Is water quality getting better or worse? If so - what makes it change?
4. How can we improve the quality, ecological health and integrity of the Waikato River?

The monitoring information allows the Council to:

- determine compliance with classification standards
- define the suitability of the resource for various beneficial uses and values of the water
- monitor the impact of major discrete point source discharges on water quality
- monitor the impacts of diffuse discharges on water quality
- provide a basis for evaluating the effectiveness of resource management measures.

This dataset is invaluable for the evaluation of the Waikato River: its state, the pressures on it and its response to these pressures. We need to continue to gather comprehensive, reliable, and good quality data on the Waikato River to protect and enhance its values into the future.

This report is the 25th since the re-design of the Waikato River Monitoring Programme (WARIMP) implemented in 1989. Copies of reports can be obtained via the Waikato Regional Council Internet site http://www.waikatoregion.govt.nz/Publications/ or by contacting Waikato Regional Council (the Library) on 0800 800 401, e-mail: inforeq@waikatoregion.govt.nz.

1.2 Report content

The report provides information on:

1. Routine monthly monitoring of water quality at 10 sites:
   - Year 2015 summary data tabulated by parameter for each location and reported with the median of the previous 5 years.
   - Key parameter graphs showing the average water quality for 2015 at each location, compared to results of the previous 5 years.
   - Summary tables identifying the number of samples meeting 'satisfactory' and 'excellent' water quality standards and guidelines.
   - Raw data for 2015.

2. Additional information is provided in the appendices on:
   - Flow (*Appendix I*).
     - The effect of flow is important to assessing water quality and making comparisons between years. Appendix I provides information on annual median flow at some locations for the previous 10 years.
   - Datasonde deployments
     - Plots of deployments undertaken during 2015 showing the level of diurnal and seasonal variation at five Waikato River sites (*Appendix II*).

1.3 Water quality guidelines and standards

Table 1 lists the physical and chemical water quality standards and guidelines used to assess the condition of the Waikato River in 2015. The standards mainly relate to either the protection of ecological health of rivers and streams or to whether they are suitable for water-based recreation, especially swimming.

Some water quality guidelines and standards are relevant to the use of the Waikato River for both general water supply (industrial/cooling water, irrigation, stock water etc.) and as a source of municipal drinking water. In most cases two criteria are shown. The less stringent criteria define water that is "satisfactory" for the desired use; these are mostly based on existing national and other guidelines and standards (Appendix III). The more stringent criteria identify "excellent" water, and reflect expert opinion. Samples gathered in 2015 whose results do not comply with the "satisfactory" criteria (Table 1) are underlined in raw data summaries.

Table 1: Guidelines and standards for physicochemical water quality for ecological health and for human uses of water

Water Quality Measure	Relevance[1]	Satisfactory	Excellent
Ecological health			
Dissolved oxygen (% saturation)	aquatic life (breathing)	>80	>90
pH	aquatic life (acidity)	6.5–9	7–8
Turbidity (NTU)	plant growth (clarity)	<5	<2
Ammoniacal-N (g/m^3)	aquatic life (toxicity)	<0.88	<0.1
Temperature (°C) (May-Sep)	fish (spawning)	<12	<10
(Oct-Apr)		<20	<16
Total phosphorus (g/m^3)	nuisance plant growth	<0.04	<0.01
Total nitrogen (g/m^3)	nuisance plant growth	<0.5	<0.1
Human uses - recreation			
Baseflow water clarity (m)	visibility	>1.6	>4
Escherichia coli (no./100 mL)	human health	<550	<55
Median Escherichia coli (no./100 mL)	human health	<126	<23
Human uses - water supply			
Phytoplankton chlorophyll *a* (g/m^3)	filter blockage	<0.02	<0.005
Human uses - drinking water			
Arsenic (g/m^3)	human health (toxicity)	<0.01	–
Boron (g/m^3)	human health (toxicity)	<1.4	–

[1] Refer to Appendix III for description of guideline and standards values used. These guidelines and standards are also defined on the Waikato Regional Council Internet site; www.waikatoregion.govt.nz

2 The Waikato River monitoring programme design

2.1 Sampling collection

Sample collection occurs monthly, as two sampling runs. Locations in the upper catchment from Taupo to Waipapa are visited as part of the first run, and locations in the middle and lower catchments from Hamilton (at the Narrows) to Tuakau are visited on the next. Each location is sampled at a similar time on each occasion (coefficient of variation ≈2–6%) to minimise the effect of diurnal variation on the measurement of water quality parameters. Sample times are recorded in New Zealand Standard Time (NZST). Because of the controlled nature of the river, our daytime samples are generally collected at higher than median flows.

2.2 Sample locations

Routine water quality monitoring locations of the Waikato River Monitoring Programme and additional locations used during the summer microbiological surveys are illustrated in *Figure 1* and summarised in *Table 2.*

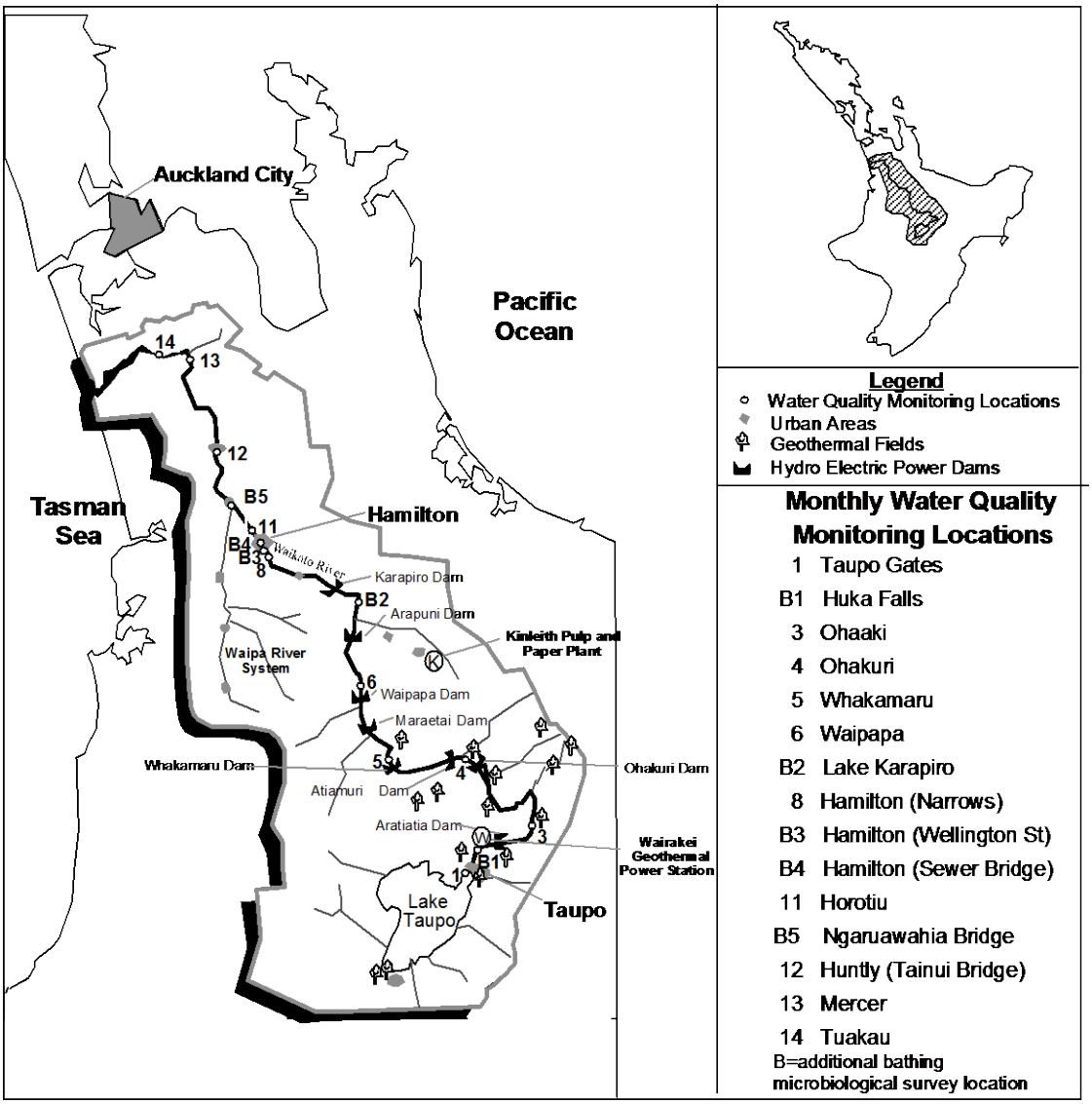


Figure 1: Waikato River water quality monitoring locations

Ten locations along the river are visited monthly (Taupo, Ohaaki, Ohakuri, Whakamaru, Waipapa, Hamilton-Narrows, Hamilton-Horotiu, Huntly, Mercer and Tuakau), and an additional four locations are included for the summer intensive microbiological survey (*see Table 2, Figure 1*). The major tributaries that enter the Waikato River are also monitored monthly as part of the Regional River Monitoring Programme (RERIMP) initiated in 1993 (Huser and Wilson, 1996b). Three locations (Taupo at Reids Farm, Hamilton at Wellington Street, and Rangiriri) are sampled by NIWA as part of the 'National River Water Quality Network' (*Table 2*).

Table 2: Routine sampling and bathing water monitoring locations

Location Number	Distance[1] (km)	Location name	Map Ref.	Field[ϒ] Measurements
1131.127	0.1	Taupo Gates	U18:772-757	–
1131.119*[d]	1.2	Taupo – Reids Farm	U18:778:763	true left bank
1131.70[b]	6.0	Huka Falls	U18:789-792	–
1131.244[d]	7.8	Downstream Huka Falls	U18:797-809	river boat jetty[2]
1131.105[d]	36.5	Ohaaki Bridge	U17:981-914	at bridge, true right bank
1131.107	75.8	Ohakuri Tailrace Bridge	U17:796-061	boat ramp[3]
1131.147	105.0	Whakamaru Tailrace	T17:552-056	boat ramp[4]
1131.143	126.1	Waipapa Tailrace	T16:448-200	boat ramp[5]
1131.81[b]	166.7	Lake Karapiro Boat Ramp	T15:436-570	Horahora domain
1131.328	202.2	Hamilton – Narrows	S14:168-710	boat ramp[6]
1131.145*[b]	210.8	Hamilton – Wellington St Bch	S14:117-757	at jetty, true right bank
1131.64[d]	211.5	Hamilton – Traffic Bridge	S14:118-764	true right bank
1131.121[b]	219.8	Hamilton – Sewer Bridge	S14:082-823	true left bank
1131.69	225.6	Horotiu Bridge	S14:048-871	d/s of bridge
1131.102[b]	232.3	Ngaruawahia Bridge	S14:997-912	u/s of confluence[7]
1131.77	246.5	Huntly – Tainui Bridge	S13:003-018	true left bank
1131.117*[d]	262.3	Rangiriri Bridge	S13:989-167	true right bank
1131.91	286.3	Mercer Bridge	S12:919-336	–
1131.133	296.8	Tuakau Bridge	R12:828-320	boat ramp[8]
1131.131[d]	306.5	Tuakau – Elbows Landing	R12:745-352	NZ Steel Ltd pumping station

[1] approximate distance (in kilometres) from Lake Taupo's outlet.
[2] river boat jetty and boat ramp, true left bank, about 1.8 km downstream of Huka Falls
[3] boat ramp in recreation reserve immediately upstream from dam (true left bank).
[4] boat ramp at Whakamaru Power Station.
[5] river access d/s of Lake Waipapa, about 500 m off S.H. 32 along a gravel road (true left bank).
[6] boat ramp accessed via Narrows Lane (true right bank)
[7] road bridge upstream of Waipa River confluence.
[8] immediately d/s of bridge, at Reserve (true right bank).
[b] bathing season intensive microbiological survey locations only – survey conducted over the 2014/15 summer.
***** Locations at **Taupo (Reids Farm,** 1.1 km d/s from Taupo Gates), at **Hamilton** (Wellington Street jetty) and at **Rangiriri** (Rangiriri Bridge) are sampled and reported as part of the National River Water Quality Network undertaken by NIWA. Contact person: Graham Bryers, NIWA, Hamilton.
[ϒ] Logistic considerations mean field measurements are often made at slightly different locations from sample collection (e.g. sampling from bridges).
[d] Datasonde deployment sites.

2.3 Water quality parameters

Water quality of the Waikato River is assessed by measuring up to 40 parameters (27 routinely). Some parameters are measured in the field, but the majority of parameters are analysed in a laboratory using standard analytical methods. Details of field measurements and analytical methods used are appended (*Appendix III*).

2.4 Quality control, data storage and analysis

Quality control measures are undertaken in accordance with Waikato Regional Council's standards including procedures for the collection, transport, storage of samples, and methods for data verification and quality assurance to ensure the consistency of data across the programme. Samples are sent to IANZ registered laboratories for analysis. Back-up samples are held for two months until results have been verified by routine quality assurance procedures. All data from field measurements and laboratory analyses are stored in Waikato Regional Council's database called WISKI.

Data analysis was performed using Statistica (version 11.0) and DataDesk (version 6.0.1). For the purpose of data analysis, non-detect results (i.e. results with "less than" values) were assumed to be equal to half the corresponding limit of detection (i.e. <x = x/2), and results greater than the value reported were taken as equal to the value reported (i.e. >x = x).

2.5 Reports

Waikato Regional Council's State of the Environment Report summarises the state of the Waikato River, other rivers in the region, and common pressures (Environment Waikato, 1999).

Waikato Regional Council Technical Report 2013/20, Trends in River Water Quality in the Waikato Region, 1993–2012 (Vant, 2013) outlines the trends in the Waikato River and other rivers in the region. Copies are available in electronic format from the publications page of the Waikato Regional Council website:

http://www.waikatoregion.govt.nz/Publications/Technical-Reports

The data contained in these Waikato River reports is updated to the Waikato Regional Council "Waikato River" Internet page:

http://www.waikatoregion.govt.nz/Fresh-water-quality

The "How healthy are our rivers?" link provides details of the guidelines and standards used to assess the condition of the Waikato River and other rivers in the region. A link to water quality at other regional river monitoring sites is also available from this page.

This data is also supplied to the LAWA website https://www.lawa.org.nz/explore-data/waikato-region

3 Results

3.1 Waikato River Monitoring Programme

Routine Water Quality Monitoring

Summary Statistics

Key Parameter Graphs

Comparison with Water Quality Standards

Raw Data

5 Yearly Trace Metal Analysis Raw Data

Absorbance of filtered sample at 340 nm (units: /cm)								
Location	**Count**	**Mean**	**Median**	**Min**	**Max**	**IQR**	**Skew**	**5 Yr Median**
Taupo Control Gates	12	0.001	0.001	0.001	0.002	0.000	**3.02**	0.001
Ohaaki Bridge	12	0.003	0.003	0.001	0.004	0.001	-0.38	0.003
Ohakuri Tailrace Bridge	12	0.005	0.005	0.004	0.006	0.002	-0.14	0.005
Whakamaru Tailrace	12	0.007	0.007	0.005	0.012	0.002	1.17	0.007
Waipapa Tailrace	12	0.011	0.010	0.008	0.016	0.004	0.96	0.010
Narrows	12	0.014	0.014	0.010	0.021	0.005	0.60	0.012
Horotiu Bridge	12	0.015	0.013	0.010	0.035	0.005	**2.01**	0.012
Huntly-Tainui Bridge	12	0.021	0.021	0.013	0.037	0.007	0.90	0.019
Mercer Bridge	12	0.025	0.021	0.012	0.047	0.020	0.65	0.021
Tuakau Bridge	12	0.028	0.026	0.012	0.048	0.023	0.30	0.024

Absorbance of filtered sample at 440 nm (units: /cm)								
Location	**Count**	**Mean**	**Median**	**Min**	**Max**	**IQR**	**Skew**	**5 Yr Median**
Taupo Control Gates	12	0.001	0.001	0.001	0.001	0.000	-1.00	0.001
Ohaaki Bridge	12	0.001	0.001	0.001	0.001	0.000	-1.00	0.001
Ohakuri Tailrace Bridge	12	0.001	0.001	0.001	0.001	0.000	-1.00	0.001
Whakamaru Tailrace	12	0.001	0.001	0.001	0.003	0.000	**2.22**	0.001
Waipapa Tailrace	12	0.002	0.002	0.001	0.004	0.001	1.02	0.001
Narrows	12	0.003	0.003	0.001	0.004	0.001	-0.28	0.002
Horotiu Bridge	12	0.003	0.003	0.001	0.008	0.001	**1.87**	0.002
Huntly-Tainui Bridge	12	0.004	0.004	0.003	0.007	0.002	1.30	0.003
Mercer Bridge	12	0.005	0.004	0.002	0.008	0.003	0.51	0.004
Tuakau Bridge	12	0.005	0.004	0.002	0.010	0.004	0.56	0.004

Arsenic - Total (g/m^3)								
Location	**Count**	**Mean**	**Median**	**Min**	**Max**	**IQR**	**Skew**	**5 Yr Median**
Taupo Control Gates	12	0.012	0.012	0.011	0.013	0.000	-0.73	0.011
Ohaaki Bridge	12	0.024	0.025	0.017	0.029	0.007	-0.40	0.027
Ohakuri Tailrace Bridge	12	0.030	0.030	0.024	0.038	0.004	0.53	0.031
Whakamaru Tailrace	12	0.029	0.029	0.022	0.041	0.006	1.07	0.030
Waipapa Tailrace	12	0.025	0.025	0.019	0.034	0.006	0.43	0.026
Narrows	12	0.021	0.021	0.014	0.033	0.007	0.70	0.023
Horotiu Bridge	12	0.021	0.021	0.013	0.032	0.008	0.49	0.023
Huntly-Tainui Bridge	12	0.015	0.015	0.008	0.028	0.009	0.63	0.017
Mercer Bridge	12	0.016	0.016	0.008	0.028	0.011	0.41	0.017
Tuakau Bridge	12	0.016	0.016	0.009	0.027	0.009	0.41	0.017

Boron (g/m^3)								
Location	**Count**	**Mean**	**Median**	**Min**	**Max**	**IQR**	**Skew**	**5 Yr Median**
Taupo Control Gates	12	0.17	0.17	0.16	0.18	0.01	-0.03	0.17
Ohaaki Bridge	12	0.28	0.29	0.21	0.34	0.07	-0.21	0.28
Ohakuri Tailrace Bridge	12	0.32	0.31	0.29	0.36	0.03	0.82	0.32
Whakamaru Tailrace	12	0.31	0.31	0.26	0.33	0.03	-0.89	0.32
Waipapa Tailrace	12	0.27	0.28	0.24	0.32	0.03	0.26	0.28
Narrows	12	0.24	0.24	0.18	0.29	0.06	-0.11	0.25
Horotiu Bridge	12	0.24	0.25	0.18	0.29	0.06	-0.31	0.26
Huntly-Tainui Bridge	11	0.18	0.18	0.12	0.26	0.08	0.24	0.19
Mercer Bridge	11	0.19	0.22	0.11	0.27	0.08	-0.20	0.20
Tuakau Bridge	12	0.20	0.22	0.12	0.27	0.08	-0.21	0.21

Skew = skewness. Underlined values = non-normal distribution. IQR = Inter Quartile Range

Black Disk (m)								
Location	**Count**	**Mean**	**Median**	**Min**	**Max**	**IQR**	**Skew**	**5 Yr Median**
Taupo Control Gates	-	-	-	-	-	-	-	-
Ohaaki Bridge	12	4.7	4.5	3.0	7.5	2.2	0.56	3.9
Ohakuri Tailrace Bridge	12	3.0	3.0	1.8	4.9	1.2	0.53	2.3
Whakamaru Tailrace	11	2.6	2.6	2.1	3.1	0.2	0.31	2.2
Waipapa Tailrace	12	2.5	2.5	1.9	3.5	0.8	0.44	2.0
Narrow s	12	2.0	2.1	0.6	3.1	0.9	-0.40	1.7
Horotiu Bridge	12	1.5	1.7	0.5	2.2	0.5	-0.97	1.5
Huntly-Tainui Bridge	12	1.2	1.1	0.3	2.2	0.6	0.51	0.9
Mercer Bridge	-	-	-	-	-	-	-	-
Tuakau Bridge	12	0.8	0.7	0.3	1.5	0.5	0.72	0.6

Biochemical Oxygen Demand - 5 day (g/m^3)								
Location	**Count**	**Mean**	**Median**	**Min**	**Max**	**IQR**	**Skew**	**5 Yr Median**
Taupo Control Gates	12	0.7	0.7	0.2	1.1	0.3	-0.45	0.6
Ohaaki Bridge	12	0.9	0.9	0.4	1.0	0.2	-1.43	0.8
Ohakuri Tailrace Bridge	12	1.1	1.1	0.6	2.1	0.5	1.28	0.9
Whakamaru Tailrace	12	1.2	1.1	0.5	1.8	0.4	-0.02	1.0
Waipapa Tailrace	12	1.0	1.0	0.5	1.5	0.2	0.32	0.9
Narrow s	12	1.2	1.2	0.6	1.7	0.5	-0.26	1.0
Horotiu Bridge	12	1.3	1.2	0.9	2.4	0.4	1.63	1.0
Huntly-Tainui Bridge	12	1.3	1.2	0.9	2.2	0.6	0.99	1.2
Mercer Bridge	12	1.6	1.5	0.4	3.0	1.0	0.54	1.4
Tuakau Bridge	12	1.7	1.6	0.4	3.0	1.0	0.15	1.4

Carbon - Dissolved Organic (g/m^3)								
Location	**Count**	**Mean**	**Median**	**Min**	**Max**	**IQR**	**Skew**	**5 Yr Median**
Taupo Control Gates	12	0.93	0.95	0.60	1.20	0.25	-0.05	1.00
Ohaaki Bridge	12	0.79	0.80	0.50	1.10	0.35	0.26	0.95
Ohakuri Tailrace Bridge	12	0.90	0.90	0.60	1.30	0.50	0.43	1.10
Whakamaru Tailrace	12	1.26	1.20	0.80	1.80	0.40	0.10	1.20
Waipapa Tailrace	12	1.25	1.20	0.90	1.70	0.40	0.42	1.30
Narrow s	12	1.48	1.50	1.20	1.80	0.25	-0.07	1.60
Horotiu Bridge	12	1.58	1.50	1.00	2.90	0.20	**2.09**	1.60
Huntly-Tainui Bridge	12	1.84	1.75	1.50	2.90	0.25	**2.21**	1.90
Mercer Bridge	12	2.32	2.15	1.60	4.10	1.10	1.04	2.10
Tuakau Bridge	12	2.51	2.40	1.50	4.80	1.45	0.92	2.35

Carbon - Total Organic (g/m^3)								
Location	**Count**	**Mean**	**Median**	**Min**	**Max**	**IQR**	**Skew**	**5 Yr Median**
Taupo Control Gates	12	0.98	0.95	0.60	1.30	0.40	-0.01	1.10
Ohaaki Bridge	12	0.88	0.80	0.70	1.20	0.15	0.90	1.10
Ohakuri Tailrace Bridge	12	1.18	0.90	0.80	2.10	0.55	1.14	1.30
Whakamaru Tailrace	12	1.37	1.30	0.90	1.90	0.25	0.35	1.40
Waipapa Tailrace	12	1.45	1.25	1.10	2.00	0.60	0.61	1.70
Narrow s	12	1.73	1.70	1.20	2.50	0.65	0.44	1.85
Horotiu Bridge	12	1.93	1.80	1.40	3.70	0.50	**1.93**	2.00
Huntly-Tainui Bridge	12	2.31	2.10	1.60	4.80	0.60	**2.33**	2.45
Mercer Bridge	12	2.84	2.40	1.70	5.80	1.55	1.24	3.00
Tuakau Bridge	12	2.98	2.80	1.70	5.60	1.65	0.87	3.15

Skew = skewness. Underlined values = non-normal distribution. IQR = Inter Quartile Range

Chloride (g/m^3)								
Location	**Count**	**Mean**	**Median**	**Min**	**Max**	**IQR**	**Skew**	**5 Yr Median**
Taupo Control Gates	12	8.0	8.1	7.6	8.3	0.2	-0.49	8.2
Ohaaki Bridge	12	14.7	14.4	10.7	19.0	3.8	0.20	15.7
Ohakuri Tailrace Bridge	12	17.9	17.9	16.2	21.0	1.7	0.78	19.0
Whakamaru Tailrace	12	18.0	18.1	15.1	20.0	2.3	-0.39	19.2
Waipapa Tailrace	12	17.5	18.2	14.2	19.3	2.9	-0.67	18.6
Narrow s	12	16.0	16.1	12.8	18.6	3.3	-0.50	17.3
Horotiu Bridge	12	16.2	16.4	12.5	18.9	3.1	-0.60	17.4
Huntly-Tainui Bridge	12	15.2	15.4	12.0	17.8	3.7	-0.23	16.1
Mercer Bridge	12	16.1	16.0	12.8	18.7	2.8	-0.43	17.1
Tuakau Bridge	12	16.4	16.5	13.0	18.7	2.8	-0.57	17.2

Chlorophyll *a* (g/m^3)								
Location	**Count**	**Mean**	**Median**	**Min**	**Max**	**IQR**	**Skew**	**5 Yr Median**
Taupo Control Gates	12	0.002	0.002	0.002	0.002	0.000	1.00	0.002
Ohaaki Bridge	12	0.002	0.002	0.002	0.002	0.000	1.00	0.002
Ohakuri Tailrace Bridge	12	0.005	0.004	0.002	0.013	0.006	0.96	0.003
Whakamaru Tailrace	12	0.008	0.005	0.002	0.029	0.005	**2.28**	0.006
Waipapa Tailrace	12	0.007	0.007	0.002	0.017	0.005	1.08	0.005
Narrow s	12	0.013	0.005	0.002	0.083	0.010	**2.68**	0.005
Horotiu Bridge	12	0.007	0.005	0.002	0.024	0.003	**1.95**	0.006
Huntly-Tainui Bridge	12	0.007	0.005	0.002	0.020	0.005	1.28	0.006
Mercer Bridge	12	0.011	0.007	0.004	0.027	0.006	1.38	0.009
Tuakau Bridge	12	0.013	0.008	0.004	0.036	0.009	1.37	0.011

Colour (Munsell Colour Units)								
Location	**Count**	**Mean**	**Median**	**Min**	**Max**	**IQR**	**Skew**	**5 Yr Median**
Taupo Control Gates	-	-	-	-	-	-	-	-
Ohaaki Bridge	11	51.4	52.5	47.5	55.0	7.5	-0.10	50.0
Ohakuri Tailrace Bridge	12	42.9	41.3	35.0	52.5	6.3	0.40	42.0
Whakamaru Tailrace	11	40.2	37.5	35.0	52.5	4.9	1.60	40.0
Waipapa Tailrace	12	38.1	37.5	30.0	47.5	3.8	0.18	40.0
Narrow s	11	35.5	37.5	22.5	40.0	2.5	**-1.82**	37.5
Horotiu Bridge	12	34.2	35.0	25.0	40.0	1.3	-1.26	35.0
Huntly-Tainui Bridge	12	32.7	32.5	25.0	37.5	6.3	-0.41	35.0
Mercer Bridge	-	-	-	-	-	-	-	-
Tuakau Bridge	12	29.8	31.3	22.5	35.0	6.3	-0.35	30.0

Conductivity at 25 ^{o}C (ms/m)								
Location	**Count**	**Mean**	**Median**	**Min**	**Max**	**IQR**	**Skew**	**5 Yr Median**
Taupo Control Gates	12	12.1	12.1	11.9	12.2	0.1	-0.58	11.9
Ohaaki Bridge	12	14.9	15.0	12.9	16.6	2.0	-0.15	15.0
Ohakuri Tailrace Bridge	12	16.5	16.5	15.2	18.1	1.0	0.26	16.7
Whakamaru Tailrace	12	16.4	16.6	14.9	17.7	1.2	-0.35	16.8
Waipapa Tailrace	12	16.2	16.4	14.5	17.6	1.5	-0.38	16.3
Narrow s	12	15.7	16.0	13.5	17.1	1.9	-0.63	15.9
Horotiu Bridge	12	15.7	15.8	13.0	17.6	1.9	-0.56	15.9
Huntly-Tainui Bridge	12	14.8	14.9	12.0	16.8	3.0	-0.18	14.9
Mercer Bridge	12	15.8	15.7	13.1	17.5	1.8	-0.57	15.7
Tuakau Bridge	12	15.7	15.6	12.6	17.5	1.9	-0.77	15.8

Skew = skewness. Underlined values = non-normal distribution. IQR = Inter Quartile Range

Dissolved Oxygen (g/m^3)								
Location	**Count**	**Mean**	**Median**	**Min**	**Max**	**IQR**	**Skew**	**5 Yr Median**
Taupo Control Gates	12	9.7	9.7	8.9	10.4	1.1	-0.09	9.7
Ohaaki Bridge	12	9.8	9.8	8.2	12.0	2.4	0.15	9.7
Ohakuri Tailrace Bridge	12	9.6	9.6	8.0	10.8	1.7	-0.22	9.7
Whakamaru Tailrace	12	9.9	9.9	8.5	10.9	0.9	-0.46	10.0
Waipapa Tailrace	12	9.5	9.9	7.1	10.8	1.8	-0.79	9.8
Narrow s	12	9.6	9.8	8.3	10.9	1.7	-0.09	9.9
Horotiu Bridge	12	9.3	9.7	7.3	10.7	1.6	-0.49	9.7
Huntly-Tainui Bridge	12	9.2	9.4	7.6	10.2	1.2	-0.49	9.4
Mercer Bridge	12	9.3	9.3	8.0	10.2	1.0	-0.26	9.5
Tuakau Bridge	12	9.4	9.4	8.6	10.6	1.2	0.23	9.5

Dissolved Oxygen (% Saturation)								
Location	**Count**	**Mean**	**Median**	**Min**	**Max**	**IQR**	**Skew**	**5 Yr Median**
Taupo Control Gates	12	101.1	98.8	94.2	108.2	8.1	0.33	101.1
Ohaaki Bridge	12	102.3	99.5	94.8	118.8	10.3	0.99	101.8
Ohakuri Tailrace Bridge	12	100.7	99.4	89.0	114.6	12.0	0.34	101.3
Whakamaru Tailrace	12	103.4	102.4	93.5	114.1	10.2	0.29	103.5
Waipapa Tailrace	12	97.9	96.3	92.2	107.0	7.5	0.76	101.3
Narrow s	12	96.5	96.6	89.6	105.3	6.1	0.28	97.9
Horotiu Bridge	12	94.3	93.2	84.9	103.1	11.2	0.04	97.7
Huntly-Tainui Bridge	12	94.2	94.5	85.8	102.2	8.1	0.09	95.9
Mercer Bridge	12	95.2	93.7	83.5	111.2	8.8	0.42	96.1
Tuakau Bridge	12	98.4	98.7	81.6	116.7	18.8	0.12	98.0

Enterococci (cfu/100 mL)								
Location	**Count**	**Mean**	**Median**	**Min**	**Max**	**IQR**	**Skew**	**5 Yr Median**
Taupo Control Gates	12	5	3	1	20	7	1.5	1
Ohaaki Bridge	12	13	8	1	50	16	1.5	8
Ohakuri Tailrace Bridge	12	2	2	1	6	2	0.8	2
Whakamaru Tailrace	12	10	4	1	34	12	1.3	4
Waipapa Tailrace	12	6	1	1	23	7	1.4	4
Narrow s	12	114	47	17	520	88	**1.9**	32
Horotiu Bridge	12	261	58	22	2100	112	**2.8**	49
Huntly-Tainui Bridge	12	197	38	19	1300	116	**2.4**	43
Mercer Bridge	12	146	28	13	1400	37	**3.0**	25
Tuakau Bridge	12	195	26	11	1800	37	**2.9**	22

Escherichia coli (cfu/100 mL)								
Location	**Count**	**Mean**	**Median**	**Min**	**Max**	**IQR**	**Skew**	**5 Yr Median**
Taupo Control Gates	12	4	3	1	10	6	0.7	2
Ohaaki Bridge	12	15	9	3	90	4	**2.9**	12
Ohakuri Tailrace Bridge	12	2	2	1	4	2	0.1	2
Whakamaru Tailrace	12	8	6	1	31	10	1.6	7
Waipapa Tailrace	12	32	5	1	320	4	**3.0**	5
Narrow s	12	242	46	29	1900	63	**2.7**	38
Horotiu Bridge	12	465	90	34	4200	174	**3.0**	90
Huntly-Tainui Bridge	12	396	140	30	2700	90	**2.6**	125
Mercer Bridge	12	329	80	36	3000	76	**3.0**	80
Tuakau Bridge	12	262	57	30	2400	60	**3.0**	80

Skew = skewness. Underlined values = non-normal distribution. IQR = Inter Quartile Range

Faecal Coliforms (cfu/100 mL)								
Location	**Count**	**Mean**	**Median**	**Min**	**Max**	**IQR**	**Skew**	**5 Yr Median**
Taupo Control Gates	12	4	4	1	12	7	0.8	2
Ohaaki Bridge	12	17	11	6	90	4	**2.9**	12
Ohakuri Tailrace Bridge	12	3	2	1	4	2	0.2	2
Whakamaru Tailrace	12	9	6	1	39	11	**1.9**	8
Waipapa Tailrace	12	35	6	1	350	5	**3.0**	7
Narrows	12	293	52	30	2000	130	**2.4**	48
Horotiu Bridge	12	485	100	45	4200	220	**3.0**	90
Huntly-Tainui Bridge	12	488	140	60	3300	130	**2.5**	135
Mercer Bridge	12	378	95	46	3500	76	**3.0**	95
Tuakau Bridge	12	289	65	40	2600	70	**3.0**	80

Lithium (g/m^3)								
Location	**Count**	**Mean**	**Median**	**Min**	**Max**	**IQR**	**Skew**	**5 Yr Median**
Taupo Control Gates	12	0.041	0.041	0.039	0.043	0.002	0.507	0.040
Ohaaki Bridge	12	0.080	0.081	0.055	0.103	0.023	-0.083	0.085
Ohakuri Tailrace Bridge	12	0.102	0.099	0.087	0.122	0.016	0.580	0.109
Whakamaru Tailrace	12	0.104	0.106	0.085	0.117	0.014	-0.567	0.111
Waipapa Tailrace	12	0.092	0.093	0.072	0.107	0.012	-0.560	0.098
Narrows	12	0.082	0.080	0.058	0.104	0.025	-0.121	0.088
Horotiu Bridge	12	0.081	0.084	0.059	0.102	0.027	-0.169	0.090
Huntly-Tainui Bridge	11	0.058	0.057	0.034	0.090	0.028	0.345	0.063
Mercer Bridge	11	0.060	0.066	0.033	0.093	0.033	0.085	0.066
Tuakau Bridge	12	0.063	0.066	0.037	0.095	0.029	0.131	0.066

Nitrate/Nitrite Nitrogen (g/m^3)								
Location	**Count**	**Mean**	**Median**	**Min**	**Max**	**IQR**	**Skew**	**5 Yr Median**
Taupo Control Gates	12	0.001	0.001	0.001	0.001	0.000	-1.15	0.001
Ohaaki Bridge	12	0.030	0.027	0.018	0.049	0.021	0.35	0.039
Ohakuri Tailrace Bridge	12	0.060	0.053	0.004	0.126	0.068	0.17	0.080
Whakamaru Tailrace	12	0.095	0.085	0.031	0.173	0.103	0.16	0.101
Waipapa Tailrace	12	0.175	0.164	0.088	0.300	0.127	0.38	0.171
Narrows	12	0.268	0.270	0.033	0.440	0.237	-0.25	0.240
Horotiu Bridge	12	0.282	0.280	0.082	0.490	0.258	-0.05	0.260
Huntly-Tainui Bridge	12	0.423	0.405	0.115	0.700	0.475	-0.09	0.395
Mercer Bridge	12	0.372	0.390	0.049	0.690	0.445	-0.06	0.375
Tuakau Bridge	12	0.349	0.395	0.014	0.680	0.451	-0.10	0.330

Nitrogen - Ammoniacal (g/m^3)								
Location	**Count**	**Mean**	**Median**	**Min**	**Max**	**IQR**	**Skew**	**5 Yr Median**
Taupo Control Gates	12	0.005	0.005	0.003	0.005	0.000	**-1.79**	0.005
Ohaaki Bridge	12	0.007	0.005	0.003	0.028	0.001	**2.54**	0.005
Ohakuri Tailrace Bridge	12	0.006	0.005	0.003	0.021	0.001	**2.52**	0.005
Whakamaru Tailrace	12	0.006	0.005	0.003	0.016	0.000	1.60	0.005
Waipapa Tailrace	12	0.013	0.013	0.003	0.027	0.015	0.29	0.015
Narrows	12	0.014	0.005	0.003	0.060	0.013	**2.17**	0.015
Horotiu Bridge	12	0.012	0.005	0.005	0.047	0.012	**1.76**	0.011
Huntly-Tainui Bridge	12	0.011	0.008	0.005	0.027	0.010	0.99	0.011
Mercer Bridge	12	0.007	0.005	0.005	0.020	0.000	**2.56**	0.005
Tuakau Bridge	12	0.006	0.005	0.005	0.019	0.000	**3.02**	0.005

Skew = skewness. Underlined values = non-normal distribution. IQR = Inter Quartile Range

Nitrogen - Total Kjeldahl (g/m^3)								
Location	**Count**	**Mean**	**Median**	**Min**	**Max**	**IQR**	**Skew**	**5 Yr Median**
Taupo Control Gates	12	0.050	0.055	0.025	0.080	0.045	0.01	0.060
Ohaaki Bridge	12	0.077	0.075	0.025	0.110	0.035	-0.59	0.090
Ohakuri Tailrace Bridge	12	0.111	0.100	0.070	0.220	0.030	**1.93**	0.100
Whakamaru Tailrace	12	0.132	0.130	0.080	0.180	0.055	-0.14	0.140
Waipapa Tailrace	12	0.152	0.140	0.100	0.230	0.045	0.81	0.140
Narrow s	12	0.180	0.185	0.100	0.290	0.060	0.51	0.160
Horotiu Bridge	12	0.211	0.195	0.140	0.430	0.045	**1.98**	0.180
Huntly-Tainui Bridge	12	0.248	0.220	0.180	0.430	0.085	1.37	0.220
Mercer Bridge	12	0.290	0.255	0.160	0.600	0.120	1.45	0.280
Tuakau Bridge	12	0.319	0.310	0.190	0.580	0.110	1.18	0.285

Nitrogen - Total (g/m^3)								
Location	**Count**	**Mean**	**Median**	**Min**	**Max**	**IQR**	**Skew**	**5 Yr Median**
Taupo Control Gates	12	0.050	0.056	0.026	0.081	0.045	0.01	0.065
Ohaaki Bridge	12	0.107	0.119	0.047	0.132	0.030	-1.18	0.130
Ohakuri Tailrace Bridge	12	0.171	0.165	0.104	0.261	0.055	0.44	0.205
Whakamaru Tailrace	12	0.227	0.227	0.161	0.317	0.073	0.35	0.256
Waipapa Tailrace	12	0.326	0.330	0.253	0.400	0.067	-0.09	0.339
Narrow s	12	0.448	0.440	0.278	0.690	0.200	0.37	0.420
Horotiu Bridge	12	0.493	0.485	0.259	0.920	0.238	0.75	0.450
Huntly-Tainui Bridge	12	0.671	0.605	0.361	1.100	0.473	0.25	0.595
Mercer Bridge	12	0.662	0.630	0.242	1.190	0.600	0.15	0.672
Tuakau Bridge	12	0.668	0.665	0.264	1.160	0.509	0.15	0.620

pH (pH Units)								
Location	**Count**	**Mean**	**Median**	**Min**	**Max**	**IQR**	**Skew**	**5 Yr Median**
Taupo Control Gates	12	7.6	7.7	7.1	8.0	0.6	-0.36	7.7
Ohaaki Bridge	12	7.3	7.4	7.0	7.6	0.4	-0.02	7.3
Ohakuri Tailrace Bridge	12	7.3	7.4	7.0	7.6	0.3	-0.23	7.3
Whakamaru Tailrace	12	7.4	7.4	7.1	7.6	0.2	-0.15	7.4
Waipapa Tailrace	12	7.3	7.3	7.0	7.5	0.3	-0.40	7.4
Narrow s	12	7.4	7.4	6.6	7.9	0.3	-1.12	7.5
Horotiu Bridge	12	7.5	7.5	7.0	7.7	0.3	-0.83	7.5
Huntly-Tainui Bridge	12	7.5	7.4	7.3	7.7	0.2	0.32	7.4
Mercer Bridge	12	7.4	7.5	6.7	7.8	0.4	-0.91	7.5
Tuakau Bridge	12	7.5	7.5	6.8	7.8	0.5	-0.69	7.5

Phosphorus - Dissolved Reactive (g/m^3)								
Location	**Count**	**Mean**	**Median**	**Min**	**Max**	**IQR**	**Skew**	**5 Yr Median**
Taupo Control Gates	12	0.002	0.002	0.002	0.004	0.000	**2.42**	0.002
Ohaaki Bridge	12	0.007	0.006	0.004	0.013	0.003	1.05	0.006
Ohakuri Tailrace Bridge	12	0.009	0.008	0.002	0.017	0.007	0.19	0.009
Whakamaru Tailrace	12	0.010	0.009	0.004	0.021	0.006	1.04	0.008
Waipapa Tailrace	12	0.016	0.018	0.006	0.023	0.007	-0.68	0.016
Narrow s	12	0.017	0.019	0.005	0.026	0.008	-0.53	0.016
Horotiu Bridge	12	0.021	0.022	0.007	0.034	0.007	-0.08	0.020
Huntly-Tainui Bridge	12	0.022	0.024	0.011	0.028	0.006	-0.99	0.021
Mercer Bridge	12	0.015	0.015	0.005	0.022	0.008	-0.47	0.016
Tuakau Bridge	12	0.015	0.017	0.002	0.023	0.011	-0.63	0.014

Skew = skewness. Underlined values = non-normal distribution. IQR = Inter Quartile Range

Phosphorus - Total (g/m^3)								
Location	**Count**	**Mean**	**Median**	**Min**	**Max**	**IQR**	**Skew**	**5 Yr Median**
Taupo Control Gates	12	0.004	0.002	0.002	0.016	0.003	**2.33**	0.005
Ohaaki Bridge	12	0.010	0.010	0.008	0.016	0.002	1.49	0.011
Ohakuri Tailrace Bridge	12	0.017	0.017	0.014	0.022	0.004	0.49	0.019
Whakamaru Tailrace	12	0.020	0.019	0.014	0.026	0.004	0.27	0.021
Waipapa Tailrace	12	0.026	0.027	0.018	0.036	0.011	0.07	0.026
Narrow s	12	0.031	0.030	0.021	0.048	0.010	0.81	0.029
Horotiu Bridge	12	0.042	0.036	0.030	0.106	0.010	**2.43**	0.036
Huntly-Tainui Bridge	12	0.049	0.045	0.034	0.103	0.009	**2.38**	0.044
Mercer Bridge	12	0.050	0.045	0.031	0.119	0.015	**2.32**	0.049
Tuakau Bridge	12	0.053	0.049	0.036	0.098	0.026	1.13	0.051

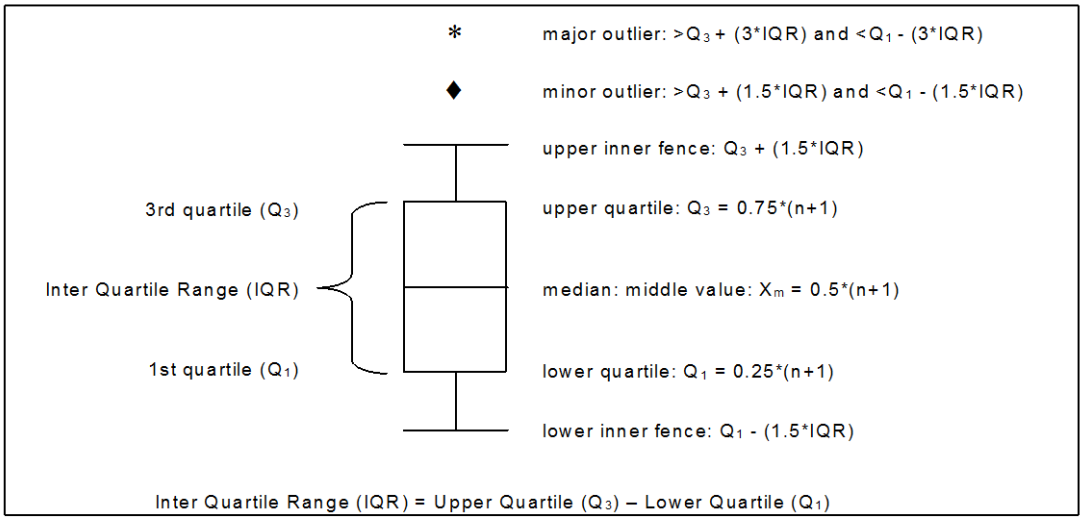
Temperature (^{o}C)								
Location	**Count**	**Mean**	**Median**	**Min**	**Max**	**IQR**	**Skew**	**5 Yr Median**
Taupo Control Gates	12	15.6	14.7	10.9	21.9	7.1	0.39	14.6
Ohaaki Bridge	12	16.5	15.8	11.4	22.0	7.7	0.20	16.2
Ohakuri Tailrace Bridge	12	16.8	16.1	11.8	23.1	7.9	0.19	16.3
Whakamaru Tailrace	12	16.8	16.3	11.5	23.7	7.8	0.22	16.5
Waipapa Tailrace	12	16.5	16.2	11.3	23.4	7.5	0.22	16.2
Narrow s	12	16.1	15.9	10.5	21.4	7.7	-0.06	16.2
Horotiu Bridge	12	16.6	17.0	10.8	22.5	7.8	-0.01	16.4
Huntly-Tainui Bridge	12	16.8	16.4	11.2	23	8.1	0.12	16.2
Mercer Bridge	12	17.1	16.4	11.2	23	8.0	0.06	16.7
Tuakau Bridge	12	17.6	17.2	11.8	24.1	8.9	0.06	17.2

Dissolved Solids - Total (g/m^3)								
Location	**Count**	**Mean**	**Median**	**Min**	**Max**	**IQR**	**Skew**	**5 Yr Median**
Taupo Control Gates	12	86.6	87.0	71.0	98.0	5.5	-0.67	87.0
Ohaaki Bridge	12	106.0	106.5	95.0	120.0	13.5	0.10	109.0
Ohakuri Tailrace Bridge	12	119.8	121.0	111.0	127.0	6.5	-0.30	122.0
Whakamaru Tailrace	12	120.3	123.0	102.0	131.0	9.0	-1.06	126.0
Waipapa Tailrace	12	123.8	122.0	108.0	144.0	17.0	0.20	124.0
Narrow s	12	122.1	125.5	95.0	134.0	11.0	-1.36	123.0
Horotiu Bridge	12	124.6	128.5	102.0	143.0	15.5	-0.34	121.5
Huntly-Tainui Bridge	12	118.7	122.0	99.0	137	16.5	-0.24	114.5
Mercer Bridge	12	123.7	128.5	106.0	134	16.0	-0.73	119.0
Tuakau Bridge	12	122.2	125.0	100.0	136.0	15.0	-0.68	120.0

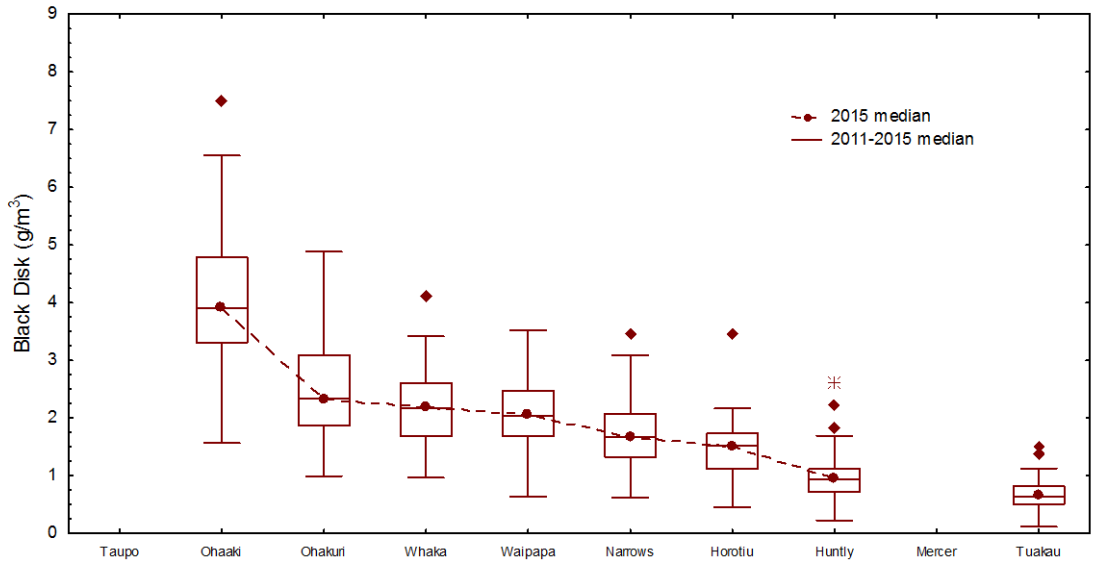
Turbidity (NTU)								
Location	**Count**	**Mean**	**Median**	**Min**	**Max**	**IQR**	**Skew**	**5 Yr Median**
Taupo Control Gates	12	0.6	0.3	0.2	1.9	0.4	**1.93**	0.5
Ohaaki Bridge	12	0.7	0.5	0.4	1.9	0.3	**2.19**	0.8
Ohakuri Tailrace Bridge	12	0.9	0.9	0.6	1.2	0.4	-0.08	1.0
Whakamaru Tailrace	12	1.0	1.0	0.6	1.4	0.4	-0.03	1.2
Waipapa Tailrace	12	1.2	1.2	0.8	1.7	0.3	0.04	1.3
Narrow s	12	3.1	1.8	1.1	13.7	1.1	**2.61**	1.9
Horotiu Bridge	12	5.1	2.4	1.4	33.0	1.3	**2.90**	2.4
Huntly-Tainui Bridge	12	9.0	5.9	2.2	48	4.6	**2.77**	5.5
Mercer Bridge	12	12.3	7.9	3.5	62	5.3	**2.80**	9.4
Tuakau Bridge	12	10.2	8.2	2.9	41.0	6.3	**2.47**	8.9

Skew = skewness. Underlined values = non-normal distribution. IQR = Inter Quartile Range

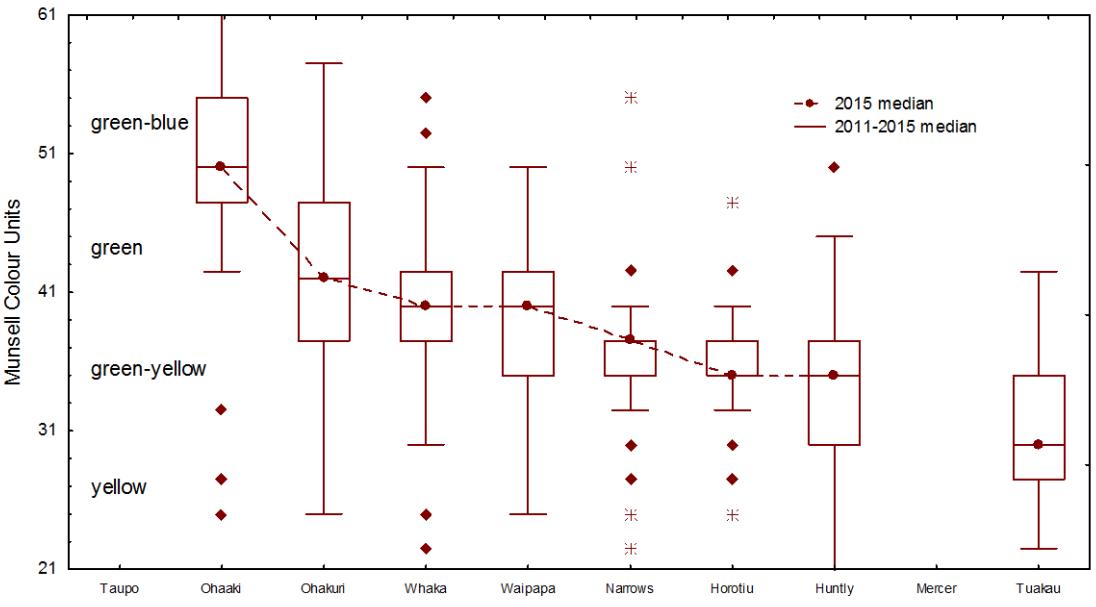
Boxplots are used to present data

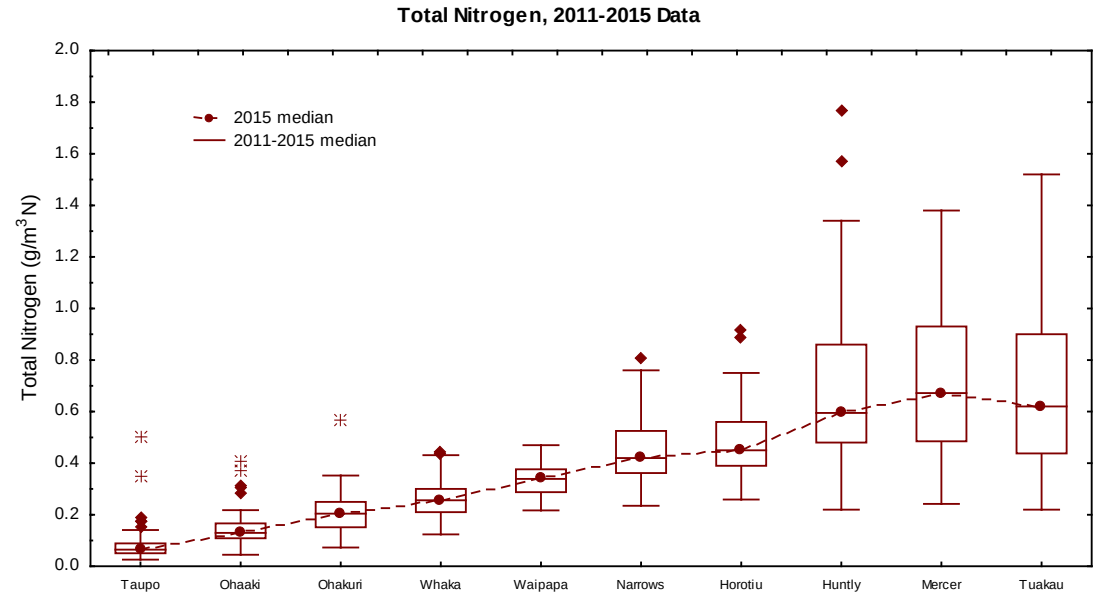


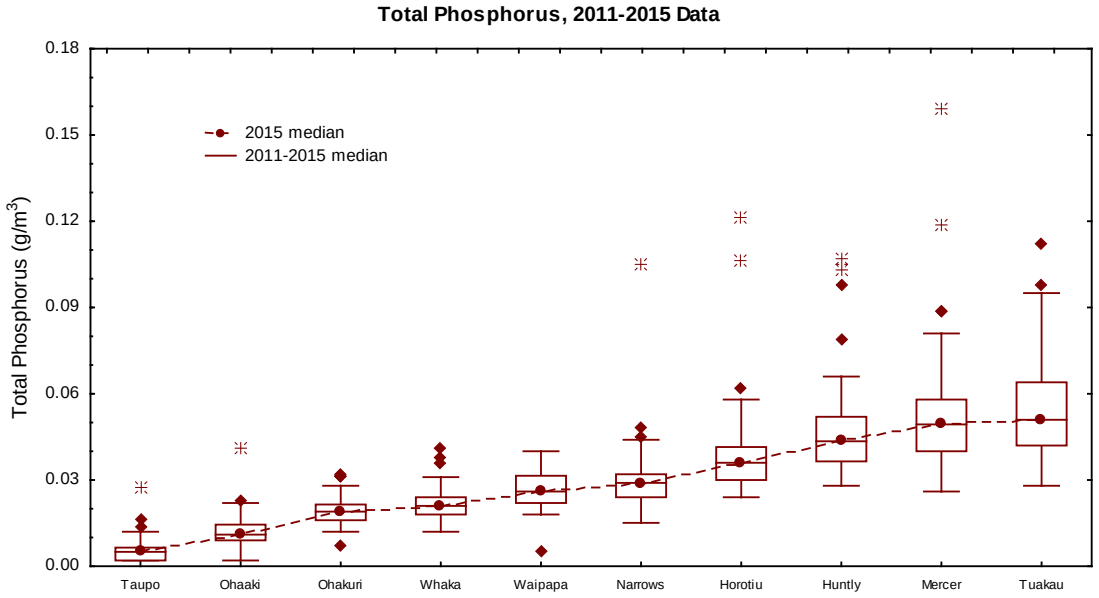
Black Disk, 2011-2015 Data

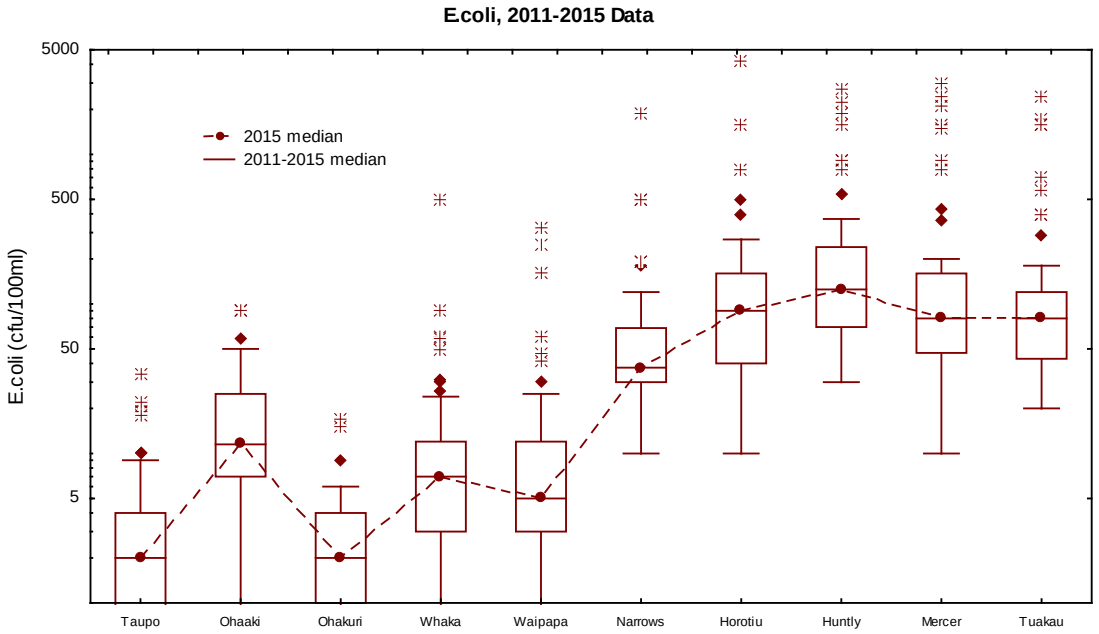


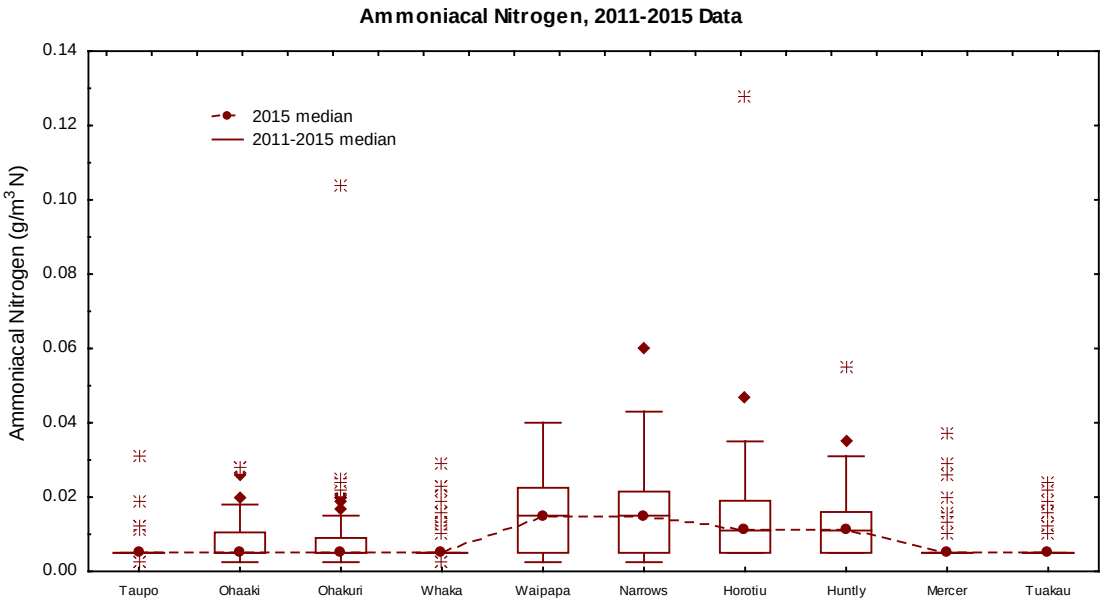
Colour, 2011-2015 Data

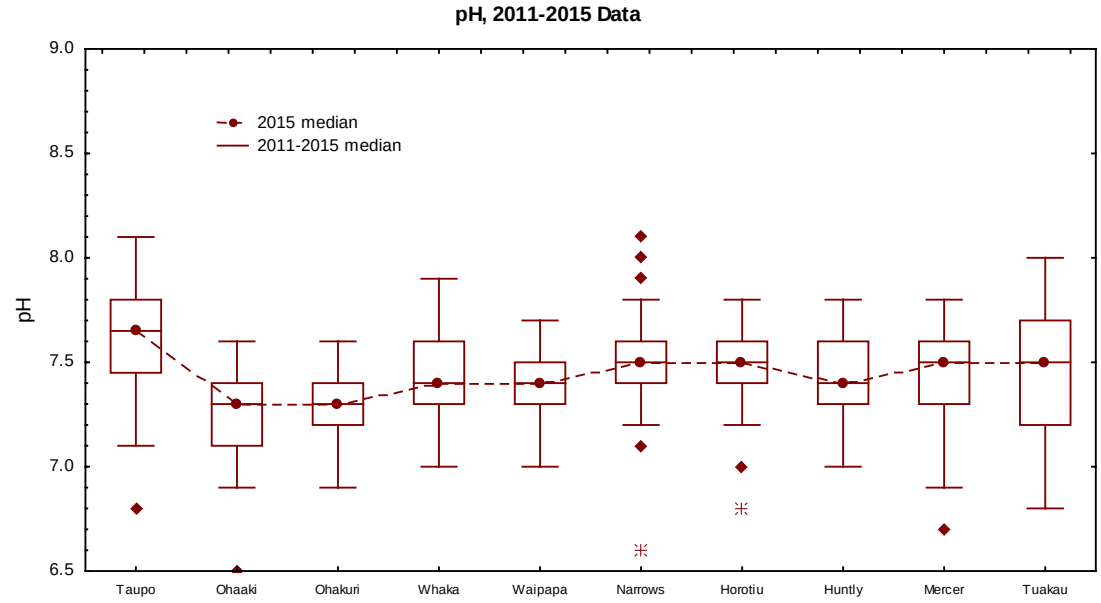


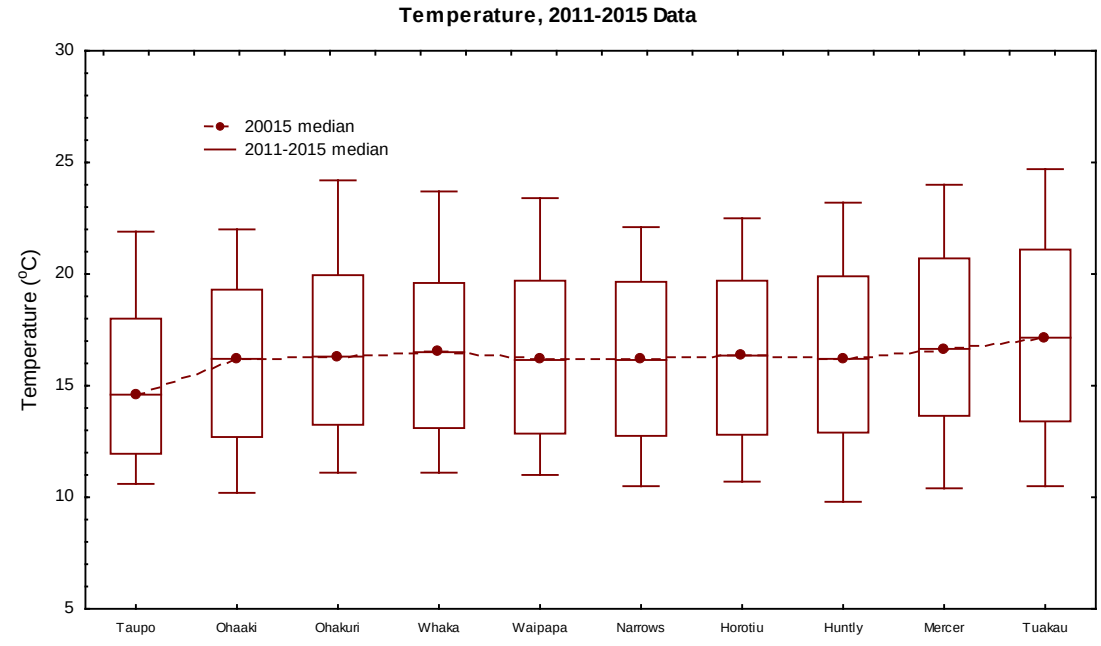

Total Nitrogen, 2011-2015 Data
2015 median
2011-2015 median
Total Nitrogen (g/m3 N)
2.0
1.8
1.6
1.4
1.2
1.0
0.8
0.6
0.4
0.2
0.0
Taupo
Ohaaki
Ohakuri
Whaka
Waipapa
Narrows
Horotiu
Huntly
Mercer
Tuakau

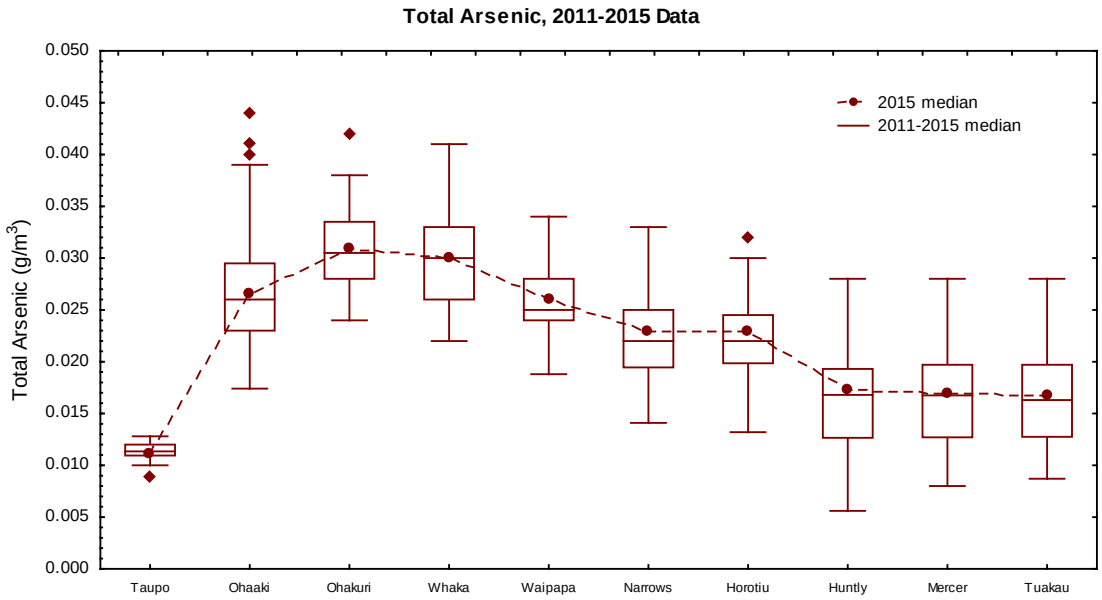

Total Phosphorus, 2011-2015 Data
2015 median
2011-2015 median
Total Phosphorus (g/m3)
0.18
0.15
0.12
0.09
0.06
0.03
0.00
Taupo
Ohaaki
Ohakuri
Whaka
Waipapa
Narrows
Horotiu
Huntly
Mercer
Tuakau

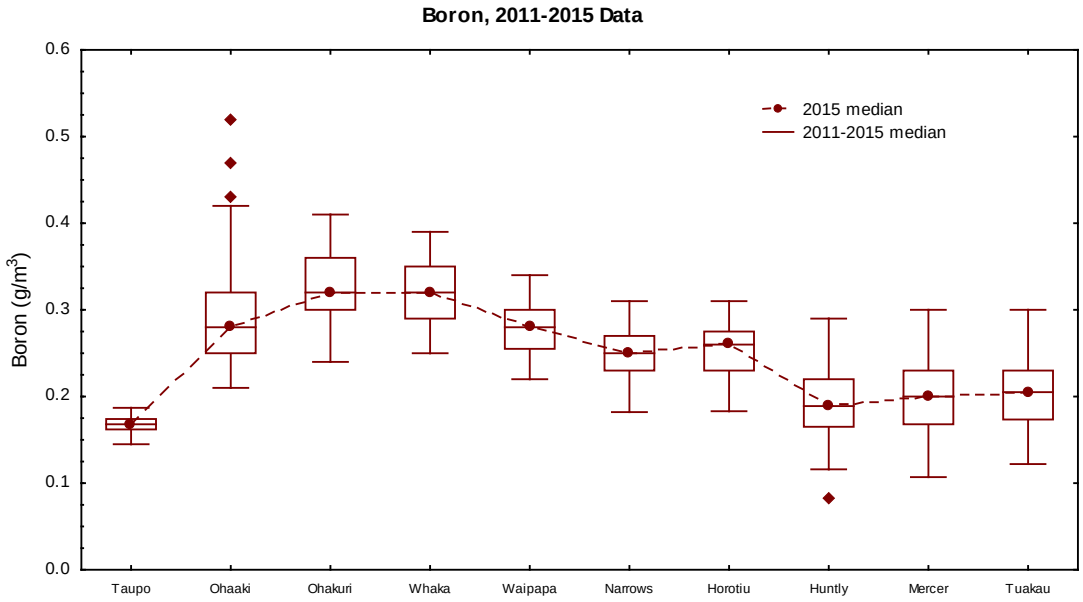

E.coli, 2011-2015 Data
2015 median
2011-2015 median
E.coli (cfu/100ml)
5000
500
50
5
Taupo
Ohaaki
Ohakuri
Whaka
Waipapa
Narrows
Horotiu
Huntly
Mercer
Tuakau


Ammoniacal Nitrogen, 2011-2015 Data
2015 median
2011-2015 median
Ammoniacal Nitrogen (g/m3 N)
0.14
0.12
0.10
0.08
0.06
0.04
0.02
0.00
Taupo
Ohaaki
Ohakuri
Whaka
Waipapa
Narrows
Horotiu
Huntly
Mercer
Tuakau


pH, 2011-2015 Data
2015 median
2011-2015 median
pH
9.0
8.5
8.0
7.5
7.0
6.5
Taupo
Ohaaki
Ohakuri
Whaka
Waipapa
Narrows
Horotiu
Huntly
Mercer
Tuakau


Temperature, 2011-2015 Data
20015 median
2011-2015 median
Temperature (°C)
30
25
20
15
10
5
Taupo
Ohaaki
Ohakuri
Whaka
Waipapa
Narrows
Horotiu
Huntly
Mercer
Tuakau


Total Arsenic, 2011-2015 Data
Total Arsenic (g/m3)
0.050
0.045
0.040
0.035
0.030
0.025
0.020
0.015
0.010
0.005
0.000
2015 median
2011-2015 median
Taupo
Ohaaki
Ohakuri
Whaka
Waipapa
Narrows
Horotiu
Huntly
Mercer
Tuakau


Boron, 2011-2015 Data
Boron (g/m3)
0.6
0.5
0.4
0.3
0.2
0.1
0.0
2015 median
2011-2015 median
Taupo
Ohaaki
Ohakuri
Whaka
Waipapa
Narrows
Horotiu
Huntly
Mercer
Tuakau

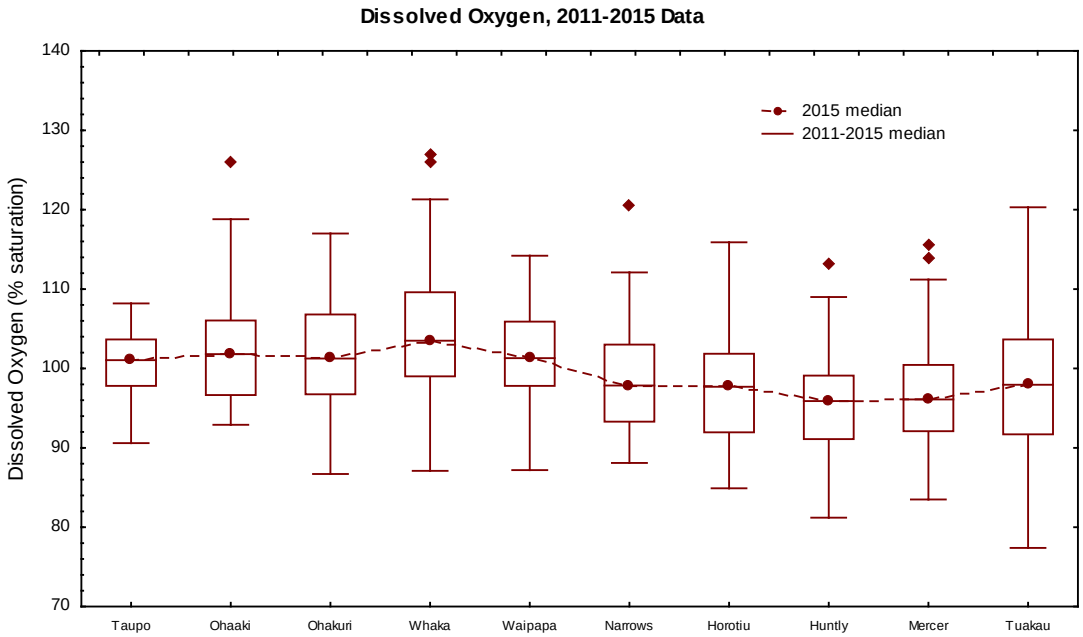

Dissolved Oxygen, 2011-2015 Data
Dissolved Oxygen (% saturation)
140
130
120
110
100
90
80
70
2015 median
2011-2015 median
Taupo
Ohaaki
Ohakuri
Whaka
Waipapa
Narrows
Horotiu
Huntly
Mercer
Tuakau

Table 3: Number of samples (year 2015) complying with the 'satisfactory' water quality guidelines and standards. n = 12 (except * where n = 11).

	ECOLOGICAL HEALTH							HUMAN USES					
								Recreation			water supply	drinking water	
Location	DO	pH	Turb	NH_4N	Temp	TP	TN	Bk[1] Disk	E coli	Median E coli	CHL*a*	As	B
Taupo Gates	12	12	12	12	5	12	12	-	12	Y	12	0	12
Ohaaki Bridge	12	12	12	12	4	12	12	12/12	12	Y	12	0	12
Ohakuri Tailrace Br	12	12	12	12	6	12	12	12/12	12	Y	12	0	12
Whakamaru Tailrace	12	12	12	12	6	12	12	*11/11	12	Y	11	0	12
Waipapa Tailrace	12	12	12	12	7	12	12	12/12	12	Y	12	0	12
Hamilton – Narrows	12	12	11	12	7	10	7	8/11	11	Y	10	0	12
Horotiu Bridge	12	12	10	12	5	9	6	7/11	11	Y	11	0	12
Huntly – Tainui Br	12	12	5	12	5	3	4	3/11	10	N	11	3	12
Mercer Bridge	12	12	3	12	4	3	4	-	11	Y	10	3	12
Tuakau Bridge	12	12	3	12	4	4	5	0/11	11	Y	9	3	12

[1]samples complying with the baseflow water clarity guideline from the number of samples measured when flow was **below the upper decile of all flows**

Table 4: Number of samples (year 2015) complying with the 'excellent' water quality guidelines and standards. n = 12 (except * where n = 11).

	ECOLOGICAL HEALTH							HUMAN USES					
								Recreation			water supply	Drinking water	
Location	DO	pH	Turb	NH_4N	Temp	TP	TN	Bk[1] Disk	E coli	Median E coli	CHL*a*	As	B
Taupo Gates	12	12	12	12	2	11	12	-	12	Y	12	n/a	n/a
Ohaaki Bridge	12	12	12	12	2	3	3	8/12	11	Y	12	n/a	n/a
Ohakuri Tailrace Br	11	12	12	12	2	0	0	2/12	12	Y	7	n/a	n/a
Whakamaru Tailrace	12	12	12	12	1	0	0	0/ 11 *	12	Y	4	n/a	n/a
Waipapa Tailrace	12	12	12	12	1	0	0	0/12	11	Y	5	n/a	n/a
Hamilton – Narrows	11	11	7	12	2	0	0	0/11	7	N	5	n/a	n/a
Horotiu Bridge	9	12	4	12	1	0	0	0/11	3	N	6	n/a	n/a
Huntly – Tainui Br	8	12	0	12	1	0	0	0/11	1	N	5	n/a	n/a
Mercer Bridge	9	11	0	12	1	0	0	-	4	N	1	n/a	n/a
Tuakau Bridge	9	11	0	12	1	0	0	0/11	6	N	1	n/a	n/a

[1]samples complying with the baseflow water clarity guideline from the number of samples measured when flow was **below the upper decile of all flows**

DATE dd/mm/yy	TIME* hh:mm	FLOW m^3/s	BDISK m	COLOR units	COND mS/m	pH units	TEMP 'C	DO g/m^3	PCDO %Sat	BOD5 g/m^3	TURB NTU	TDS g/m^3	NNN g/m^3	NO3-N g/m^3	NH4-N g/m^3
Satisfactory Water Quality Guideline/Standard			>1.6	-	-	6.5-9	<12 (May-Sep) <20 (Oct-Apr)		>80	-	<5	-	-	-	<0.88
1131-127		UD = 263 m^3/s	*(Flows from "Reids Farm")*												
Waikato River at Taupo Control Gates															
6/01/2015	09:10	112	-	-	12.1	7.5	**20.5**	9.4	107.8	< 0.4	0.25	86	< 0.002	< 0.002	< 0.01
3/02/2015	08:30	200	-	-	12.1	7.8	**21.9**	8.9	106.0	0.9	0.39	87	< 0.002	< 0.002	< 0.01
3/03/2015	08:44	120	-	-	12.1	7.9	**20.0**	9.0	102.7	0.6	0.58	98	< 0.002	< 0.002	< 0.01
7/04/2015	09:56	93	-	-	12.0	7.8	18.4	8.9	97.7	0.9	0.31	87	< 0.002	< 0.002	< 0.01
5/05/2015	09:38	100	-	-	12.1	7.3	**15.2**	9.7	99.2	0.8	0.30	71	< 0.002	< 0.002	< 0.01
2/06/2015	09:51	204	-	-	12.2	7.2	**13.6**	9.7	97.8	0.5	0.28	90	< 0.002	< 0.002	< 0.01
7/07/2015	09:15	190	-	-	12.0	7.1	**12.1**	10.0	97.2	1.1	1.13	94	< 0.002	< 0.002	< 0.01
4/08/2015	09:50	103	-	-	12.0	8.0	**12.0**	9.2	98.0	0.6	0.70	78	< 0.002	< 0.002	< 0.01
1/09/2015	10:05	200	-	-	11.9	7.1	10.9	10.0	94.2	0.6	0.33	84	< 0.002	< 0.002	< 0.01
6/10/2015	08:30	249	-	-	12.1	7.6	12.1	10.3	98.4	0.7	0.34	90	< 0.002	< 0.002	< 0.01
3/11/2015	08:55	201	-	-	12.1	7.8	14.2	10.4	105.6	0.9	1.92	89	< 0.002	< 0.002	< 0.01
1/12/2015	08:16	204	-	-	12.1	7.8	16.5	10.3	108.2	0.7	0.22	85	< 0.002	< 0.002	< 0.01
1131-105		UD = 255 m^3/s	*(Flows from Ohaaki Bridge Recorder, +/- 20%)*												
Waikato River at Ohaaki Br															
6/01/2015	09:59	110	6.2	55.0	16.1	7.3	**21.1**	8.6	98.9	0.4	0.47	109	0.019	0.015	< 0.01
3/02/2015	09:38	101	7.5	55.0	15.4	7.5	**22.0**	8.2	97.9	0.9	0.52	100	0.036	0.034	< 0.01
3/03/2015	09:25	88	3.0	55.0	14.9	7.1	**21.1**	8.3	96.0	0.8	0.76	113	0.018	0.017	< 0.01
7/04/2015	11:13	88	3.5	-	16.6	7.4	**20.4**	8.4	95.2	0.9	0.52	120	0.042	0.041	< 0.01
5/05/2015	10:36	96	4.7	55.0	15.9	7.1	**16.3**	9.7	100.1	1.0	0.44	113	0.042	0.042	< 0.01
2/06/2015	10:30	97	5.8	47.5	16.2	7.0	**15.3**	9.4	97.1	1.0	0.54	113	0.049	0.055	0.03
7/07/2015	10:10	206	3.1	52.5	13.6	7.1	**12.2**	10.9	106.1	1.0	0.98	99	0.019	0.020	< 0.01
4/08/2015	10:20	135	4.2	47.5	14.3	7.5	**12.4**	9.8	94.8	0.6	1.91	95	0.039	0.039	0.01
1/09/2015	10:50	208	4.0	50.0	13.8	7.1	11.4	10.9	102.3	1.0	0.81	102	0.022	0.023	0.01
6/10/2015	09:30	184	5.5	52.5	15.0	7.4	13.7	12.0	118.8	0.9	0.49	109	0.022	0.021	< 0.01
3/11/2015	09:34	129	5.1	47.5	14.2	7.4	15.1	10.5	107.5	0.9	0.78	104	0.031	0.031	< 0.01
1/12/2015	08:55	215	3.3	47.5	12.9	7.6	16.9	10.8	113.1	0.8	0.53	95	0.020	0.020	< 0.01
1131-107		UD = 322 m^3/s	*(Flows from Ohakuri Dam - Total)*												
Waikato River at Ohakuri Tailrace Br															
6/01/2015	10:50	110	2.0	45.0	18.1	7.2	**22.4**	9.3	109.6	1.4	1.13	126	0.004	0.003	< 0.01
3/02/2015	10:06	103	3.3	45.0	17.2	7.4	**23.1**	8.0	96.1	1.1	0.71	114	0.041	0.041	< 0.01
3/03/2015	10:15	89	2.8	50.0	16.5	7.6	**21.4**	8.8	102.1	1.2	1.18	122	0.014	0.014	< 0.01
7/04/2015	12:03	88	2.2	40.0	17.4	7.4	**20.1**	8.5	95.1	0.8	0.66	118	0.050	0.049	< 0.01
5/05/2015	11:39	95	4.9	47.5	16.8	7.3	**16.4**	8.6	89.0	0.7	0.57	121	0.096	0.094	0.02
2/06/2015	11:30	106	4.0	40.0	16.8	7.1	**13.9**	9.5	95.6	0.6	0.67	118	0.126	0.124	0.01
7/07/2015	11:00	207	3.2	52.5	16.0	7.1	11.8	10.4	99.9	1.0	0.96	123	0.096	0.100	< 0.01
4/08/2015	11:10	133	3.6	37.5	15.5	7.5	11.8	9.6	91.5	0.8	0.88	111	0.098	0.098	< 0.01
1/09/2015	11:15	208	2.9	40.0	15.2	7.0	11.9	10.4	98.8	0.9	0.90	114	0.081	0.082	< 0.01
6/10/2015	10:20	186	2.4	42.5	16.1	7.4	15.2	10.3	105.0	2.1	1.21	127	0.055	0.053	< 0.01
3/11/2015	10:19	132	1.8	35.0	16.4	7.4	15.7	10.8	111.3	1.3	1.12	121	0.034	0.031	< 0.01
1/12/2015	09:54	213	3.2	40.0	16.2	7.3	18.3	10.6	114.6	1.1	0.92	122	0.023	0.027	< 0.01
1131-147		UD = 301 m^3/s	*(Flows from Whakamaru Dam - Total)*												
Waikato River at Whakamaru Tailrace															
6/01/2015	11:40	110	2.8	42.5	17.7	7.4	**21.9**	9.8	113.6	1.8	1.4	131	0.037	0.035	< 0.01
3/02/2015	11:05	108	2.7	42.0	17.1	7.6	**23.7**	8.5	103.5	1.4	0.8	124	0.045	0.043	< 0.01
3/03/2015	11:15	90	-	-	16.3	7.3	**21.6**	9.4	108.4	1.1	0.8	122	0.031	0.030	< 0.01
7/04/2015	13:02	87	2.4	37.5	16.4	7.5	19.6	9.2	101.3	1.0	1.1	123	0.041	0.039	< 0.01
5/05/2015	12:37	95	2.6	42.5	16.8	7.4	**16.0**	9.7	99.0	1.5	0.7	126	0.136	0.135	< 0.01
2/06/2015	12:12	112	2.4	37.5	17.0	7.2	**13.7**	9.8	97.6	0.5	0.6	123	0.173	0.184	< 0.01
7/07/2015	11:40	207	2.5	52.5	15.6	7.1	11.9	10.4	98.6	1.4	1.1	102	0.167	0.168	< 0.01
4/08/2015	11:45	131	2.7	37.5	15.9	7.4	11.5	10.0	93.5	1.1	1.3	109	0.147	0.145	< 0.01
1/09/2015	12:20	207	2.1	40.0	14.9	7.1	**12.0**	10.4	96.9	0.9	1.0	115	0.144	0.143	< 0.01
6/10/2015	10:50	188	2.5	35.0	15.7	7.3	14.3	10.7	105.9	1.1	1.2	118	0.109	0.108	< 0.01
3/11/2015	11:02	135	2.6	37.5	17.0	7.6	16.6	10.9	114.1	1.2	1.2	126	0.047	0.045	0.02
1/12/2015	10:32	212	3.1	37.5	16.7	7.4	18.7	10.0	108.1	1.0	0.9	125	0.061	0.060	0.02

Note: < = less than the value stated

UD = upper decile flow (long-term record 1996-2015 inclusive)

*New Zealand Standard Time

Underlined values don't comply with the "satisfactory" water quality Guidelines and Standards - Table 1

() black disk measurements taken in flows above upper decile values – don't assess for compliance

TKN g/m³	TN g/m³	DRP g/m³	TP g/m³	CL g/m³	AS g/m³	B g/m³	LI g/m³	A340F /cm	A440F /cm	ENT	FC	E coli	CHLA g/m³	DOC g/m³	TOC g/m³
										cfu/100mL					
-	<0.5	-	<0.04	-	<0.01	<0.3	-	-	-	<77	-	<550	<0.02		
< 0.05	0.03	< 0.004	< 0.004	8.0	**0.011**	0.17	0.040	< 0.002	< 0.002	2	12	10	< 0.003	1.2	0.8
0.08	0.08	< 0.004	< 0.004	7.6	**0.012**	0.17	0.040	< 0.002	< 0.002	11	9	9	< 0.003	1.2	1.3
0.07	0.07	< 0.004	0.016	7.8	**0.013**	0.18	0.041	< 0.002	< 0.002	3	3	3	< 0.003	1.0	1.2
< 0.05	0.03	< 0.004	0.005	8.1	**0.012**	0.18	0.040	< 0.002	< 0.002	20	5	4	< 0.003	0.9	0.8
< 0.05	0.03	< 0.004	< 0.004	7.9	**0.013**	0.17	0.043	< 0.002	< 0.002	< 1	< 1	< 1	< 0.003	0.8	1.2
< 0.05	0.03	< 0.004	< 0.004	7.9	**0.012**	0.16	0.039	< 0.002	< 0.002	7	4	3	< 0.003	0.8	1.0
0.06	0.06	< 0.004	0.004	8.1	**0.012**	0.17	0.040	< 0.002	< 0.002	8	4	4	< 0.003	1.1	0.9
0.05	0.05	< 0.004	0.006	8.3	**0.012**	0.18	0.042	< 0.002	< 0.002	2	< 1	< 1	< 0.003	0.7	0.9
0.06	0.06	< 0.004	< 0.004	8.1	**0.011**	0.18	0.041	0.002	< 0.002	1	< 1	< 1	< 0.003	1.0	0.8
< 0.05	0.03	< 0.004	< 0.004	8.1	**0.012**	0.17	0.042	< 0.002	< 0.002	< 1	< 1	< 1	< 0.003	0.6	0.6
0.08	0.08	0.004	0.005	7.9	**0.012**	0.16	0.040	< 0.002	< 0.002	< 1	2	2	< 0.003	0.8	1.0
0.07	0.07	< 0.004	< 0.004	8.2	**0.012**	0.17	0.041	< 0.002	< 0.002	5	9	9	< 0.003	1.0	1.2
0.05	0.07	0.006	0.009	17.7	**0.028**	**0.31**	0.097	0.003	< 0.002	2	10	6	< 0.003	0.8	0.8
0.09	0.13	0.007	0.010	14.7	**0.027**	**0.30**	0.087	0.004	< 0.002	19	8	5	< 0.003	1.0	0.9
0.10	0.12	0.006	0.012	14.1	**0.025**	**0.31**	0.078	0.004	< 0.002	17	12	10	< 0.003	0.9	0.8
0.08	0.12	0.010	0.010	19.0	**0.028**	**0.34**	0.103	0.003	< 0.002	14	7	7	< 0.003	0.6	0.8
0.07	0.11	0.006	0.011	16.9	**0.029**	**0.31**	0.095	0.003	< 0.002	8	11	9	< 0.003	0.6	0.7
0.07	0.12	0.013	0.016	16.3	**0.026**	0.29	0.084	0.003	< 0.002	7	11	9	< 0.003	0.8	0.8
0.06	0.08	0.004	0.008	12.8	**0.021**	0.23	0.064	< 0.002	< 0.002	50	19	17	< 0.003	0.7	0.7
0.07	0.11	0.006	0.010	12.7	**0.018**	0.26	0.072	0.003	< 0.002	1	9	9	< 0.003	0.6	1.0
0.11	0.13	0.007	0.010	12.9	**0.020**	0.25	0.070	0.002	< 0.002	4	6	3	< 0.003	1.1	1.2
< 0.05	0.05	0.005	0.010	15.7	**0.025**	0.28	0.089	0.002	< 0.002	2	6	3	< 0.003	0.5	0.8
0.10	0.13	0.010	0.011	12.8	**0.023**	0.23	0.069	0.002	< 0.002	2	11	8	< 0.003	0.8	0.9
0.10	0.12	0.005	0.008	10.7	**0.017**	0.21	0.055	0.003	< 0.002	28	90	90	< 0.003	1.1	1.1
0.10	0.10	< 0.004	0.017	21.0	**0.035**	**0.36**	0.122	0.006	< 0.002	2	3	3	0.009	0.9	2.1
0.22	0.26	0.017	0.022	18.0	**0.038**	**0.34**	0.117	0.006	< 0.002	6	4	4	0.004	1.3	2.0
0.12	0.13	0.004	0.018	16.6	**0.031**	**0.32**	0.099	0.005	< 0.002	< 1	1	1	0.006	1.3	1.6
0.10	0.15	0.008	0.019	19.7	**0.029**	**0.34**	0.112	0.005	< 0.002	< 1	3	3	< 0.003	0.7	0.9
0.10	0.20	0.012	0.019	18.7	**0.032**	**0.32**	0.110	0.005	< 0.002	2	1	< 1	< 0.003	0.6	0.8
0.08	0.21	0.012	0.022	18.1	**0.028**	0.30	0.097	0.006	< 0.002	3	4	4	< 0.003	0.9	0.9
0.08	0.18	0.013	0.014	17.8	**0.027**	**0.31**	0.095	0.004	< 0.002	3	2	2	< 0.003	0.9	0.9
0.10	0.20	0.011	0.014	16.3	**0.024**	0.30	0.095	0.004	< 0.002	4	2	2	0.004	0.6	1.0
0.11	0.19	0.008	0.017	16.2	**0.025**	0.30	0.087	0.004	< 0.002	2	2	1	< 0.003	1.3	0.9
0.07	0.13	0.005	0.016	17.0	**0.028**	0.30	0.098	0.005	< 0.002	< 1	2	2	0.012	0.7	0.9
0.12	0.15	0.005	0.015	17.4	**0.030**	0.29	0.095	0.005	< 0.002	1	2	2	0.013	0.6	0.9
0.13	0.15	0.009	0.015	18.2	**0.031**	**0.31**	0.101	0.006	< 0.002	3	4	4	0.003	1.0	1.3
0.17	0.21	0.006	0.022	20.0	**0.032**	**0.33**	0.117	0.008	< 0.002	9	11	9	0.012	1.6	1.5
0.13	0.18	0.013	0.022	18.3	**0.041**	0.33	0.111	0.007	< 0.002	34	39	31	0.005	1.2	1.3
0.13	0.16	0.005	0.018	16.9	**0.031**	**0.31**	0.102	0.006	< 0.002	8	3	3	0.008	1.4	1.9
0.13	0.17	0.008	0.019	17.8	**0.027**	**0.31**	0.104	0.005	< 0.002	32	1	1	< 0.003	1.2	1.3
0.09	0.23	0.010	0.020	19.2	**0.031**	**0.32**	0.110	0.008	0.003	1	1	1	0.007	0.8	0.9
0.08	0.25	0.021	0.023	18.9	**0.028**	**0.31**	0.107	0.008	< 0.002	5	2	2	0.003	1.2	1.1
0.15	0.32	0.015	0.018	16.9	**0.025**	**0.30**	0.095	0.012	0.002	17	8	8	0.005	1.8	1.7
0.12	0.27	0.009	0.016	17.4	**0.024**	0.29	0.099	0.005	< 0.002	1	< 1	< 1	0.008	1.6	1.4
0.14	0.28	0.008	0.019	15.1	**0.022**	0.26	0.085	0.007	< 0.002	2	14	13	0.005	1.2	1.2
0.09	0.20	0.004	0.018	16.4	**0.026**	0.27	0.095	0.007	< 0.002	3	16	14	**0.029**	0.8	1.3
0.18	0.23	0.006	0.014	19.2	**0.030**	**0.31**	0.107	0.007	< 0.002	< 1	3	2	0.003	1.3	1.3
0.17	0.23	0.011	0.026	19.6	**0.029**	**0.32**	0.111	0.008	< 0.002	2	9	8	0.004	1.0	1.5

Note: < = less than the value stated

UD = upper decile flow (long-term record 1996-2015 inclusive)

*New Zealand Standard Time

Underlined values don't comply with the "satisfactory" water quality Guidelines and Standards - Table 1

DATE dd/mm/yy	TIME* hh:mm	FLOW m^3/s	BDISK m	COLOR units	COND mS/m	PH units	TEMP 'C	DO g/m^3	PCDO %Sat	BOD5 g/m^3	TURB NTU	TDS g/m^3	NNN g/m^3	NO3-N g/m^3	NH4-N g/m^3
Satisfactory Water Quality Guideline/Standard			>1.6	-	-	6.5-9	<12 (May-Sep) <20 (Oct-Apr)		>80	-	<5	-	-	-	<0.88
1131-143		UD = 367 m^3/s	*(Flows from Waipapa Dam - Total)*												
Waikato River at Waipapa Tailrace															
6/01/2015	12:56	111	2.6	37.5	17.6	7.3	**21.2**	8.7	98.3	0.9	1.4	131	0.128	0.125	< 0.01
3/02/2015	12:25	119	2.9	40.0	17.2	7.4	**23.4**	7.1	94.7	1.5	0.8	119	0.103	0.100	0.03
3/03/2015	11:37	90	2.0	32.5	17.5	7.4	**21.4**	8.4	95.5	1.0	1.1	144	0.120	0.115	0.02
7/04/2015	13:40	88	3.5	37.5	16.8	7.3	19.3	8.6	93.7	1.1	1.1	122	0.149	0.145	0.03
5/05/2015	13:16	96	2.9	42.5	16.6	7.1	**16.1**	9.2	92.4	1.0	1.2	138	0.250	0.240	0.02
2/06/2015	12:45	117	3.1	37.5	16.8	7.2	**13.6**	9.7	95.4	0.5	0.9	134	0.300	0.300	< 0.01
7/07/2015	12:15	207	2.1	47.5	15.4	7.1	11.6	10.4	97.1	0.7	1.6	108	0.230	0.230	0.01
4/08/2015	12:15	130	2.7	40.0	14.5	7.3	11.3	10.0	92.2	0.9	1.4	108	0.250	0.250	< 0.01
1/09/2015	13:00	207	2.3	40.0	14.5	7.0	11.9	10.4	97.5	0.8	1.4	114	0.193	0.196	< 0.01
6/10/2015	11:20	189	1.9	30.0	15.6	7.5	14.0	10.8	105.0	1.0	1.2	129	0.179	0.177	< 0.01
3/11/2015	11:48	139	2.2	37.5	16.2	7.5	16.3	10.4	107.0	1.0	1.2	117	0.088	0.086	0.02
1/12/2015	11:00	212	2.1	35.0	15.9	7.4	18.1	10.1	106.2	1.4	1.7	122	0.107	0.105	0.02
1131-328		UD = 364 m^3/s	*(Flows from Karapiro Dam - Total)*												
Waikato River at Narrows Boat Ramp															
8/01/2015	07:51	169	2.5	-	16.0	7.4	**20.3**	8.8	96.8	1.3	1.8	132	0.167	0.165	< 0.01
4/02/2015	07:22	150	3.1	37.5	17.1	7.8	**21.4**	8.6	97.8	1.7	1.1	134	0.033	0.032	< 0.01
4/03/2015	07:30	149	2.1	37.5	16.6	7.4	**21.0**	8.4	93.9	1.4	1.6	129	0.078	0.075	< 0.01
8/04/2015	08:33	159	2.6	40.0	16.6	7.4	19.5	8.3	89.6	0.6	1.2	123	0.160	0.157	0.02
6/05/2015	09:05	153	2.1	40.0	16.6	7.3	**15.9**	9.7	96.3	1.1	1.8	127	0.250	0.250	< 0.01
3/06/2015	08:50	214	**1.6**	37.5	15.9	7.4	**13.1**	10.3	92.6	0.6	1.7	124	0.390	0.390	< 0.01
8/07/2015	09:20	349	**1.3**	35.0	15.1	7.4	11.1	10.9	99.4	1.0	4.9	115	0.440	0.440	0.01
5/08/2015	08:40	239	2.4	37.5	14.1	6.6	10.5	10.1	90.5	1.1	1.7	95	0.410	0.390	< 0.01
2/09/2015	08:30	492	**(0.6)**	22.5	13.5	7.9	11.3	10.9	99.3	1.5	**13.7**	111	0.440	0.420	0.02
7/10/2015	07:55	212	**1.5**	32.5	14.4	7.6	14.4	10.4	102.5	1.5	2.7	120	0.340	0.330	< 0.01
5/11/2015	09:00	236	1.8	35.0	15.6	7.3	15.8	9.2	94.2	0.9	2.5	127	0.220	0.220	0.06
1/12/2015	07:55	247	2.2	35.0	16.3	7.6	19.0	9.9	105.3	1.2	2.7	128	0.290	0.290	0.02
1131-69		UD = 366 m^3/s	*(Flows from Hamilton - Bridge Street Bridge)*												
Waikato River at Horotiu Br															
8/01/2015	08:55	169	1.8	37.5	15.5	7.7	**21.3**	8.9	99.7	2.4	2.5	129	0.082	0.081	< 0.01
4/02/2015	08:50	150	1.7	40.0	17.6	7.6	**22.5**	7.3	84.9	1.4	1.4	138	0.099	0.098	0.02
4/03/2015	08:21	150	1.7	35.0	16.9	7.5	**21.5**	8.0	90.1	1.1	1.6	134	0.119	0.117	< 0.01
8/04/2015	09:10	157	1.9	37.5	16.8	7.4	19.5	8.1	86.8	1.0	1.8	143	0.186	0.183	0.02
6/05/2015	15:22	150	**1.5**	35.0	16.8	7.5	**17.9**	9.9	101.9	1.0	1.5	130	0.300	0.300	< 0.01
3/06/2015	09:56	213	1.7	35.0	15.8	7.2	**13.2**	10.1	90.3	0.9	2.6	128	0.420	0.420	< 0.01
8/07/2015	10:00	350	**1.0**	25.0	15.5	7.4	11.3	10.7	98.6	1.0	**6.5**	115	0.450	0.450	< 0.01
5/08/2015	09:27	240	2.2	35.0	14.0	7.0	10.8	9.8	88.3	1.4	2.2	102	0.400	0.390	< 0.01
2/09/2015	09:15	491	**(0.5)**	25.0	13.0	7.7	**12.1**	10.0	93.5	1.6	**33.0**	110	0.490	0.480	0.03
7/10/2015	08:32	208	**1.2**	35.0	14.4	7.7	13.7	10.7	103.1	1.4	2.8	118	0.330	0.330	< 0.01
5/11/2015	09:50	237	**1.4**	35.0	15.8	7.4	16.0	9.0	92.9	0.9	3.1	129	0.260	0.250	0.05
1/12/2015	09:10	247	1.7	35.0	16.0	7.5	18.9	9.5	101.1	1.2	2.1	119	0.250	0.240	< 0.01
1131-77		UD = 548 m^3/s	*(Flows from Huntly Power Station Recorder)*												
Waikato River at Huntly-Tainui Br															
8/01/2015	09:55	235	2.2	37.5	15.1	7.6	**22.4**	8.3	102.2	2.2	3.1	125	0.115	0.114	< 0.01
4/02/2015	09:56	197	1.7	37.5	16.8	7.6	**23.2**	7.6	89.1	2.1	3.0	126	0.141	0.138	0.01
4/03/2015	09:00	176	**1.2**	32.5	16.8	7.7	**21.6**	8.5	96.0	1.2	2.6	133	0.135	0.133	< 0.01
8/04/2015	10:00	180	1.8	35.0	16.8	7.4	**20.0**	8.6	94.1	0.9	2.2	122	0.230	0.220	< 0.01
6/05/2015	11:26	203	**0.9**	37.5	16.0	7.4	**16.5**	9.4	95.2	1.2	3.6	122	0.410	0.410	< 0.01
3/06/2015	10:30	326	**1.0**	32.5	14.8	7.3	**12.9**	10.0	89.8	0.9	**6.9**	115	0.680	0.670	0.01
8/07/2015	10:35	452	**0.8**	27.5	13.6	7.4	11.2	10.2	93.2	1.0	**11.2**	102	0.620	0.610	0.01
5/08/2015	10:00	354	**1.1**	30.0	13.3	7.6	11.3	9.4	85.8	1.3	**6.9**	99	0.700	0.690	0.02
2/09/2015	09:50	822	**(0.3)**	25.0	12.0	7.4	**12.6**	9.4	88.8	1.8	**48.0**	137	0.670	0.670	0.03
7/10/2015	08:59	383	**0.8**	30.0	13.3	7.4	14.3	10.1	99.1	1.2	**8.4**	107	0.650	0.650	< 0.01
5/11/2015	10:25	291	**1.1**	32.5	14.9	7.4	16.2	9.1	94.9	0.9	**6.4**	125	0.400	0.390	0.03
1/12/2015	10:05	299	**1.0**	35.0	14.6	7.6	19.3	9.5	101.8	1.0	**5.3**	111	0.330	0.320	< 0.01

Note: < = less than the value stated

UD = upper decile flow (long-term record 1996-2015 inclusive)

*New Zealand Standard Time

Underlined values don't comply with the "satisfactory" water quality Guidelines and Standards - Table 1

() black disk measurements taken in flows above upper decile values – don't assess for compliance

TKN g/m³	TN g/m³	DRP g/m³	TP g/m³	CL g/m³	AS g/m³	B g/m³	LI g/m³	A340F /cm	A440F /cm	ENT cfu/100mL	FC	E coli	CHLA g/m³	DOC g/m³	TOC g/m³
-	<0.5	-	<0.04	-	<0.01	<0.3	-	-	-	<77	-	<550	<0.02		
0.16	0.29	0.018	0.036	19.2	**0.025**	0.29	0.096	0.016	0.004	5	5	4	0.009	1.7	1.7
0.15	0.25	0.019	0.030	18.4	**0.034**	**0.32**	0.107	0.010	0.002	18	22	22	0.007	1.6	1.9
0.23	0.35	0.020	0.032	19.3	**0.031**	0.30	0.102	0.012	0.002	9	7	5	0.008	1.5	2.0
0.14	0.29	0.018	0.031	18.5	**0.024**	0.28	0.092	0.010	0.002	1	2	2	< 0.003	1.4	2.0
0.13	0.38	0.020	0.031	18.0	**0.026**	0.27	0.093	0.013	0.003	1	8	7	0.004	1.3	1.3
0.10	0.40	0.023	0.028	19.2	**0.025**	0.28	0.099	0.012	0.002	6	8	6	< 0.003	1.0	1.2
0.12	0.35	0.017	0.021	16.3	**0.022**	0.27	0.088	0.008	< 0.002	23	350	320	0.004	1.0	1.2
0.11	0.36	0.012	0.020	15.3	**0.019**	0.24	0.080	0.008	< 0.002	< 1	3	3	0.007	0.9	1.2
0.14	0.33	0.013	0.020	14.2	**0.019**	0.24	0.072	0.008	< 0.002	1	6	5	0.004	1.2	1.1
0.14	0.32	0.006	0.020	15.7	**0.021**	0.25	0.085	0.010	< 0.002	< 1	1	1	0.017	1.2	1.1
0.18	0.27	0.006	0.018	17.5	**0.027**	0.26	0.093	0.009	< 0.002	< 1	3	3	0.007	1.1	1.2
0.22	0.33	0.015	0.026	18.3	**0.027**	0.28	0.098	0.010	0.002	< 1	3	3	0.009	1.1	1.5
0.16	0.33	0.012	0.026	15.6	**0.020**	0.22	0.078	0.012	< 0.002	**140**	240	120	< 0.003	1.4	1.5
0.29	0.32	0.013	0.021	18.6	**0.027**	0.28	0.097	0.013	0.002	31	37	29	**0.083**	1.4	1.3
0.20	0.28	0.005	0.029	17.9	**0.033**	0.29	0.104	0.010	0.002	21	37	34	0.015	1.6	2.5
0.14	0.30	0.016	0.030	17.7	**0.023**	0.26	0.089	0.010	0.002	38	30	30	< 0.003	1.6	1.6
0.14	0.39	0.019	0.032	17.8	**0.024**	0.26	0.099	0.011	0.002	17	40	30	0.007	1.2	1.3
0.12	**0.51**	0.022	0.036	17.4	**0.021**	0.27	0.093	0.017	0.003	67	96	69	0.005	1.4	1.7
0.19	**0.63**	0.026	**0.043**	16.1	**0.017**	0.23	0.076	0.021	0.003	**310**	800	500	< 0.003	1.6	2.0
0.10	**0.51**	0.020	0.024	12.8	**0.014**	0.20	0.064	0.014	0.003	**99**	48	40	0.005	1.2	1.2
0.25	**0.69**	0.022	**0.048**	13.1	**0.015**	0.20	0.063	0.020	0.004	520	2000	**1900**	0.006	1.8	2.1
0.20	**0.54**	0.008	0.024	13.4	**0.016**	0.18	0.058	0.015	0.003	33	90	60	**0.021**	1.3	1.7
0.19	0.41	0.019	0.030	16.1	**0.022**	0.23	0.079	0.012	0.003	37	53	43	< 0.003	1.7	1.7
0.18	0.47	0.019	0.033	16.0	**0.021**	0.24	0.081	0.016	0.003	56	50	48	0.004	1.6	2.2
0.18	0.26	0.014	0.036	15.9	**0.022**	0.25	0.084	0.011	< 0.002	57	80	70	0.004	1.3	2.1
0.16	0.26	0.021	0.031	18.9	**0.026**	0.29	0.099	0.011	< 0.002	32	48	34	0.004	1.5	1.4
0.20	0.32	0.010	0.031	17.6	**0.032**	0.27	0.102	0.011	0.002	58	60	40	0.014	1.6	2.0
0.18	0.37	0.022	0.030	17.9	**0.024**	0.26	0.092	0.010	0.002	**150**	340	270	0.004	1.6	1.6
0.21	**0.51**	0.024	0.036	18.3	**0.024**	0.28	0.098	0.013	0.003	34	110	90	0.008	1.6	1.9
0.14	**0.56**	0.024	**0.042**	17.5	**0.020**	0.26	0.085	0.017	0.003	**140**	220	180	0.006	1.5	1.7
0.22	**0.67**	0.034	**0.058**	16.6	**0.017**	0.21	0.072	0.023	0.004	**410**	450	400	< 0.003	1.7	2.4
0.14	**0.54**	0.021	0.030	12.8	**0.015**	0.21	0.064	0.012	0.002	22	45	43	0.004	1.0	1.6
0.43	**0.92**	0.033	**0.106**	12.5	**0.013**	0.18	0.059	0.035	0.008	**2100**	4200	**4200**	0.006	2.9	3.7
0.27	**0.60**	0.007	0.033	13.5	**0.016**	0.19	0.061	0.014	0.003	26	60	60	**0.024**	1.4	1.9
0.19	0.45	0.022	0.039	16.1	**0.021**	0.23	0.078	0.012	0.003	47	120	100	0.004	1.4	1.5
0.21	0.46	0.020	0.035	16.2	**0.020**	0.25	0.083	0.013	0.002	60	90	90	0.006	1.5	1.4
0.27	0.39	0.016	0.036	15.5	**0.020**	0.21	0.070	0.017	0.003	35	90	70	0.004	1.7	2.3
0.22	0.36	0.022	**0.041**	17.5	**0.019**	-	-	0.019	0.003	28	190	160	< 0.003	1.6	1.8
0.29	0.43	0.013	**0.042**	17.6	**0.028**	0.26	0.090	0.013	0.003	70	120	120	0.017	1.7	1.8
0.18	0.41	0.026	0.034	17.8	**0.021**	0.25	0.085	0.013	0.003	30	100	90	0.005	1.7	1.6
0.21	**0.62**	0.025	**0.044**	17.0	**0.017**	0.21	0.071	0.018	0.003	36	120	120	0.007	1.8	1.9
0.18	**0.86**	0.024	**0.049**	15.5	**0.011**	0.17	0.052	0.024	0.004	**220**	260	170	0.006	1.9	2.2
0.22	**0.84**	0.028	**0.058**	14.5	**0.010**	0.13	0.045	0.027	0.005	**510**	1200	**900**	< 0.003	2	2.6
0.22	**0.92**	0.025	0.038	12.7	0.009	0.13	0.042	0.022	0.004	60	70	60	0.003	1.5	2.1
0.43	**1.10**	0.023	**0.103**	12.0	0.008	0.12	0.034	0.037	0.007	**1300**	3300	**2700**	0.005	2.9	4.8
0.31	**0.96**	0.011	**0.048**	12.6	0.010	0.12	0.037	0.025	0.005	21	190	170	0.020	1.8	2.6
0.18	**0.58**	0.024	**0.047**	15.3	**0.016**	0.18	0.057	0.020	0.004	40	160	160	0.004	1.6	1.9
0.26	**0.59**	0.023	**0.045**	14.7	**0.014**	0.19	0.060	0.022	0.004	19	60	30	0.010	1.9	2.1

Note: < = less than the value stated

UD = upper decile flow (long-term record 1996-2015 inclusive)

*New Zealand Standard Time

Underlined values don't comply with the "satisfactory" water quality Guidelines and Standards - Table 1

DATE dd/mm/yy	TIME* hh:mm	FLOW m^3/s	BDISK m	COLOR units	COND mS/m	PH units	TEMP 'C	DO g/m^3	PCDO %Sat	BOD5 g/m^3	TURB NTU	TDS g/m^3	NNN g/m^3	NO3-N g/m^3	NH4-N g/m^3
Satisfactory Water Quality Guideline/Standard			>1.6	-	-	6.5-9	<12 (May-Sep) <20 (Oct-Apr)		>80	-	<5	-	-	-	<0.88
1131-91		UD = 637 m^3/s	*(Flows from Mercer Bridge Recorder)*												
Waikato River at Mercer Br															
8/01/2015	10:35	189	-	-	15.4	7.6	**22.7**	9.3	104.1	2.7	4.0	127	0.071	0.070	< 0.01
4/02/2015	10:15	151	-	-	17.5	7.7	**23.0**	8.0	93.9	3.0	**5.8**	134	0.082	0.081	< 0.01
4/03/2015	09:48	134	-	-	17.1	7.7	**21.8**	9.0	101.5	1.4	3.5	129	0.049	0.048	< 0.01
8/04/2015	10:45	130	-	-	17.0	7.5	**20.7**	8.5	93.5	0.9	4.6	129	0.210	0.210	< 0.01
6/05/2015	12:34	185	-	-	17.2	7.2	**16.5**	9.4	95.5	1.2	**7.5**	132	0.410	0.410	< 0.01
3/06/2015	11:19	319	-	-	16.5	7.2	**13.7**	9.9	88.9	1.0	**10.8**	130	0.690	0.690	< 0.01
8/07/2015	11:20	422	-	-	15.7	7.3	11.2	10.2	93.4	< 0.8	**9.8**	113	0.580	0.580	< 0.01
5/08/2015	10:49	395	-	-	15.1	7.3	11.6	9.2	84.7	1.5	**10.2**	106	0.680	0.680	< 0.01
2/09/2015	10:30	763	-	-	13.1	6.7	**12.9**	8.8	83.5	1.7	**62.0**	128	0.590	0.590	0.02
7/10/2015	09:45	429	-	-	14.3	7.5	14.8	9.9	98.3	1.7	**14.8**	113	0.530	0.530	< 0.01
5/11/2015	11:20	296	-	-	15.5	7.4	16.3	9.1	93.3	1.0	**8.2**	129	0.370	0.370	0.01
1/12/2015	11:00	316	-	-	15.6	7.8	**20.3**	10.2	111.2	2.2	**6.8**	114	0.199	0.198	< 0.01
1131-133		UD = 637 m^3/s	*(Flows from Mercer Bridge Recorder)*												
Waikato River at Tuakau Br															
8/01/2015	11:10	188	**1.1**	32.5	15.6	7.6	**24.1**	9.9	116.5	2.5	2.9	128	0.062	0.061	< 0.01
4/02/2015	10:35	153	**1.5**	32.5	17.5	7.8	**23.4**	8.6	101.0	3.0	3.5	136	0.053	0.051	< 0.01
4/03/2015	10:20	144	**0.9**	32.5	16.9	7.7	**22.6**	9.4	107.9	1.7	3.3	134	0.014	0.012	< 0.01
8/04/2015	11:27	127	**1.5**	32.5	16.9	7.2	**21.3**	8.6	96.4	1.1	**5.1**	124	0.210	0.210	< 0.01
6/05/2015	13:05	199	**0.7**	30.0	17.2	7.4	**17.4**	10.2	105.2	1.6	**6.4**	128	0.410	0.400	< 0.01
3/06/2015	11:32	323	**0.6**	27.5	16.6	7.2	**13.5**	9.4	84.8	1.6	**10.4**	126	0.680	0.670	< 0.01
8/07/2015	12:00	423	**0.5**	25.0	15.6	7.3	11.9	9.8	90.8	< 0.8	**10.7**	100	0.540	0.540	< 0.01
5/08/2015	11:16	394	**0.8**	25.0	14.6	7.4	11.8	8.9	81.6	1.4	**9.3**	112	0.640	0.640	< 0.01
2/09/2015	10:55	769	**(0.3)**	22.5	12.6	6.8	**12.6**	8.8	83.1	1.4	**41.0**	122	0.580	0.580	0.02
7/10/2015	10:10	429	**0.7**	27.5	14.2	7.7	15.2	10.2	102.2	2.1	**13.5**	112	0.460	0.460	< 0.01
5/11/2015	12:00	295	**0.7**	35.0	15.6	7.5	17.0	8.9	94.1	0.9	**8.4**	129	0.380	0.380	< 0.01
1/12/2015	11:34	314	**0.5**	35.0	15.5	7.8	**20.8**	10.6	116.7	2.3	**8.0**	115	0.157	0.155	< 0.01

Note: < = less than the value stated

UD = upper decile flow (long-term record 1996-2015 inclusive)

*New Zealand Standard Time

Underlined values don't comply with the "satisfactory" water quality Guidelines and Standards - Table 1

() black disk measurements taken in flows above upper decile values – don't assess for compliance

TKN g/m³	TN g/m³	DRP g/m³	TP g/m³	CL g/m³	AS g/m³	B g/m³	LI g/m³	A340F /cm	A440F /cm	ENT cfu/100mL	FC	E coli	CHLA g/m³	DOC g/m³	TOC g/m³
-	<0.5	-	<0.04	-	<0.01	<0.3	-	-	-	<77	-	<550	<0.02		
0.23	0.30	0.014	**0.052**	15.8	**0.021**	0.22	0.075	0.015	0.002	24	130	130	0.006	1.7	2.0
0.16	0.24	0.012	0.031	18.7	**0.027**	-	-	0.015	0.003	31	60	60	0.009	1.6	1.7
0.23	0.28	0.005	0.032	17.8	**0.028**	0.27	0.093	0.012	0.003	31	55	49	**0.027**	1.7	2.0
0.18	0.39	0.020	0.034	18.2	**0.021**	0.25	0.084	0.014	0.003	16	53	47	0.006	1.6	1.7
0.27	**0.68**	0.019	**0.044**	17.5	**0.017**	0.22	0.067	0.022	0.005	13	50	50	0.009	2.1	2.6
0.36	**1.05**	0.016	**0.052**	17.2	**0.011**	0.17	0.047	0.035	0.006	36	130	110	0.007	3.3	3.4
0.24	**0.82**	0.021	**0.045**	15.9	**0.011**	0.17	0.053	0.026	0.004	**80**	190	180	0.004	2.2	2.8
0.27	**0.95**	0.013	0.040	14.0	0.008	0.14	0.038	0.035	0.006	70	80	80	0.007	2.8	3.7
0.60	**1.19**	0.018	**0.119**	12.8	0.008	0.11	0.033	0.047	0.008	**1400**	3500	**3000**	0.007	4.1	5.8
0.41	**0.94**	0.006	**0.059**	13.2	0.009	0.12	0.036	0.037	0.007	22	130	120	**0.024**	2.8	4.1
0.21	**0.58**	0.022	**0.044**	16.0	**0.017**	0.22	0.066	0.017	0.003	14	110	80	0.005	1.7	2.1
0.32	**0.52**	0.012	**0.048**	16.0	**0.016**	0.22	0.069	0.020	0.004	16	46	36	0.015	2.2	2.2
0.24	0.30	0.014	**0.042**	16.1	**0.018**	0.22	0.071	0.018	0.003	28	44	41	0.008	1.6	2.7
0.33	0.38	0.009	0.036	18.7	**0.020**	0.26	0.090	0.015	0.003	27	50	30	0.013	1.5	1.7
0.25	0.26	< 0.004	0.037	17.7	**0.027**	0.27	0.095	0.012	0.002	30	60	54	**0.036**	1.7	2.1
0.19	0.40	0.021	0.036	18.0	**0.022**	0.25	0.078	0.013	0.002	22	51	41	0.008	1.6	1.8
0.32	**0.73**	0.021	**0.072**	17.9	**0.016**	0.22	0.066	0.031	0.006	21	40	40	0.010	2.6	2.9
0.38	**1.06**	0.016	**0.065**	18.2	**0.012**	0.18	0.050	0.046	0.009	270	90	90	0.008	3.8	4.3
0.30	**0.84**	0.020	0.037	16.4	**0.013**	0.17	0.055	0.028	0.004	**80**	170	150	0.007	2.6	3.2
0.26	**0.90**	0.017	**0.050**	14.5	0.009	0.14	0.041	0.040	0.007	25	70	60	0.008	3.1	3.6
0.58	**1.16**	0.020	**0.098**	13.0	0.009	0.12	0.037	0.048	0.010	**1800**	2600	**2400**	0.008	4.8	5.6
0.44	**0.90**	0.007	**0.061**	13.4	0.009	0.13	0.037	0.039	0.007	12	120	100	**0.027**	3.0	3.7
0.22	**0.60**	0.023	**0.048**	16.6	**0.017**	0.21	0.066	0.019	0.004	16	51	38	0.004	1.6	1.9
0.32	0.48	0.011	**0.057**	15.8	**0.016**	0.22	0.068	0.024	0.004	11	120	100	**0.021**	2.2	2.3

Note: < = less than the value stated

UD = upper decile flow (long-term record 1996-2015 inclusive)

*New Zealand Standard Time

Underlined values don't comply with the "satisfactory" water quality Guidelines and Standards - Table 1

5-Yearly Trace Metal Analysis

DATE	TIME*	AlTR	AsTR	BTR	CdTR	CoTR	CrTR	CuTR	FeD	FeTR	HgT
dd/mm/yy	hh:mm	g/m^3	g/m^3	g/m^3	g/m^3	g/m^3	g/m^3	g/m^3	g/m^3	g/m^3	g/m^3
1131-127											
Waikato River at Taupo Control Gates											
3/02/2015	8:30 a.m.	< 0.003	0.0124	0.18	< 0.000011	< 0.00004	< 0.0006	< 0.0003	< 0.005	0.007	< 0.00002
5/05/2015	9:38 a.m.	< 0.002	0.0128	0.17	< 0.000011	< 0.00004	< 0.0006	< 0.0003	< 0.005	0.006	< 0.00002
7/08/2015	11:00 a.m.	0.0028	0.012	0.18	< 0.000011	< 0.00004	< 0.0006	< 0.0003	< 0.005	< 0.006	< 0.00002
3/11/2015	8:56 a.m.	0.0016	0.0126	0.17	< 0.000011	< 0.00004	< 0.0006	< 0.0003	< 0.005	< 0.006	< 0.00002
1131-107											
Waikato River at Ohakuri Tailrace											
3/02/2015	10:06 a.m.	0.0160	0.0380	0.330	< 0.00001	< 0.00003	< 0.0004	0.0003	0.063	0.147	< 0.00002
5/05/2015	11:39 a.m.	0.0120	0.0320	0.320	< 0.000011	< 0.00004	< 0.0006	< 0.0003	0.046	0.100	< 0.00002
7/08/2015	11:30 a.m.	0.0240	0.0260	0.320	< 0.000011	< 0.00004	< 0.0006	< 0.0003	0.049	0.115	< 0.00002
3/11/2015	10:20 a.m.	0.0210	0.0320	0.320	< 0.000011	< 0.00004	< 0.0006	0.0002	0.050	0.147	< 0.00002
1131-101											
Waikato River at Narrows Br											
4/02/2015	7:22 a.m.	0.0120	0.0270	0.300	< 0.000011	< 0.00004	< 0.0006	< 0.0003	0.022	0.093	< 0.00002
6/05/2015	9:05 a.m.	0.0230	0.0220	0.260	< 0.000011	< 0.00004	< 0.0006	< 0.0003	0.040	0.117	< 0.00002
5/08/2015	8:40 a.m.	0.0500	0.0162	0.210	< 0.000011	0.00003	< 0.0006	0.0003	0.056	0.142	< 0.00002
5/11/2015	9:05 a.m.	0.0660	0.0230	0.240	< 0.000011	0.00004	< 0.0006	0.0003	0.049	0.220	< 0.00002
1131-69											
Waikato River at Horotiu Br											
4/02/2015	8:50 a.m.	0.0450	0.0260	0.300	< 0.000011	0.00005	< 0.0006	0.0002	0.030	0.169	< 0.00002
6/05/2015	9:55 p.m.	0.0980	0.0230	0.270	< 0.000011	0.00007	< 0.0006	0.0003	0.058	0.300	< 0.00002
5/08/2015	9:27 a.m.	0.0630	0.0163	0.210	< 0.000011	0.00006	< 0.0006	< 0.0003	0.072	0.220	< 0.00002
5/11/2015	9:55 a.m.	0.0980	0.0220	0.240	< 0.000011	0.00007	< 0.0006	0.0002	0.057	0.300	< 0.00002
1131-133											
Waikato River at Tuakau Br											
4/02/2015	10:35 a.m.	0.0680	0.0200	0.270	0.000012	0.00007	< 0.0006	0.0003	0.052	0.197	< 0.00002
6/05/2015	13:05 p.m.	0.2000	0.0146	0.210	< 0.000011	0.00019	< 0.0006	0.0007	0.175	0.590	< 0.00002
5/08/2015	11:16 a.m.	0.3000	0.0103	0.146	< 0.000011	0.00035	< 0.0006	0.0008	0.260	0.780	< 0.00002
5/11/2015	12:05 p.m.	0.2900	0.0179	0.210	< 0.000011	0.00024	< 0.0006	0.0006	0.101	0.720	< 0.00002

< = less than value stated
D = Dissolved, T = Total, TR = Total Recoverable

*Time = New Zealand Standard Time

LiT g/m³	MnD g/m³	MnTR g/m³	MoTR g/m³	NiTR g/m³	PbTR g/m³	SbTR g/m³	TlTR g/m³	UTR g/m³	ZnD g/m³	ZnTR g/m³
0.041	0.0003	0.0013	0.0002	< 0.0004	< 0.00006	0.00025	< 0.000011	< 0.00003	0.0018	0.0014
0.042	0.0002	0.0011	0.0003	< 0.0004	< 0.00006	0.00024	< 0.000011	< 0.00003	0.0007	< 0.0006
0.040	< 0.0002	0.0011	0.0002	< 0.0004	< 0.00006	0.00020	< 0.000011	< 0.00003	0.0007	< 0.0006
0.040	0.0003	0.0011	0.0002	< 0.0004	< 0.00006	0.00019	< 0.000011	< 0.00003	< 0.0005	0.0012
0.112	0.0009	0.0160	0.0006	< 0.0003	0.00054	0.00088	0.000040	< 0.00002	0.0034	0.0045
0.113	0.0010	0.0155	0.0005	< 0.0004	< 0.00006	0.00092	0.000034	< 0.00003	< 0.0005	0.0005
0.093	0.0080	0.0121	0.0004	< 0.0004	0.00006	0.00081	0.000028	< 0.00003	0.0008	0.0013
0.099	0.0004	0.0220	0.0004	< 0.0004	< 0.00006	0.00082	0.000041	< 0.00003	0.0007	0.0013
0.099	0.0003	0.0181	0.0004	< 0.0004	< 0.00006	0.00070	0.000038	< 0.00003	< 0.0005	< 0.0010
0.095	0.0010	0.0178	0.0004	< 0.0004	< 0.00006	0.00068	0.000025	< 0.00003	< 0.0005	< 0.0006
0.062	0.0047	0.0127	0.0004	< 0.0004	< 0.00006	0.00048	0.000020	< 0.00003	0.0010	0.0006
0.080	0.0148	0.0370	0.0004	< 0.0004	0.00006	0.00058	0.000035	< 0.00003	< 0.0005	< 0.0011
0.098	0.0004	0.0250	0.0005	< 0.0004	0.00007	0.00066	0.000036	< 0.00003	< 0.0005	0.0012
0.098	0.0022	0.0350	0.0004	< 0.0004	0.00014	0.00069	0.000020	< 0.00003	0.0008	0.0020
0.061	0.0062	0.0168	0.0003	< 0.0004	0.00007	0.00050	0.000026	< 0.00003	0.0015	0.0024
0.076	0.0120	0.0390	0.0004	< 0.0004	0.00010	0.00055	0.000028	< 0.00003	< 0.0005	0.0023
0.087	0.0006	0.0330	0.0005	< 0.0004	0.00007	0.00054	0.000037	< 0.00003	< 0.0005	< 0.0010
0.067	0.0230	0.0550	0.0003	< 0.0004	0.00018	0.00047	0.000026	0.00003	0.0010	0.0035
0.038	0.0290	0.0600	0.0002	0.0004	0.00024	0.00029	0.000025	0.00004	0.0018	0.0027
0.064	0.0126	0.0550	0.0003	< 0.0004	0.00030	0.00044	0.000027	0.00003	< 0.0005	0.0046

< = less than value stated
D = Dissolved, T = Total, TR = Total Recoverable

References

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Appendix I:

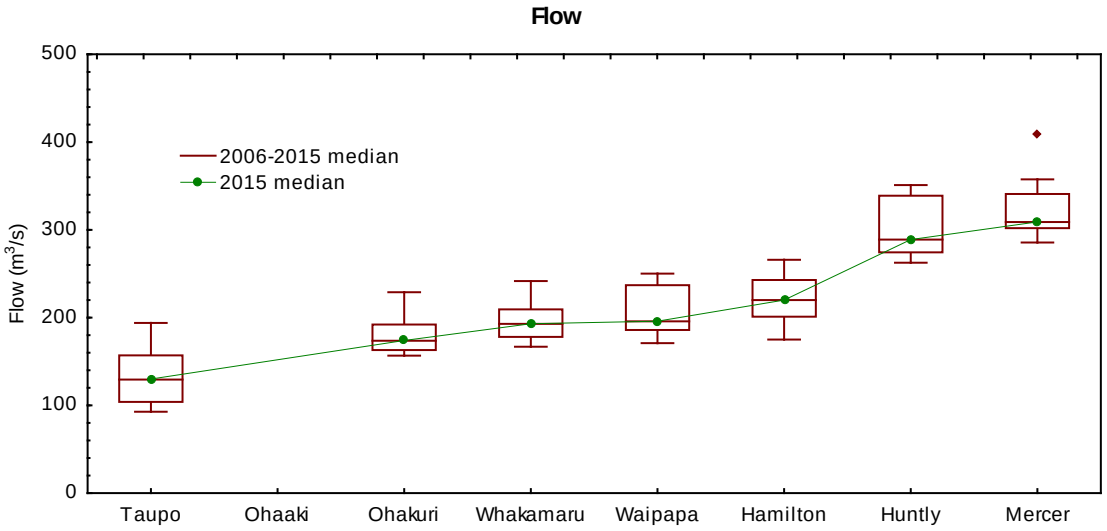
Flow Information

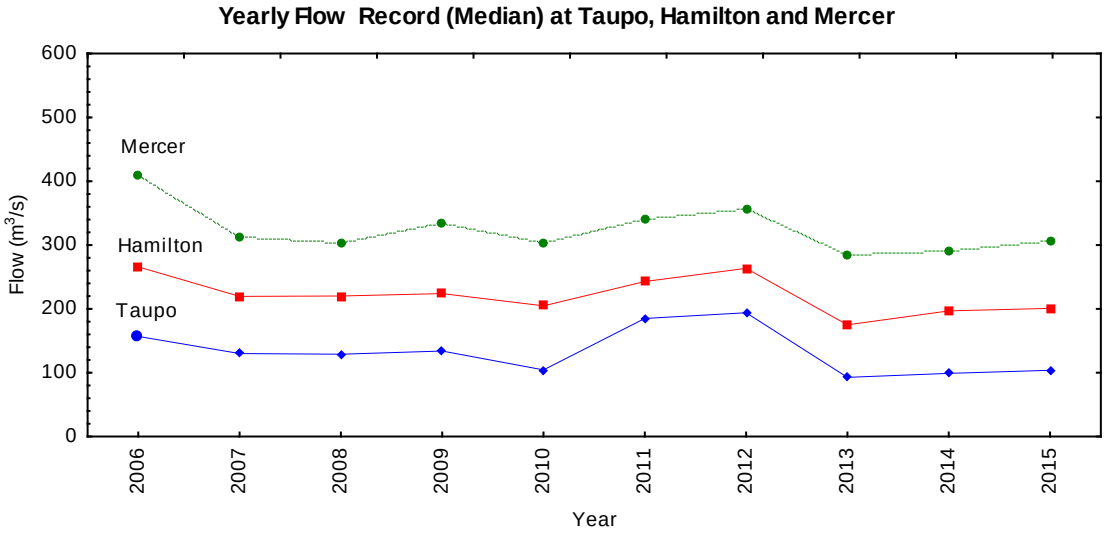
Median Flows of the Waikato River and Main Tributaries

	DISTANCE	FLOW RATE[+] (m^3/s)										10 YEAR
Location	km	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	Median
Taupo	4.2	157	130	129	134	104	185	194	93	99	104	130
Ohakuri	75.8	184	157	163	162	192	225	229	163	163	184	174
Whakamaru	105.0	208	178	186	196	209	242	232	168	167	190	193
Waipapa	126.1	237	190	211	194	198	250	245	175	171	186	196
Hamilton	211.5	266	220	220	224	205	243	264	175	197	201	220
Huntly	246.5	351	278	274	302	297	339	345	266	263	281	289
Mercer	286.3	409	313	302	334	304	341	358	286	290	305	309
Waiotapu Stm	46.6	3.8	2.8	3.0	2.7	3.3	3.8	3.5	2.5	2.4	3	3
Waipa River	232.7	62	34	43	53	41	61	62	47	55	53	53

+Rating curve errors mean estimates of flow are ± 8%

[+]Historical flow data updated due to rating changes from updated data received



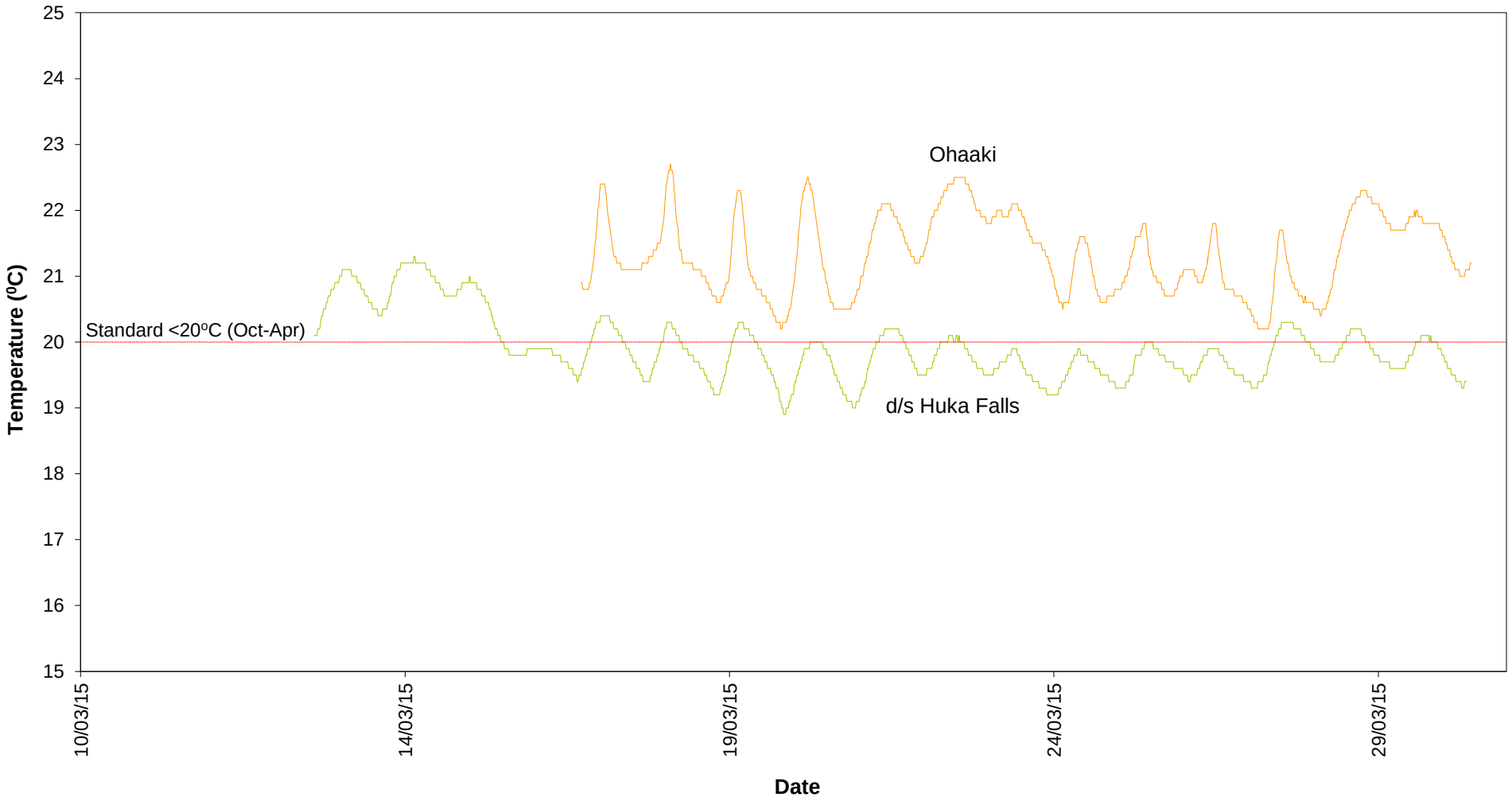


Appendix II

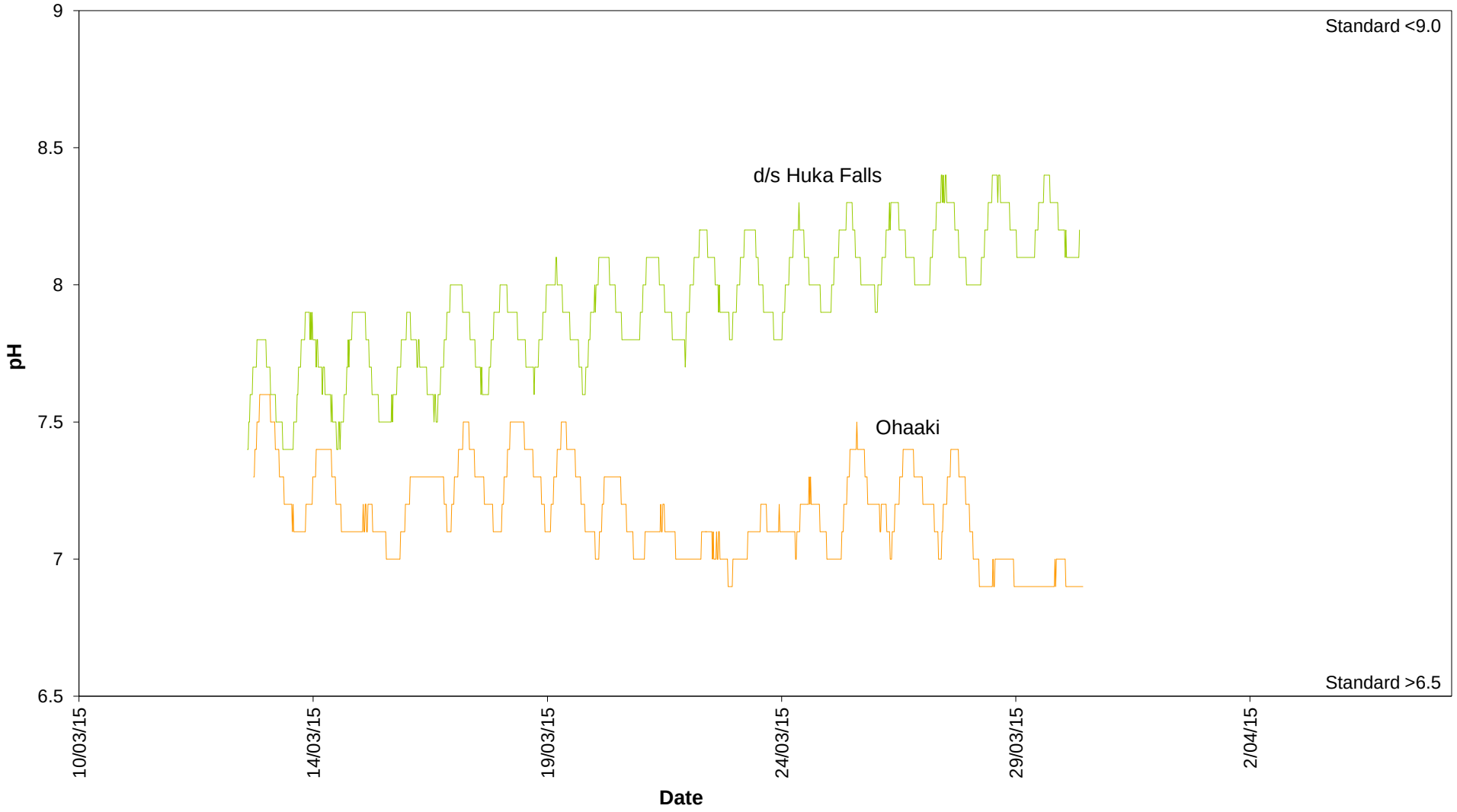
Datasonde deployments

Diurnal variation of selected water quality parameters

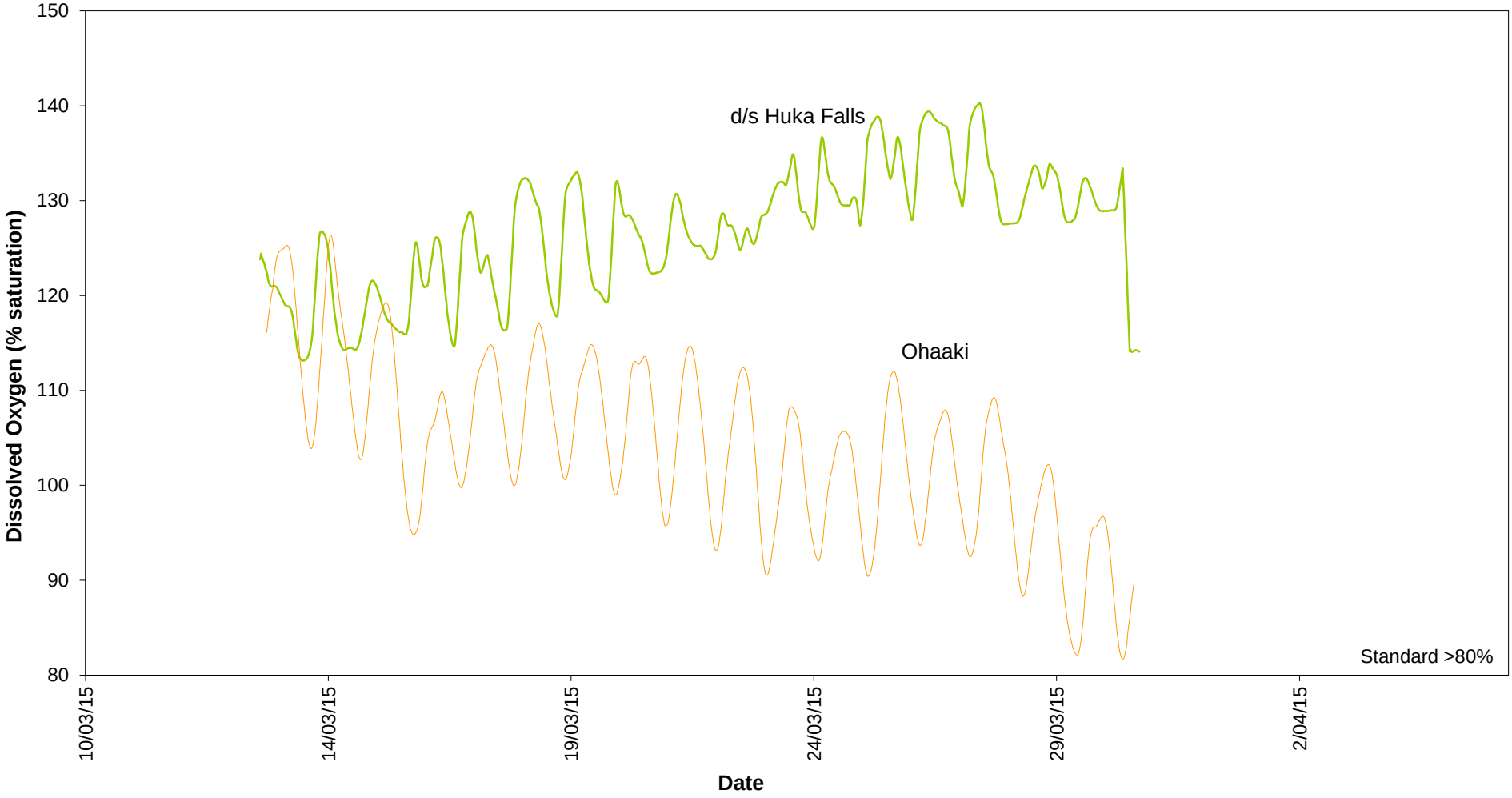
Temperature: Upper Waikato (March)



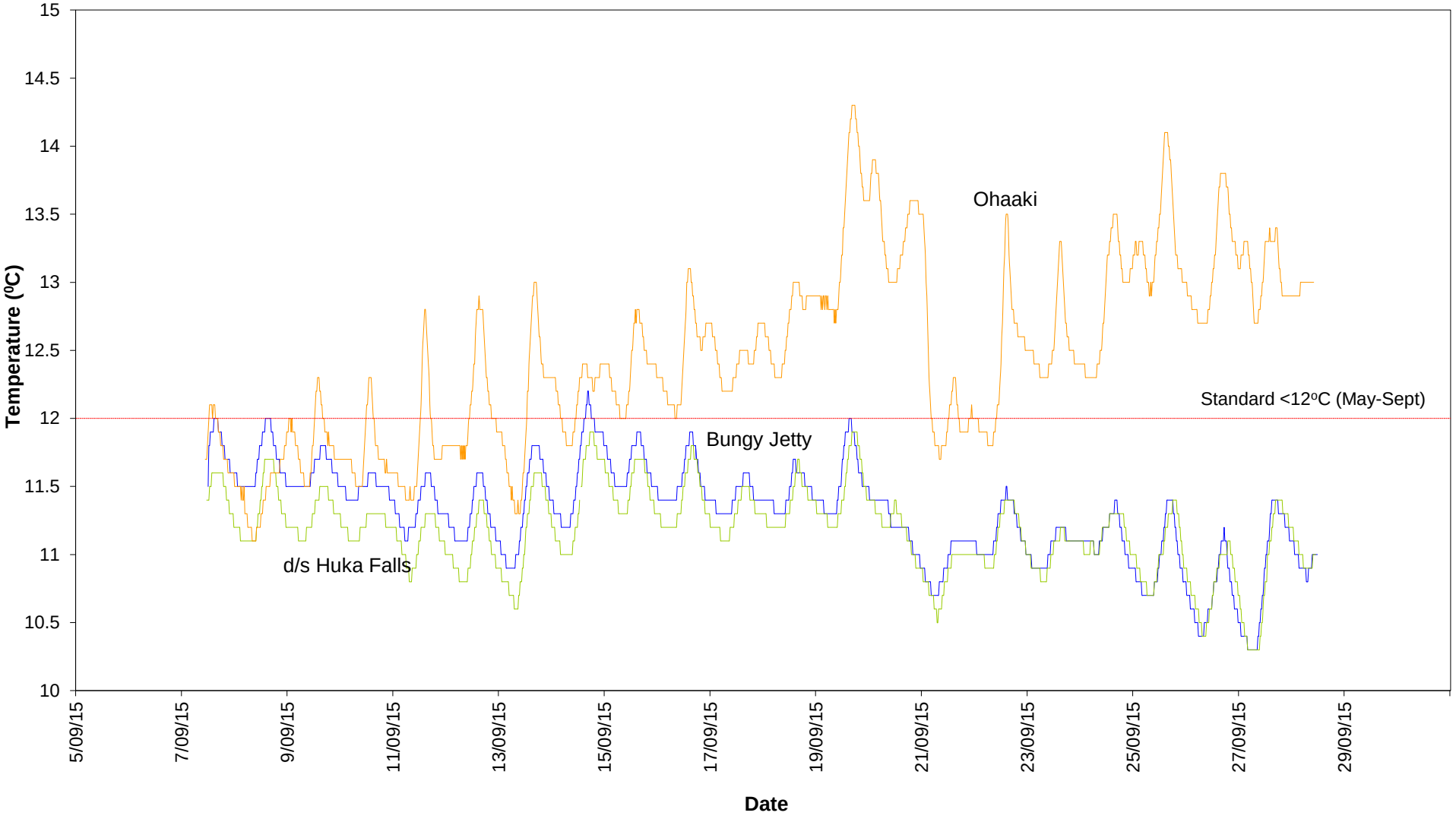
pH: Upper Waikato (March)



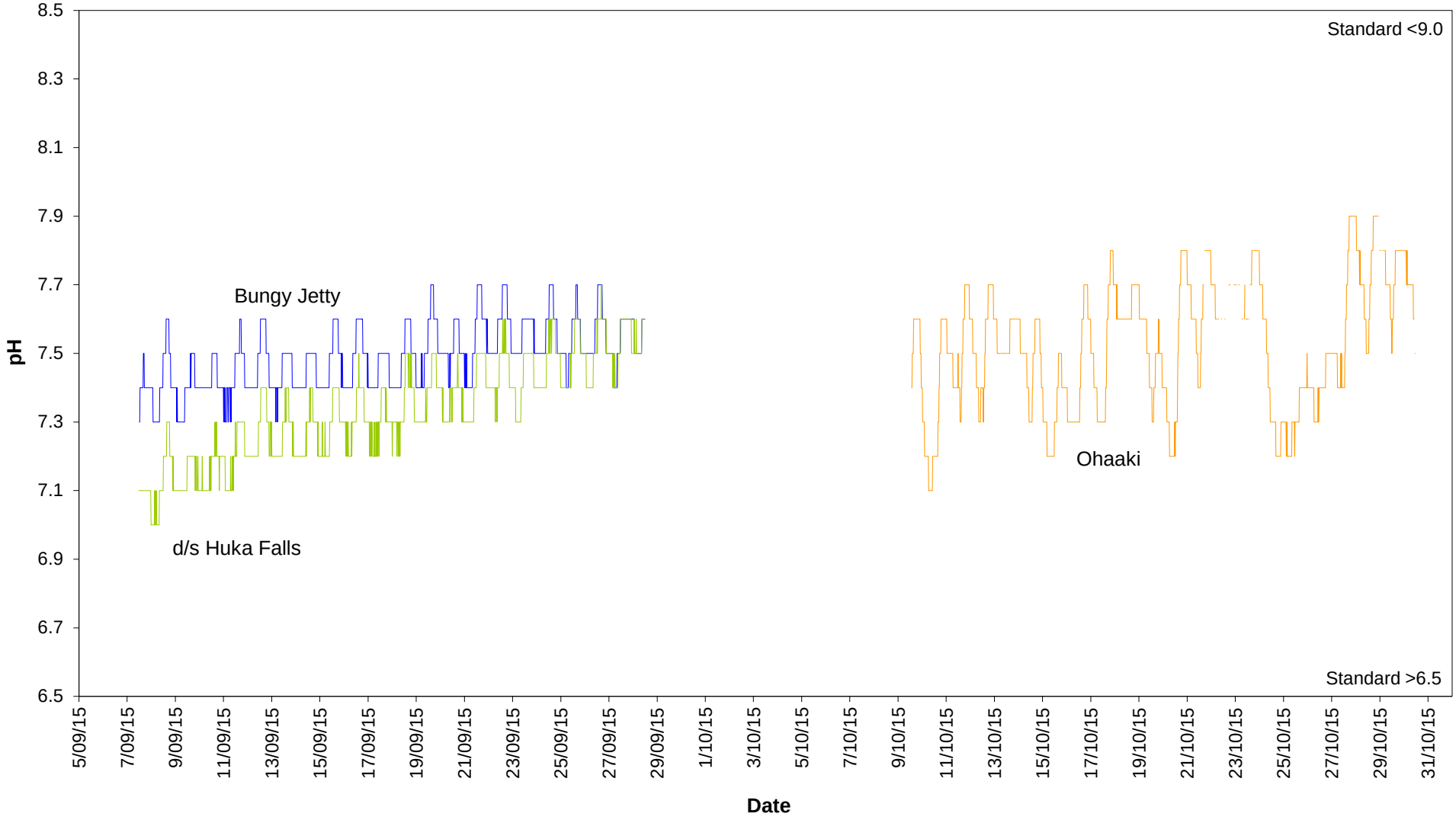
Dissolved Oxygen, % saturation: Upper Waikato (March-April)



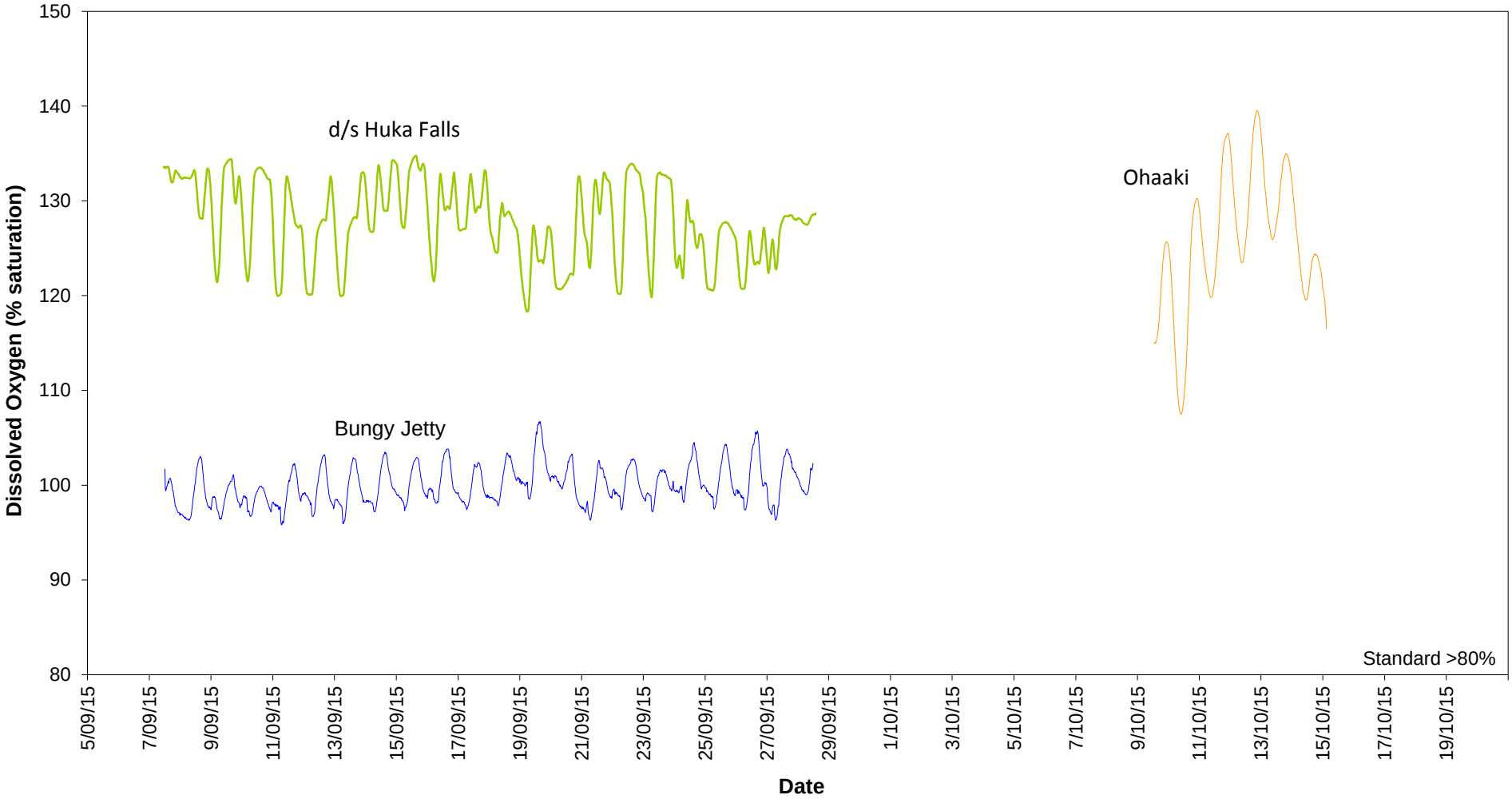
Temperature: Upper Waikato (September)



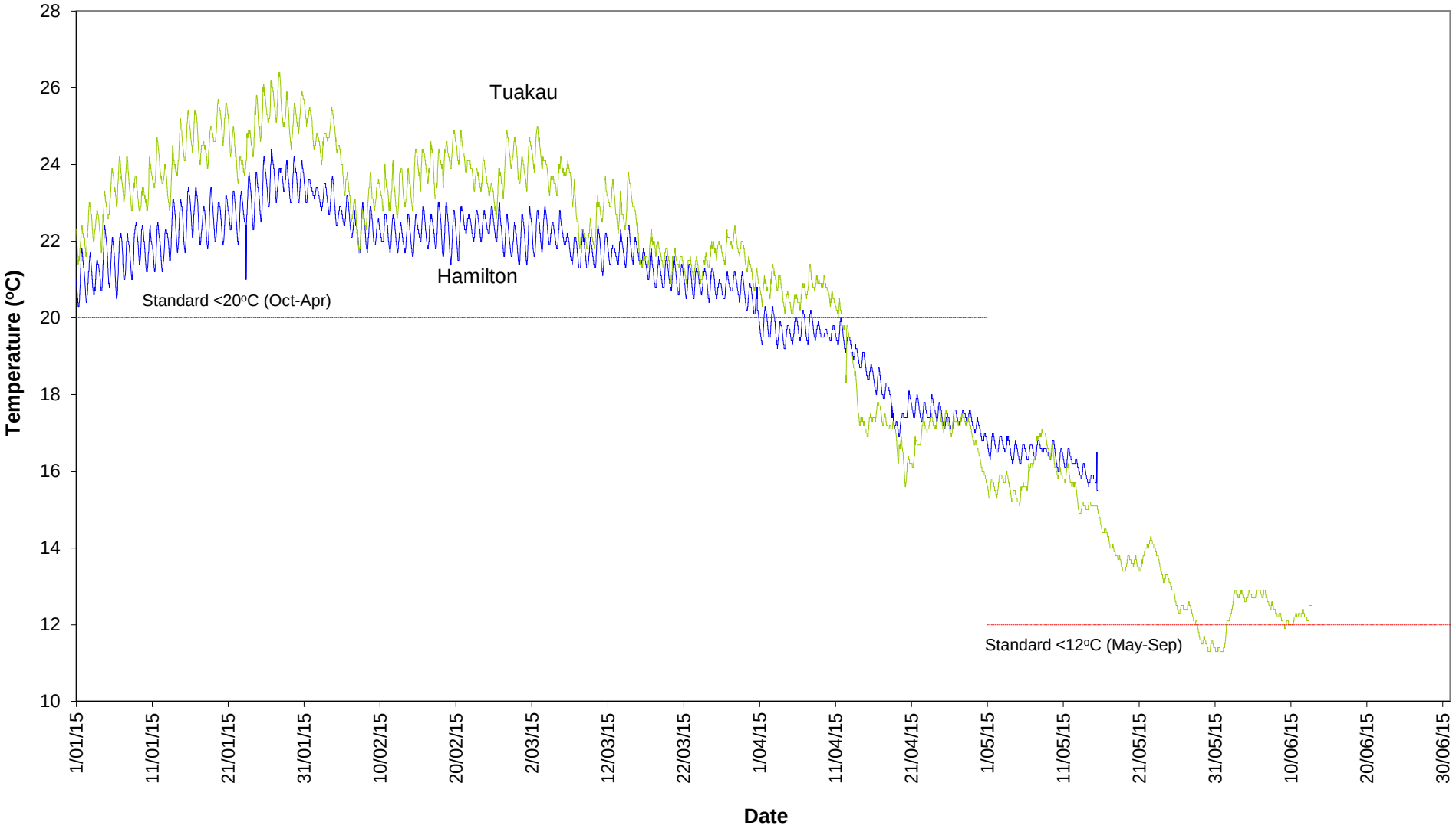
pH: Upper Waikato (September to October)



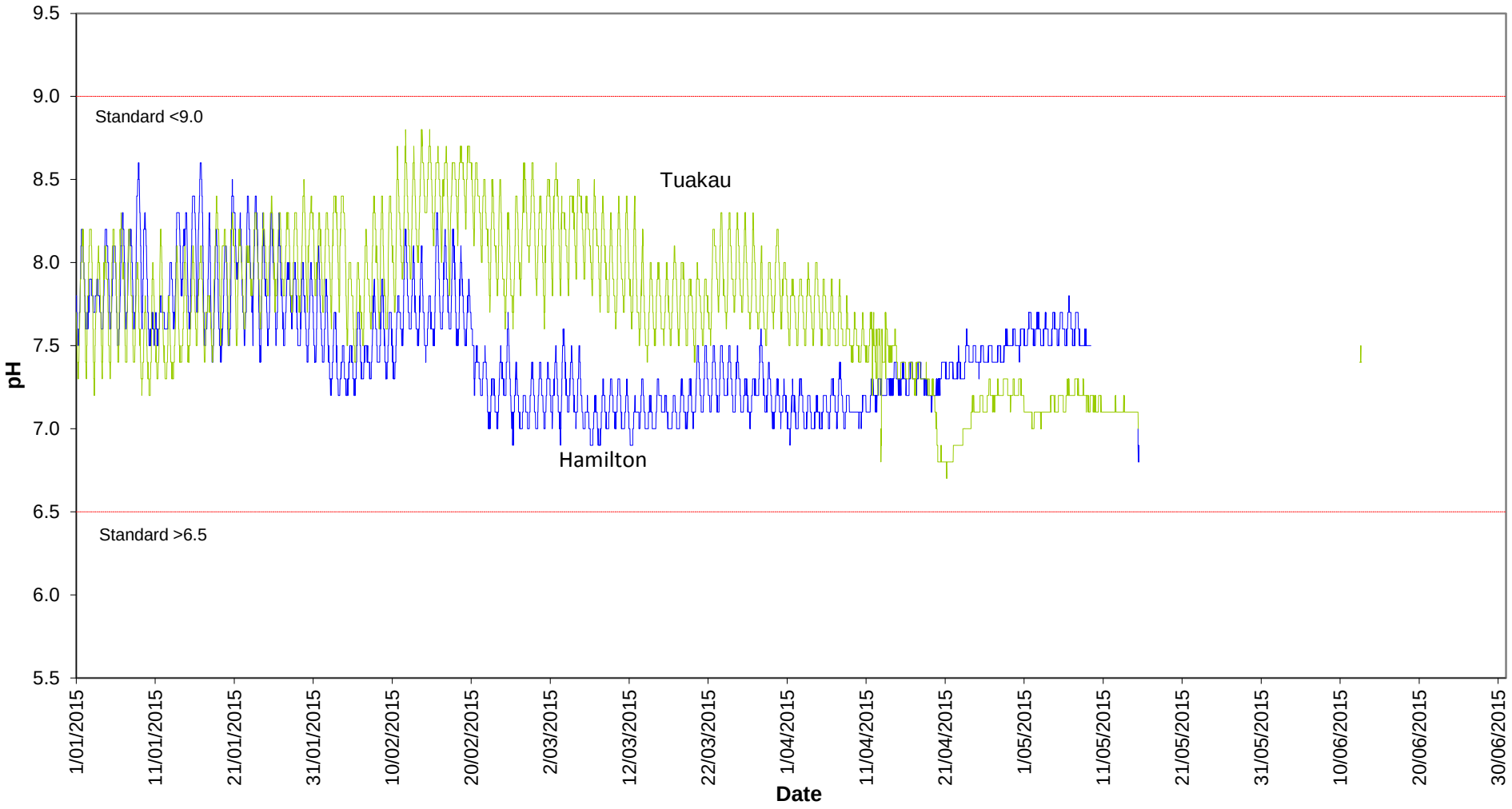
Dissolved Oxygen, % saturation: Upper Waikato (September to October)



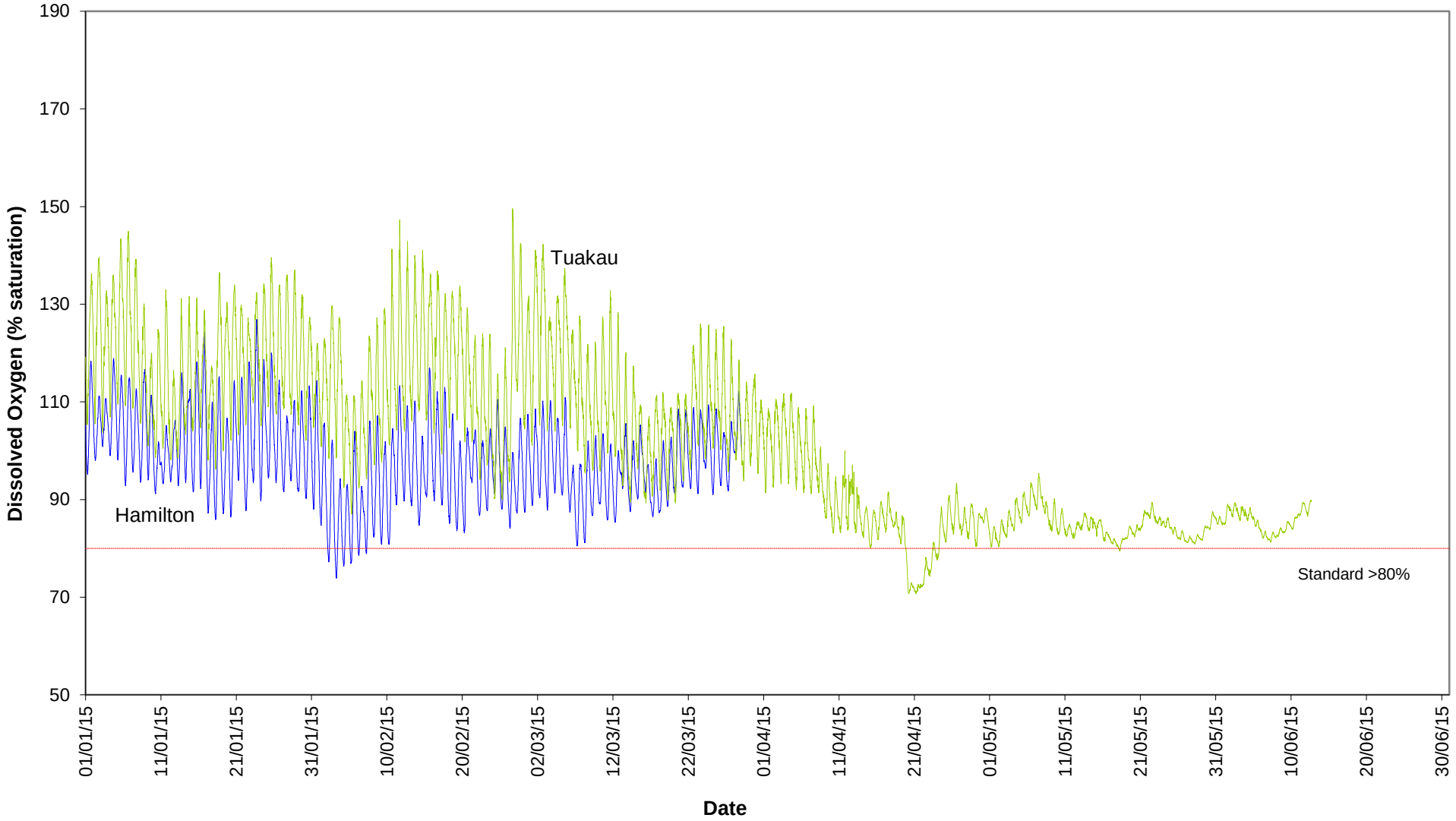
Temperature: Lower Waikato (January-June)

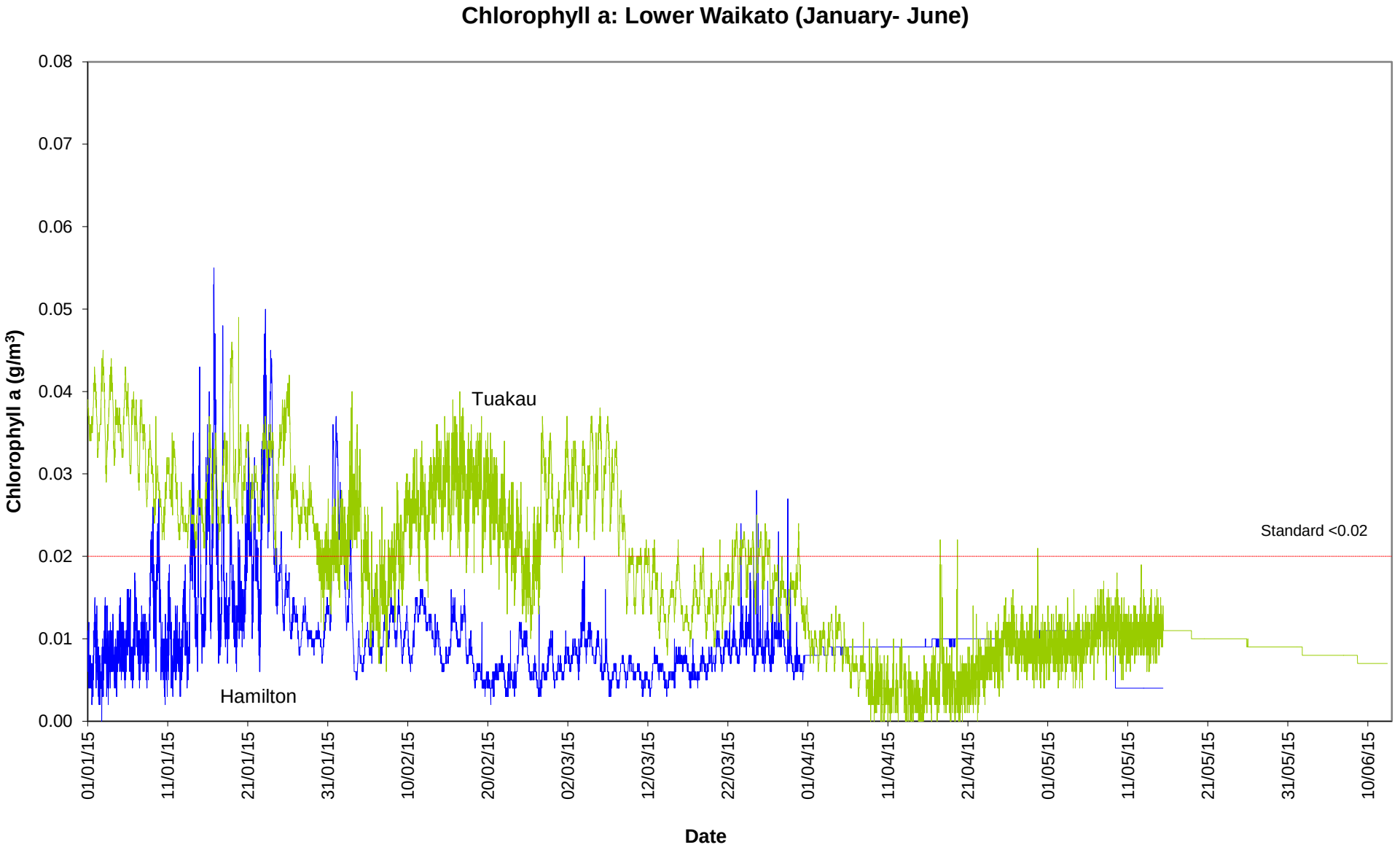


pH: Lower Waikato (January - June)

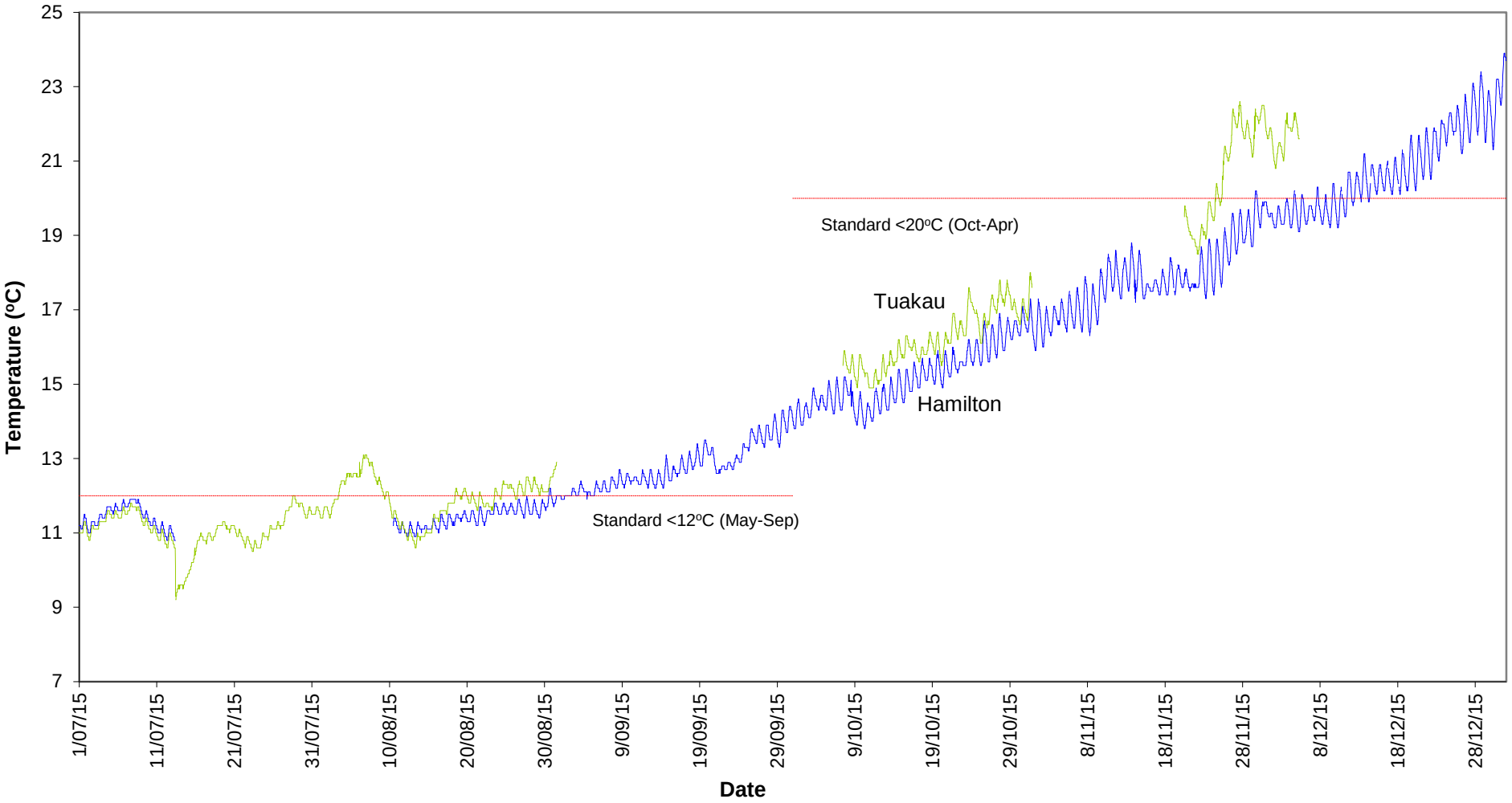


Dissolved Oxygen (% saturation): Lower Waikato (January - June)

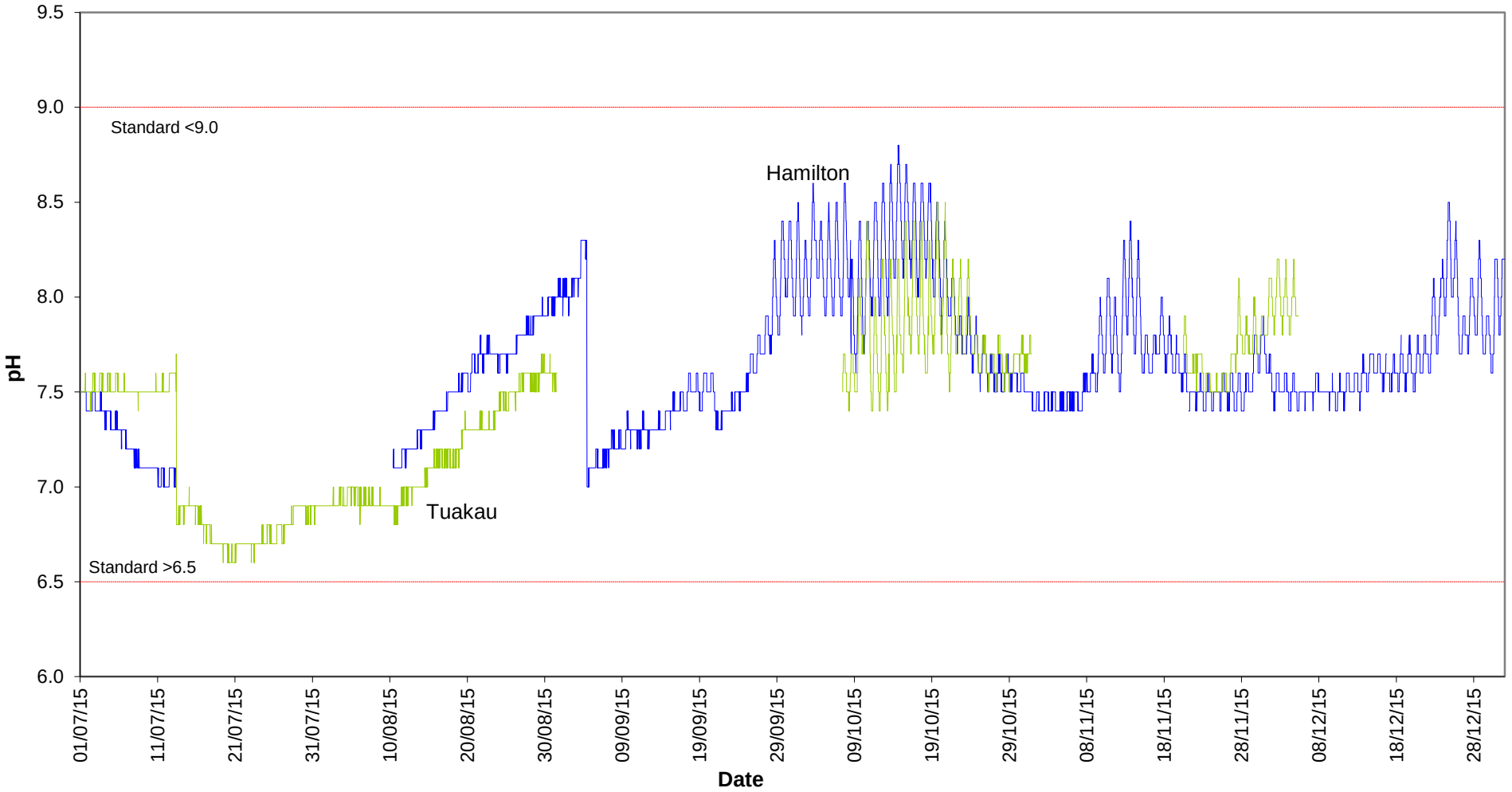



Chlorophyll a: Lower Waikato (January- June)
Chlorophyll a (g/m3)
0.08
0.07
0.06
0.05
0.04
0.03
0.02
0.01
0.00
Tuakau
Hamilton
Standard <0.02
01/01/15
11/01/15
21/01/15
31/01/15
10/02/15
20/02/15
02/03/15
12/03/15
22/03/15
01/04/15
11/04/15
21/04/15
01/05/15
11/05/15
21/05/15
31/05/15
10/06/15
Date

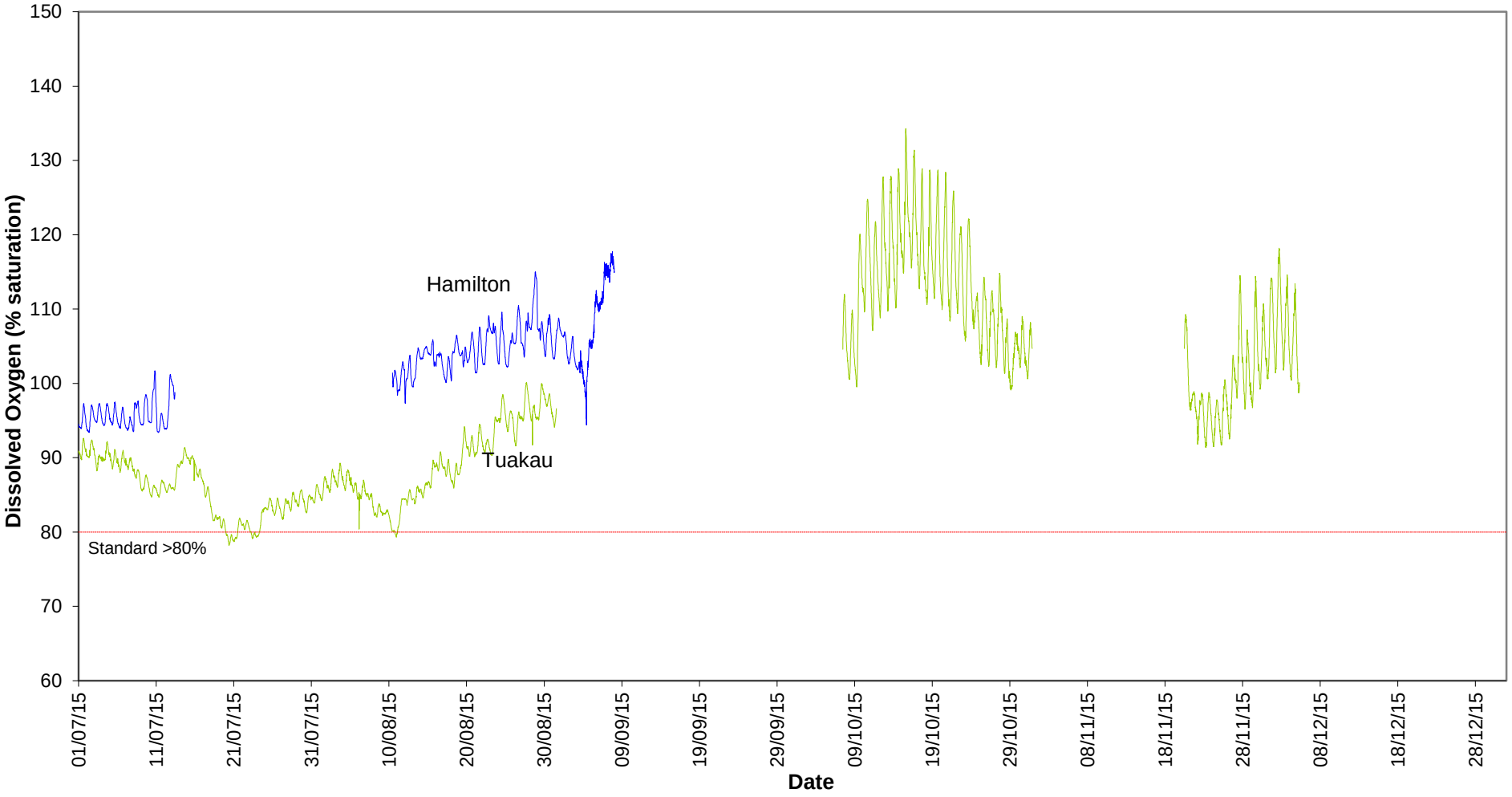
Temperature: Lower Waikato (July-December)



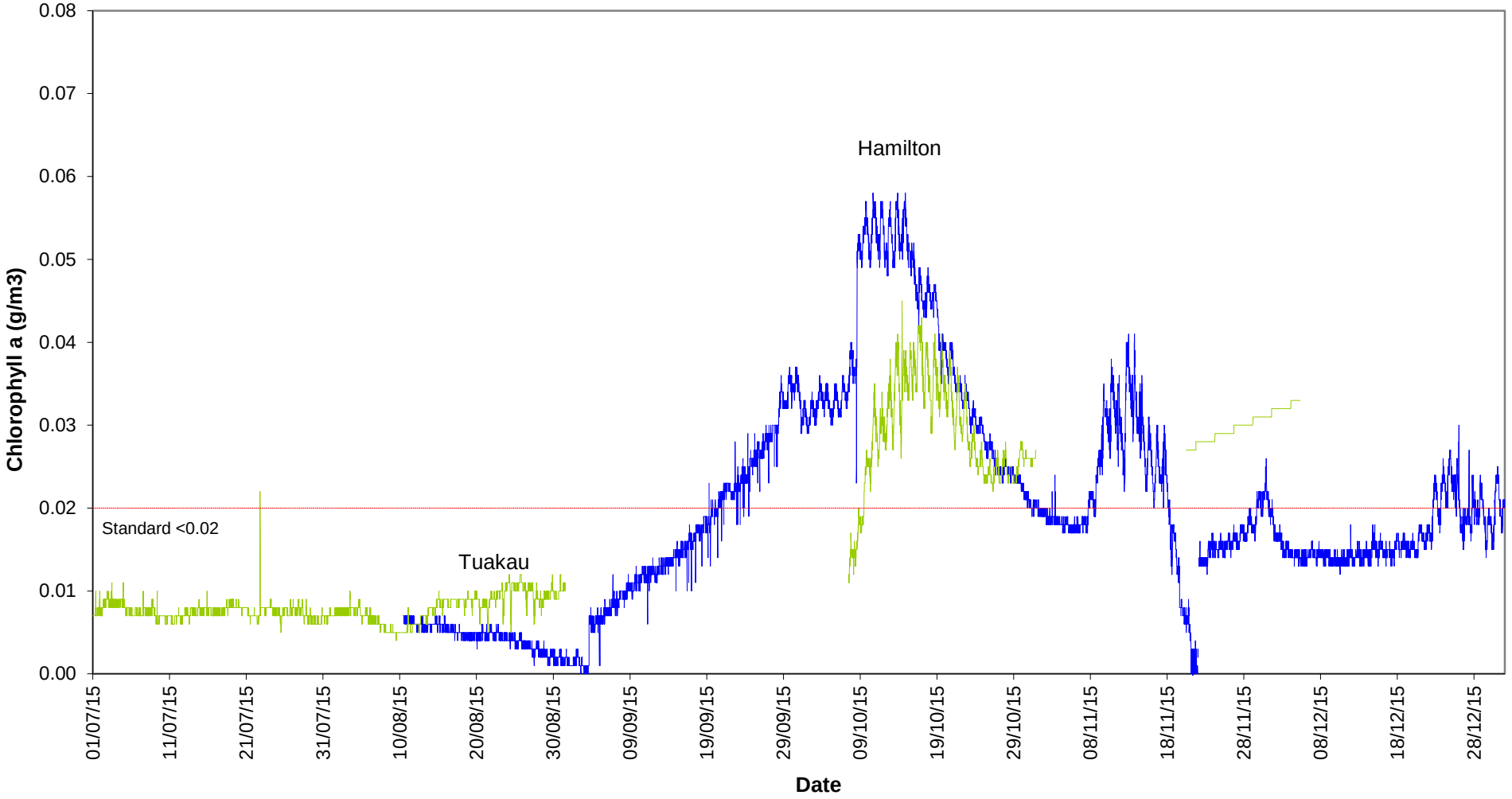
pH: Lower Waikato (July - December)



Dissolved Oxygen (% saturation): Lower Waikato (July - December)



Chlorophyll a: Lower Waikato (July - December)



Appendix III:

Water quality parameters

Guidelines and standards

Analytical methods

Waikato River water quality monitoring programme parameters

Water quality parameter	Reason for monitoring	Parameter monitored[1]	Comments[2]
Dissolved oxygen	- requirement for aquatic life	DO (conc.)	routine (field)
	- indicator of organic pollution	DO (%sat.)	routine (field)
	- indicator of photosynthesis (plant growth)		
Temperature	- indicator of biological activity	Temperature	routine (field)
	- requirement for aquatic life		
	- mixing processes		
	- modelling studies (e.g. nutrient uptake)		
Conductivity	- indicator of total salts dissolved in water	Conductivity	routine
	- indicator for geothermal input	TDS	routine
pH	- aquatic life protection	pH	routine
	- indicator of industrial discharges, mining		
Clarity	- aesthetic appearance	Turbidity	routine
- turbidity	- light availability for excessive plant growth	Black disk	routine (field)
- black disk	- aquatic life protection		
(visual clarity)	- indicator of catchment condition, land use		
Colour	- aesthetic appearance	Munsell colour	routine (field)
- light absorption	- light availability for excessive plant growth	Absorbance at:	routine
	- indicator of presence of organic matter	340,440,780nm	
Nutrients (N and P)	- enrichment, excessive plant growth	NO_3-N+NO_2-N	routine
chlorophyll *a*	- nutrient limitation for plant/algal growth	NH_4-N,TKN	
		DRP, TP, Chl *a*	
Geothermal contaminants	- indicators of geothermal inflows	Cl, Li, B, As	routine
	- aquatic life protection (ecotoxicity)		
	- drinking water (human health aspects)		
Organic carbon	- indicator of organic pollution	BOD_5	routine
	- catchment characteristics	TOC/DOC	routine
Faecal bacteria	- indicator of pollution with faecal matter	E. Coli	routine
- E. coli	- disease risk for swimming etc.	ENT	routine
- enterococci		FC	routine
- faecal coliforms			

[1] see the page 49 for the meaning of the abbreviations.
[2] routine means sampled monthly.

Details of water quality standards and guidelines for "satisfactory" water quality

Parameter	Critical value(s)	Source
Dissolved oxygen	>80% of saturation concentration	RMA Third Schedule, Classes AE, F, and FS.
pH	6.5–9	ANZECC (1992) and Canadian guidelines for freshwater aquatic life (1987).
Turbidity	<5 NTU	Studies of adverse effects on underwater light—and thus on plant and invertebrate production—in certain South Island streams (Davies-Colley 1991).
Ammoniacal-nitrogen	<0.88 g/m^3	USEPA (1998) value for 1-hour exposure at pH 9.
Temperature	<12°C (May – Sep) <20°C (Oct – Apr)	Waikato Regional Council Proposed Regional Plan standards for trout fisheries and trout spawning (1998).
Total phosphorus	<0.04 g/m^3	From upper quartile values for 77 New Zealand rivers in NIWA's National Water Quality Network (after Smith & Maasdam 1994)—note that the guidelines for "excellent" conditions are the lower quartile concentrations for these rivers.
Total nitrogen	<0.5 g/m^3	From upper quartile values for 77 New Zealand rivers in NIWA's National Water Quality Network (after Smith & Maasdam 1994)—note that the guidelines for "excellent" conditions are the lower quartile concentrations for these rivers.
Water clarity at baseflow	>1.6 m	"Baseflow" defined as flows less than the upper decile flow. Guideline from Ministry for the Environment (1994).
Escherichia coli	<550/100 mL	Ministry for the Environment (2003) guidelines for the management of recreational and marine shellfish-gathering waters.
Median Escherichia coli	<126/100 mL	Ministry for the Environment (1999) guidelines for the management of recreational and marine shellfish-gathering waters.
Enterococci	<77/100 mL	Department of Health (1992) guidelines for "moderate" level of recreational use.
Chlorophyll *a*	<0.02 g/m^3	Ministry for the Environment (1992).
Arsenic	<0.01 g/m^3	Ministry of Health (2001).
Boron	<1.4 g/m^3	Ministry of Health (2001).

Waikato River monitoring programme - water quality parameters and analytical methods

Id[1]	Parameter	Method
A340F	Absorbance @ 340 nm filtered	Spectrophotometer, 1 cm path length, APHA method 5910B
A440F	Absorbance @ 440 nm filtered	Spectrophotometer, 1 cm path length, APHA method 5910B
A780F	Absorbance @ 780 nm filtered	Spectrophotometer, 1 cm path length, APHA method 5910B
As	Arsenic total	Nitric acid digestion, ICP-MS, APHA method 3125 B / USEPA 200B
B	Boron	ICP-MS, APHA method 3125 B
BDISK	Black disk	Field measurement, horizontal water transparency (20mm, 60mm, 100mm, 200mm disk) in river
BOD_5	Biochemical oxygen Demand (5 day)	Incubation 5 days at 20°C , DO-meter, No nitrification inhibitor added, unseeded, APHA method 5210 B
CHLA	Chlorophyll a	Acetone extraction. Spectroscopy. APHA method 10200 H (modified)
Cl	Chloride	Filtered sample. Ferric thiocyanate colorimetry, Discrete analyser. APHA method 4500 Cl^-E (modified)
COLOUR	Colour	Field measurement, Munsell colour patches
COND	Conductivity	Lab Meter @ 25°C. APHA method 2510B
DO	Dissolved oxygen	Field measurement (Hach DO meter, model HQ 30d)
DO (% Sat)	Dissolved oxygen (percent saturation)	Field measurement (Hach DO meter, model HQ 30d)
DOC	Dissolved organic Carbon	Filtration, acidification, purging to remove inorganic C, persulphate oxidation, IR detection. APHA method 5310 C (modified)
DRP	Dissolved reactive Phosphorus	Filtration, Molybdenum Blue Colorimetry. Discrete analyser. APHA 4500 PE (modified)
E. coli	Escherichia coli	Membrane Filtration (mFC Agar) confirmation by MUG Agar. APHA method 9222 G
ENT	Enterococci bacteria	Membrane Filtration (mE Agar) confirmation by EIA Agar. APHA method 9230 C
FC	Faecal coliforms	Membrane Filtration (mFC Agar). APHA method 9222 D
Flow	Flow – instantaneous	Calculated from rating curve ± 8%
Li	Lithium	ICP-MS, method APHA 3125 B
NH_4-N	Ammoniacal Nitrogen (Total)	Filtration, Phenol/Hypochlorite Colorimetry. Discrete analyser. APHA method 4500-NH_3 F (modified).
NNN	Nitrite/Nitrate Nitrogen	Automated Cadmium reduction. Flow injection analyser. APHA method 4500 – NO_3 I (modified)
NO_3-N	Nitrate nitrogen	Calculation: (Nitrate-N + Nitrite –N) – Nitrite - N
pH	pH	Lab Meter @ 25°C. APHA method 4500-H^+ B
TDS	Total dissolved solids	Filtration, gravimetric. APHA 2540 C (modified)
TEMP	Temperature	Field measurement (Hach DO meter, model HQ 30d)
TKN	Total Kjeldahl-Nitrogen	Acid digestion. Phenol/Hypochlorite colorimetry. Discrete analyser. APHA method 4500-N_{org} D (modified), 4500 NH3 F (modified)
TOC	Total Organic Carbon	Acidification, purging to remove inorganic C, persulphate oxidation, IR detection. APHA method 5310 C (modified)
TN	Total Nitrogen	Calculated from NNN + TKN (Nitrite/Nitrate Nitrogen + Total Kjeldahl-Nitrogen)
TP	Total Phosphorus	Acid persulphate digestion, Colorimetry. Discrete Analyser. APHA method 4500-P B & E (modified), corrected values to take into account possible interference from arsenic present in the sample.
TURB	Turbidity	Turbidity Meter Hach 2100N. APHA method 2130 B

[1] Water quality parameter identification code refers to Waikato Regional Council's water quality database (WISKI) parameter short name.

APHA = Standards Methods for the Examination of Water and Wastewater, 22nd Edition, 2012, APHA, AWWA, WEF

ICP-MS = Inductively Coupled Plasma – Mass Spectroscopy