DWMS Annual Report 2019

Date: December 2020

DWMS Annual Report 2019

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Executive Summary

Water suppliers in New South Wales (NSW) are required to establish and adhere to a 'quality assurance program', referred to as a Drinking Water Management System (DWMS). An annual review of the DWMS is recommended to ensure that it is valid and being implemented effectively. Furthermore, an annual report is required to be prepared and submitted to the local Public Health Unit (PHU), NSW Health.

Viridis Consultants P/L (Viridis) was engaged by NSW Health on behalf of Snowy Valleys Council (SVC) to prepare the DWMS Annual Report for the 2019 reporting period.

SVC is responsible for treating and distributing water to:

- Batlow Township
- Brungle Township
- Khancoban Township
- Talbingo Township
- Tumbarumba Township
- Tumut Township
- Morgans Reserve- Cloverdale
- Adelong Township.

All schemes were typically compliant with the Australian Drinking Water Guidelines (ADWG) health-based guidelines other than one *E. coli* detection in Talbingo of the 12th of February and metal detections in Tumut.

The CCPs generally performed well in 2019 with limited critical limit breaches. Three complaints were received in the reporting period, which were largely due to the boil water notice issued in February 2019.

1. Introduction

Water suppliers in New South Wales (NSW) are required to establish and adhere to a 'quality assurance program', referred to as a Drinking Water Management System (DWMS). The DWMS is a risk-based approach to managing drinking water quality.

An annual review of the DWMS is recommended to ensure that it is valid and is being implemented effectively. In addition, an Annual Report is required to be prepared and submitted to the local Public Health Unit (PHU), NSW Health.

NSW Health has engaged Viridis Consultants P/L (Viridis) on behalf of Snowy Valleys Council (SVC) to prepare the DWMS Annual Report for 2019 reporting period.

This report covers a 12-month reporting period from 1 January 2019 to 31 December 2019. It summarises SVC's drinking water quality performance for the reporting period, outcomes of the DWMS annual review undertaken and progress on the implementation of the improvement plan.

2. Supply Schemes

SVC operates and manages the following drinking water supply schemes, as outlined in Table 1 below.

Table 1 Council's Drinking Water Supply Schemes

Scheme Name	Primary Source	Treatment Processes	Serviced Areas
Batlow	Kunama Dam (via Little Gilmore Creek)	• Flocculation • Ultrafiltration • Disinfection (chlorine gas) • Fluoridation (sodium fluoride) • Storage (Batlow Reservoir)	Batlow Township
Brungle	Nimbo Creek	• Limestone Contact Tank (optional) • Microfiltration • Disinfection (sodium hypochlorite) • Storage (Brungle Reservoir)	Brungle Township
Khancoban	Khancoban Creek	• Course filtration (offline) • Disinfection (chlorine gas) • Storage	Khancoban Township
Talbingo	Jounama Creek	• Flocculation • Sand Filtration • Disinfection (chlorine gas) • Storage (high level and low level reservoir	Talbingo Township
Tumbarumba	• Tumbarumba Creek • Burra Creek • McKeenin Street and Common Bore	• Flocculation • Sand Filtration • Fluoridation (sodium fluoride) • Disinfection (chlorine gas)	Tumbarumba Township
Tumut	Tumut River	• Powdered activated carbon (optional) • Flocculation • Fluoridation (sodium fluoride) • Sand Filtration	• Tumut Township • Morgans Reserve- Cloverdale • Adelong Township

Scheme Name	Primary Source	Treatment Processes	Serviced Areas
		• Disinfection (chlorine gas) • Adelong Rechlorination (chlorine gas)	

3. Scheme Changes

The scheme changes are discussed in this section.

3.1. Batlow Scheme

There were no significant process changes to the scheme, including for catchment characteristics, treatment processes, chemicals used and the distribution network.

3.2. Brungle Scheme

There were no significant process changes to the scheme, including for catchment characteristics, treatment processes, chemicals used and the distribution network.

3.3. Khancoban Scheme

There were no significant process changes to the scheme, including for catchment characteristics, treatment processes, chemicals used and the distribution network.

3.4. Talbingo Scheme

There were no significant process changes to the scheme, including for catchment characteristics, treatment processes, chemicals used and the distribution network.

3.5. Tumbarumba Scheme

There were no significant process changes to the scheme, including for catchment characteristics, treatment processes, chemicals used and the distribution network.

3.6. Tumut Scheme

There were no significant process changes to the scheme, including for catchment characteristics, treatment processes, chemicals used and the distribution network.

4. Critical Control Points

CCP implementation is discussed in this section.

4.1. Batlow

The current CCPs for the Batlow scheme are presented in Table 2.

Table 2 Batlow Scheme CCPs

Critical Control Point	Parameter	Operational Target	Adjustment Limit	Critical Limit
Batlow CCP 1: Filtration	Turbidity	<0.2 NTU	>0.2 NTU	>0.5 NTU
	TMP	TMP -60 to -30 kPa	-30 <= TMP <-25 kPa	TMP >= -25 kPa
Batlow CCP 2: Primary Disinfection	pH	pH 7.5 - 7.8	pH <7.5 or >7.8 for >24 hours	pH >8.2 (instantaneous)
	Turbidity	Turbidity <0.3 NTU	Turbidity >0.5 NTU (instantaneous)	Turbidity >1.0 NTU (instantaneous)
	Chlorine residual	Free Chlorine 0.7 - 1.0 mg/L	Free chlorine <0.7 mg/L or >1 mg/L (instantaneous)	Free chlorine <0.3 mg/L or >1.5 mg/L (instantaneous)
Batlow CCP 3: Fluoridation	Fluoride	0.9 - 1.1 mg/L	<0.9 mg/L or >1.1 mg/L (instantaneous)	<0.9 mg/L for greater than 72 hours or >1.5 mg/L (instantaneous)*
Batlow CCP 4: Distribution Reservoirs	Reservoir integrity	Vermin proof	Evidence of integrity breach	Integrity breach not rectified
		Secure and leak proof	Evidence of security breach	Security breach not rectified

Table 3 Batlow CCP Data Analysis

	Min	5th %ile	Mean	95th %ile	Max	Count
Filtered Turbidity (NTU)	0.04	0.05	0.074	0.1	0.22	224
Turbidity (NTU)	0.05	0.08	0.117	0.2	0.96	328
Fluoride Reading (mg/l)	0.68	0.79	0.950	1.0745	1.25	332
pH To Town	6.6	7.26	7.720	8.1	8.6	333
Free Residual Chlorine (mg/l)	0.53	0.68	0.862	1.03	1.22	334

Filter performance was typically good with only one alert. Chlorine was typically maintained within limits with no critical control breaches. Though the mean for fluoride was typically at target, there were numerous critical low breaches, however, there were no critical high breaches.

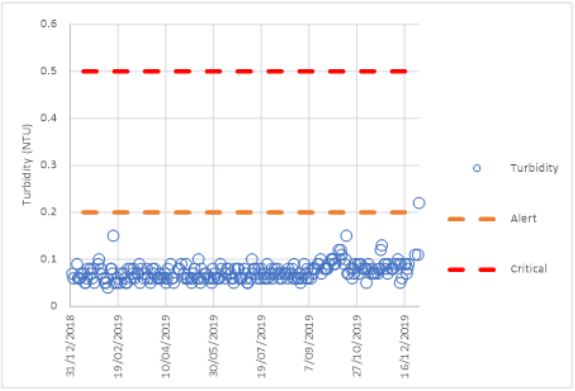

Figure 1 Batlow CCP1: Turbidity

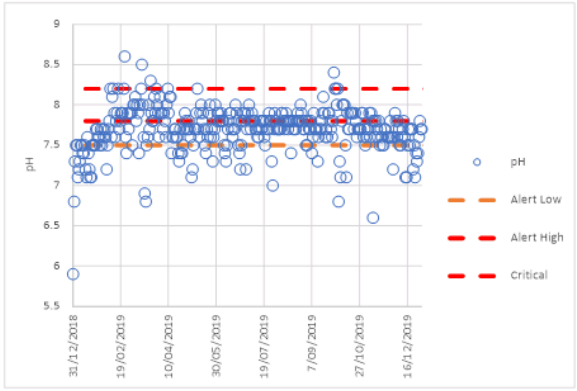

Figure 2 Batlow CCP2: pH

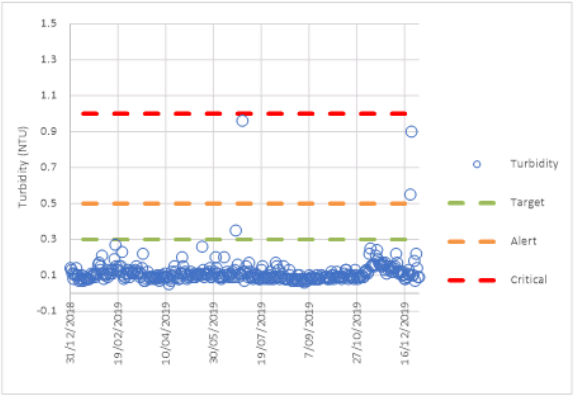

Figure 3 Batlow CCP2: Turbidity

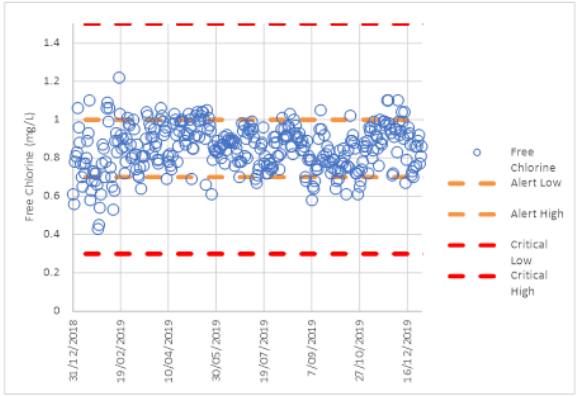

Figure 4 Batlow CCP2: Free Chlorine

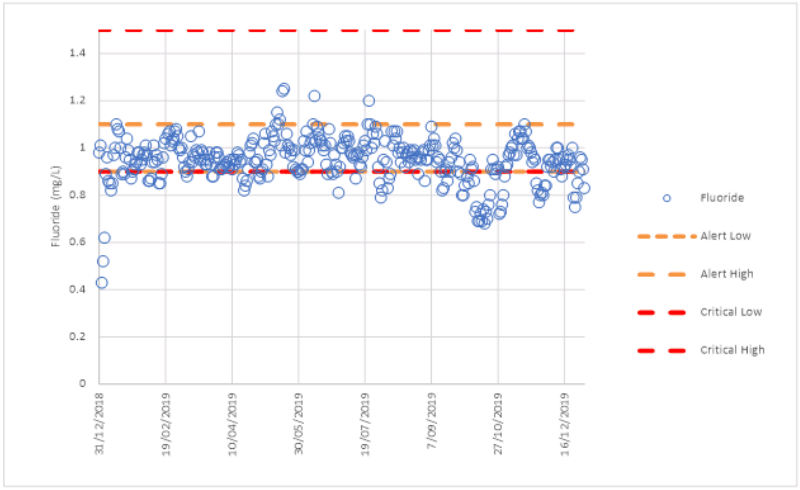

Figure 5 Batlow CCP3: Fluoride

4.2. Brungle

Table 4 Brungle Scheme CCPs

Critical Control Point	Parameter	Operational Target	Adjustment Limit	Critical Limit
Brungle CCP 1: Filtration	Turbidity	<0.4 NTU	>0.4 NTU (instantaneous)	>0.4 NTU after 24 hours
	TMP	50 kPa	70 kPa	>150 kPa
Brungle CCP 2: Primary Disinfection	pH	pH 7.5 - 7.8	pH <7.5 or >7.8 for >24 hours	pH >8.2 (instantaneous)
	Turbidity	Turbidity <0.3 NTU	Turbidity >0.5 NTU (instantaneous)	Turbidity >1.0 NTU (instantaneous)
	Chlorine residual	Free Chlorine 0.7 - 1.0 mg/L	Free chlorine <0.7 mg/L or > 1 mg/L (instantaneous)	Free chlorine <0.3 mg/L or >1.5 mg/L (instantaneous)
Brungle CCP 3: Distribution Reservoirs	Reservoir integrity	Vermin proof	Evidence of integrity breach	Integrity breach not rectified
		Secure and leak proof	Evidence of security breach	Security breach not rectified

Table 5 Brungle CCP Data Analysis

	Min	5th %ile	Mean	95th %ile	Max	Count
CCP 1: Turbidity (NTU)	0.06	0.078	0.173	0.358	0.68	97
CCP 2: pH	7.4	7.466	7.779	8.14	8.2	97
CCP 2: Turbidity (NTU)	0.016	0.078	0.166	0.306	0.41	97
CCP 2: Chlorine Residual (mg/L)	0.2	0.55	1.212	1.892	2.4	97

Filtered water turbidity has exceeded the alert/critical limit twice (1/03 and 23/08). Disinfection turbidity and pH have predominantly remained within limits. Chlorine residual is typically greater than the alert limit.

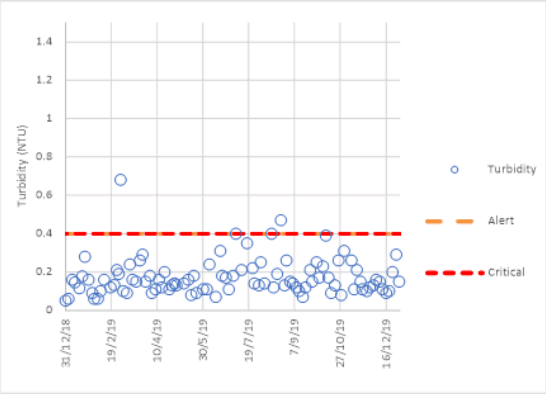

Figure 6 Brungle CCP1: Filtered Water Turbidity

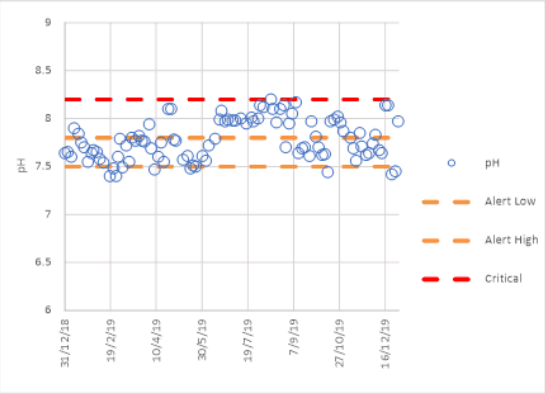

Figure 7 Brungle CCP2: pH

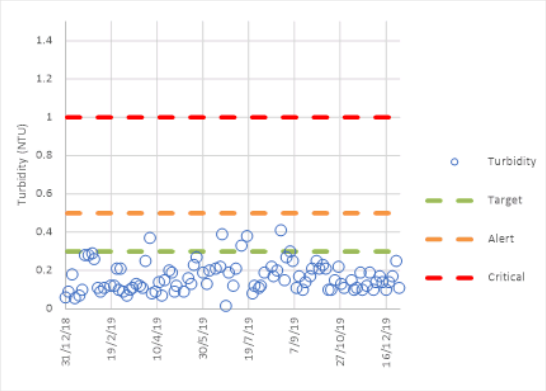

Figure 8 Brungle CCP2: Turbidity

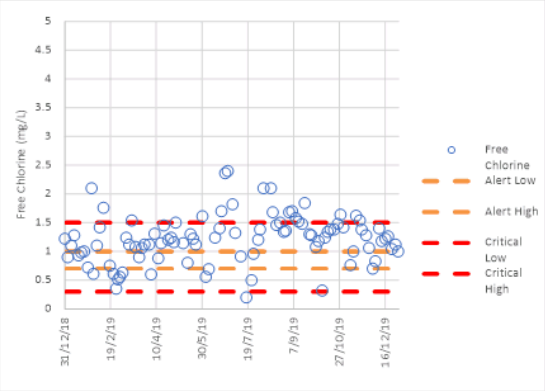

Figure 9 Brungle CCP2: Free Chlorine

4.3. Khancoban

Table 6 Khancoban Scheme CCPs

Critical Control Point	Parameter	Operational Target	Adjustment Limit	Critical Limit
Khancoban CCP 1: Primary Disinfection	Chlorine residual	0.6 mg/L – 1 mg/L	< 0.5 mg/L or > 2 mg/L	< 0.3 mg/L > 24 hr or 5 mg/L
Khancoban CCP 2: Distribution Reservoirs	Reservoir integrity	Vermin proof	Evidence of integrity breach	Integrity breach not rectified
		Secure and leak proof	Evidence of security breach	Security breach not rectified

Table 7 Khancoban CCPs Data Analysis

	Min	5th %ile	Mean	95th %ile	Max	Count
Chlorine Residual Balance Tank	0.28	0.68	1.042192	1.468	1.89	365

Chlorine residual has typically remained within limits with one low critical breach (30/03).

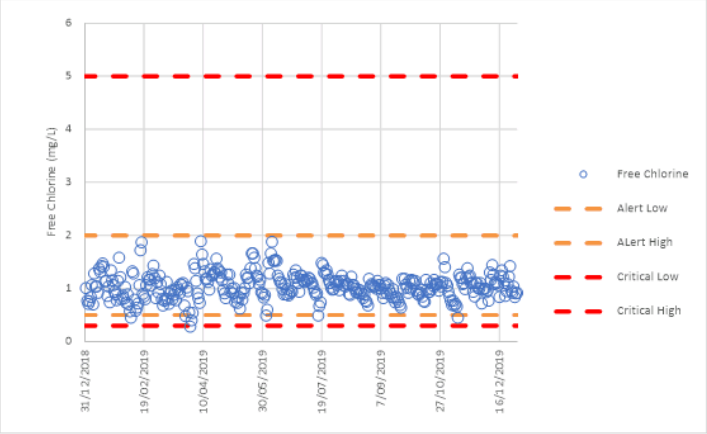

Figure 10 Khancoban Balance Tank Free Chlorine

4.4. Talbingo

Table 8 Talbingo Scheme CCPs

Critical Control Point	Parameter	Operational Target	Adjustment Limit	Critical Limit
Talbingo CCP 1: Filtration	Turbidity	<0.1 NTU	>0.2 NTU (instantaneous)	>0.8 NTU for 15 minutes
Talbingo CCP 2: Primary Disinfection	pH	pH 7.5 - 7.8	pH <7.5 or >7.8 for >24 hours	pH >8.2 (instantaneous)
	Turbidity	Turbidity <0.3 NTU	Turbidity >0.5 NTU (instantaneous)	Turbidity >1.0 NTU (instantaneous)
	Chlorine residual	Free Chlorine 0.7 - 1.0 mg/L	Free chlorine <0.7 mg/L or >1 mg/L (instantaneous)	Free chlorine <0.3 mg/L or >1.5 mg/L (instantaneous)
Talbingo CCP 3: Distribution Reservoirs	Reservoir integrity	Vermin proof	Evidence of integrity breach	Integrity breach not rectified
		Secure and leak proof	Evidence of security breach	Security breach not rectified

Table 9 Talbingo CCP Data Analysis

	Min	5th %ile	Mean	95th %ile	Max	Count
CCP1: Turbidity	0.046	0.056	0.115609	0.2193	0.804	115
CCP 2: pH	7.49	7.58	7.784219	8.028	8.36	365

CCP 2: Turbidity (NTU)	0.063	0.068	0.090036	0.1416	0.271	365
CCP 2: Chlorine Residual	0.45	0.58	0.830493	1.05	1.61	365

There was one critical limit breach for post filter turbidity. Treated water turbidity was consistently low and treated water pH exceeded its critical limit once (8/02). Free chlorine typically remained within critical limits with one critical high (8/02).

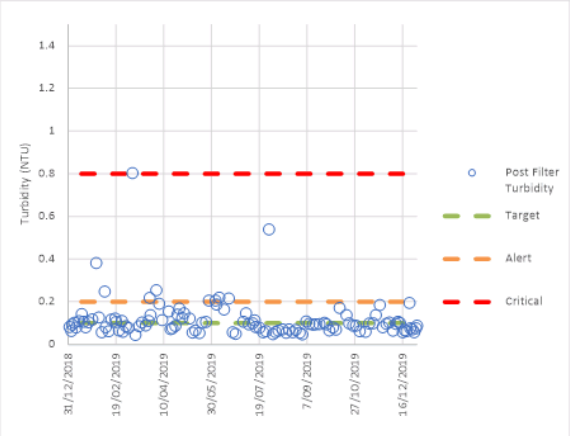

Figure 11 Talbingo CCP1: Post Filter Turbidity

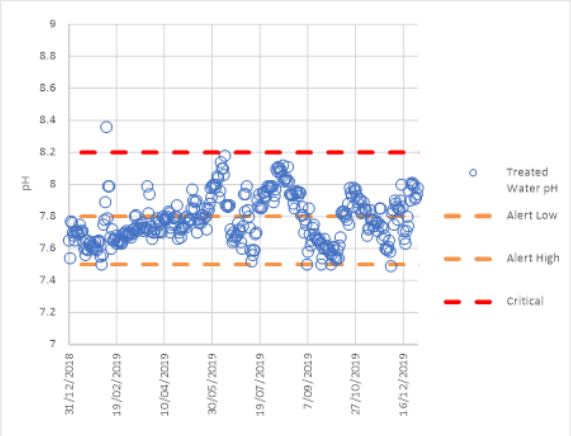

Figure 12 Talbingo CCP2: Treated Water pH

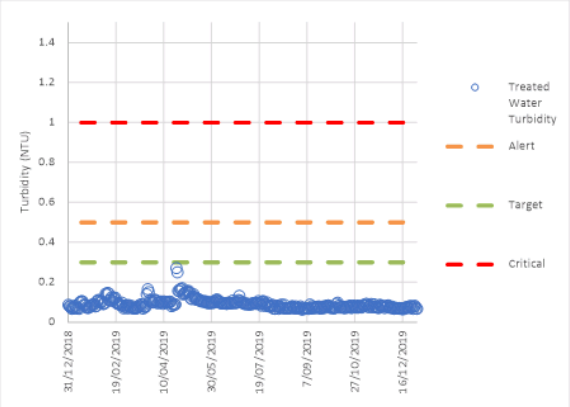

Figure 13 Talbingo CCP2: Treated Water Turbidity

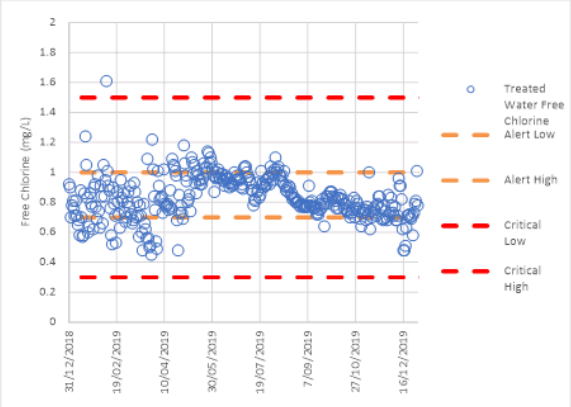

Figure 14 Talbingo CCP2: Treated Water Free Chlorine

4.5. Tumbarumba

Table 10 Tumbarumba Scheme CCPs

Critical Control Point	Parameter	Operational Target	Adjustment Limit	Critical Limit
Tumbarumba CCP 1: Filtration	Turbidity	<0.2 NTU	0.4 NTU	>0.5 NTU
Tumbarumba CCP 2: Primary Disinfection	Chlorine residual	Free Chlorine 0.6 mg/L	Free chlorine <0.45 mg/L or >1.2 mg/L (instantaneous)	Free chlorine <0.3 mg/L or >1.5 mg/L (instantaneous)
Tumbarumba CCP 3: Fluoridation	Fluoride	0.9 - 1.1 mg/L	<0.9 mg/L or >1.1 mg/L (instantaneous)	<0.9 mg/L for greater than 72 hours or >1.5 mg/L (instantaneous)*
Tumbarumba CCP 4: Distribution Reservoirs	Reservoir integrity	Vermin proof	Evidence of integrity breach	Integrity breach not rectified
		Secure and leak proof	Evidence of security breach	Security breach not rectified

Table 11 Tumbarumba CCPs Data Analysis

	Min	5th %ile	Mean	95th %ile	Max	Count
CCP1: Filter 1 Turbidity	0.0195	0.0202	0.0658	0.1868	1.4361	1096
CCP2: Filter 2 Turbidity	0.0165	0.0210	0.0701	0.1953	1.6867	1097
CCP2: Chlorine Residual	0.23	0.4845	0.7088	0.9355	1.68	330
CCP3: Fluoride	0.707	0.8549	0.9933	1.1162	1.227	330

There were two instances of periods of filter breakthrough in February and August. Chlorine residual had one critical low limit exceedance. Fluoride fell below its critical limit for several days at various points throughout the year, likely indicating critical limit breaches.

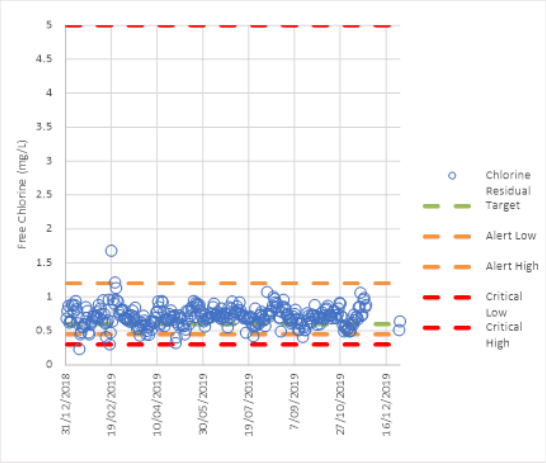

Figure 15 Tumbarumba CCP2: Chlorine Residual

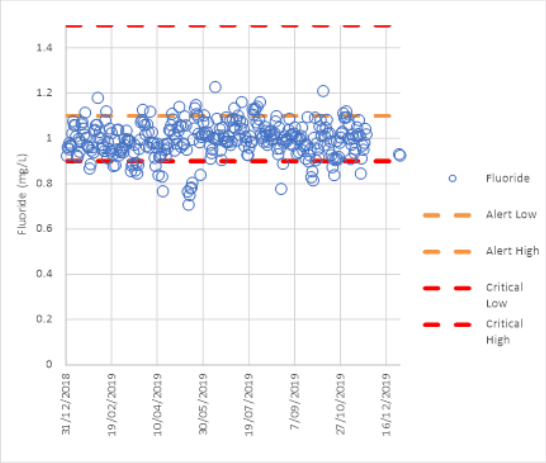

Figure 16 Tumbarumba CCP3: Fluoride

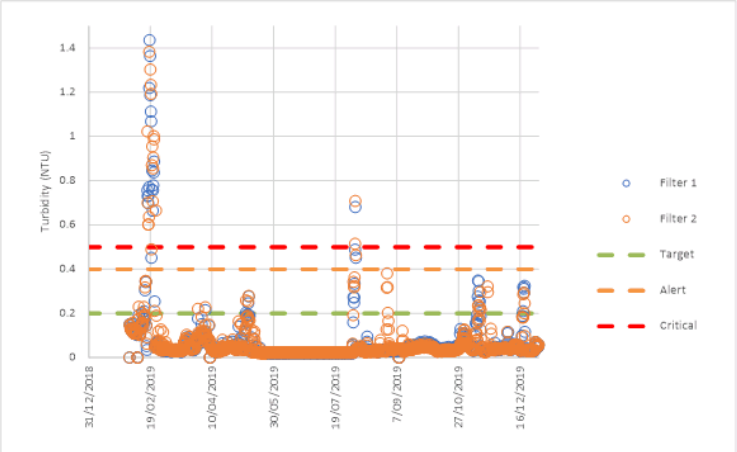

Figure 17 Tumbarumba CCP1: Filter Turbidity

4.6. Tumut

Table 12 Tumut Scheme CCPs

Critical Control Point	Parameter	Operational Target	Adjustment Limit	Critical Limit
Tumut OCP 1: Raw Water Extraction	Turbidity, rainfall	<1 NTU	-	Operator adjustable
		No rain event	Rain event or forecast of rain event	
Tumut CCP 2: Filtration	Turbidity, rainfall	<0.2 NTU	>0.5 NTU	>1 NTU
Tumut CCP 3: Primary Disinfection	pH	pH 7.5 - 7.8	pH <7.5 or >7.8 for >24 hours	pH >8.2 (instantaneous)
	Turbidity	Turbidity <0.3 NTU	Turbidity >0.5 NTU (instantaneous)	Turbidity >1.0 NTU (instantaneous)
	Chlorine residual	Free Chlorine 0.7 - 1.0 mg/L	Free chlorine <0.7 mg/L or >1.2 mg/L (instantaneous)	Free chlorine <0.3 mg/L or >1.5 mg/L (instantaneous)
Tumut CCP 4: Fluoridation	Fluoride	0.9 - 1.1 mg/L	<0.9 mg/L or >1.1 mg/L (instantaneous)	<0.9 mg/L for greater than 72 hours or > 1.5 mg/L (instantaneous)
Tumut CCP 5: Distribution Reservoirs	Reservoir integrity	Vermin proof	Evidence of integrity breach	Integrity breach not rectified
		Secure and leak proof	Evidence of security breach	Security breach not rectified

Table 13 Tumut CCPs Data Analysis

	Min	5th %ile	Mean	95th %ile	Max	Count
OCP1: Raw Water Turbidity	0.709	0.888	2.884	8.388	90	365
CCP2: Average Filter Turbidity	0.059	0.072	0.177	0.429	0.707	357
CCP3: Filtered Water Turbidity	0.016	0.0732	0.181	0.4432	0.702	365
CCP3: Treated Water pH	7	7.14	7.414	7.81	8.8	364
CCP3: Treated Water Residual Chlorine	0.6	0.78	1.084	1.456	1.8	365
CCP4: Treated Water Fluoride	0.83	0.9	1.023	1.12	1.2	335

There were no turbidity critical limit exceedances. pH for disinfection low typically low and free chlorine has breached its high critical limit several times. There were low fluoride limits early in the year with improved performance after March.

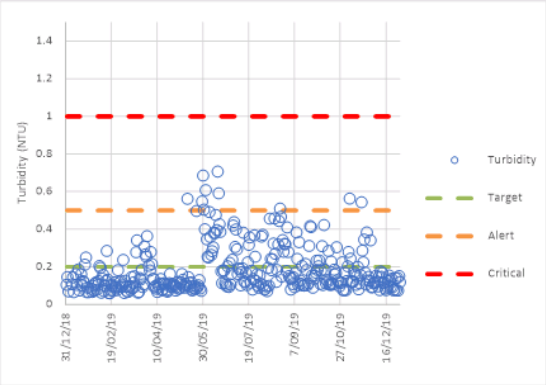

Figure 18 Tumut CCP2: Average Filter Turbidity

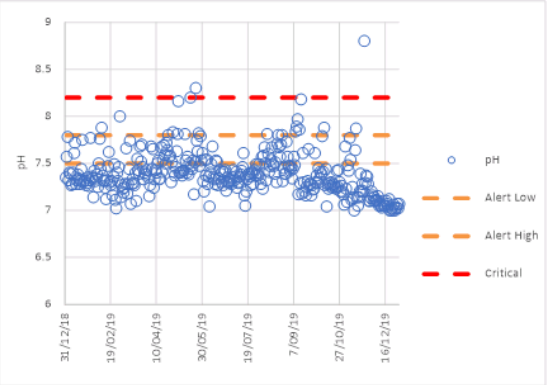

Figure 19 Tumut CCP3: Treated Water pH

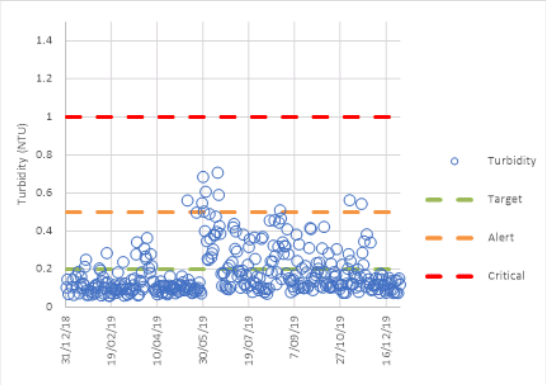

Figure 20 Tumut CCP3: Filtered Water Turbidity

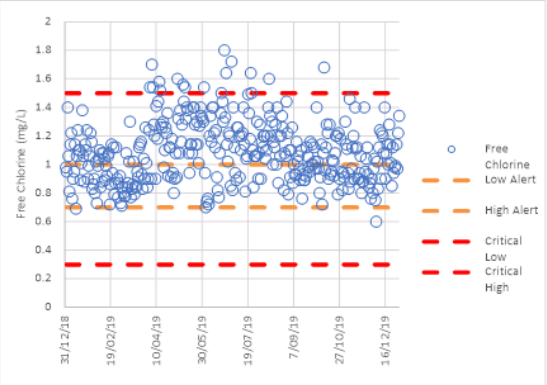

Figure 21 Tumut CCP3: Treated Water Free Chlorine

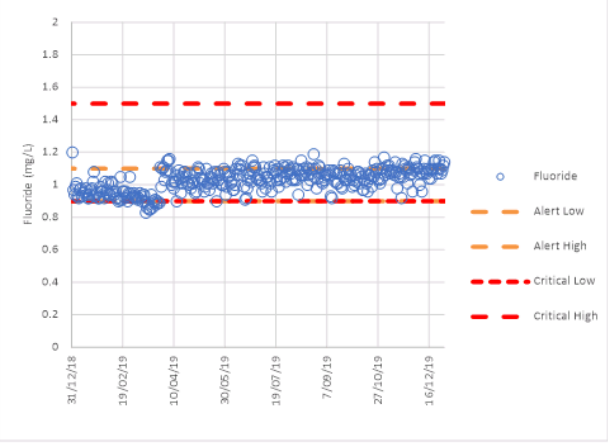

Figure 22 Tumut CCP4: Fluoride

5. Reservoir Integrity

Maintaining the integrity of the distribution system is an important barrier in keeping the supply safe from potential recontamination. This includes ensuring that the service reservoirs are not vulnerable to contamination, for example, by vermin, birds or rainwater runoff ingress.

SVC has a CCP for reservoir integrity.

6. Incidents Reported to NSW Health

There was one *E. coli* detection on 12/02/2019 at 29 Groves Street for the Talbingo Scheme.

Section 7 includes more details on verification monitoring.

7. Verification Monitoring Performance

Verification of drinking water quality provides an assessment of the overall performance of the system and the ultimate quality of drinking water being supplied to consumers. This incorporates monitoring drinking water quality as well as assessment of consumer satisfaction.

7.1. Reticulation Water Quality Monitoring

Drinking water quality monitoring is a wide-ranging assessment of the quality of water in the reticulation or distribution system and importantly, as supplied to the consumer. It includes regular sampling and testing to assess whether water quality is complying with ADWG guideline values. Monitoring of drinking water is regarded as the final check that, overall, the barriers and preventive measures implemented to protect public health are working effectively.

All schemes were 100% compliant with health guidelines other than:

- Talbingo had an E. *coli* and Total Coliforms detection on the 12th February.
- Khancoban had a total coliforms detected on the 5th February and thermotolerant coliforms on the 12th February.
- In Batlow low fluoride and free chlorine were ongoing issues in the reticulation.
- Tumbarumba had a thermotolerant coliforms detection on the 12th February and 1 instance of high aluminium, however, this is an aesthetic limit and does not present a health risk. In February 2019, a precautionary boil water notice was issued in response to issues with the filters.
- On the 2nd October Tumut had Chromium, Molybdenum and Nickel detections.

7.2. Water Quality Customer Complaints

Monitoring of consumer complaints can provide valuable information on potential problems that may not have been identified by performance monitoring of the water supply system. Consumer satisfaction with drinking water quality is largely based on a judgment that the aesthetic quality of tap water is 'good', which usually means that it is colourless, free from suspended solids and has no unpleasant taste or odour.

Three complaints were received in the reporting period, which were largely due to the boil water notice issued in February 2019.

8. Improvement Plan Implementation

An Improvement Plan is part of a management system and demonstrates the continual improvement process in place for an organisation. SVC has an Improvement Plan, which is part of their DWMS.

8.1. Status

The Improvement Plan was reviewed and updated during the preparation of this Annual Report. Refer to Appendix B for detailed progress of the Improvement Plan, including commentary.

8.2. New Additions

The Improvement Plan was fully reviewed in 2020 as part of the risk assessment review.

9. DWMS Review Outcomes

The NSW Guidelines for DWMS require that all water suppliers review their DWMS and major components on an annual basis. This is to ensure that the DWMS is managed as a quality system and to demonstrate continuous review and improvement of the system.

In June 2020, the SVC risk assessment was fully reviewed for all water supply systems, in consultation with NSW Health and DPIE Water. The risk assessment process included a comprehensive water quality data analysis, review of process flow diagrams, CCPs and catchment characteristics. Some key outcomes included:

- revising critical limits for filtered water turbidity
- development of procedures for operational correction.

The improvement plan was fully updated with new recommendations added as a result of the risk assessment review.

10. DWMS Audit Outcomes

There was no formal audit undertaken for DWMS implementation over the reporting period. The external audit frequency will be implemented as guided by NSW Health.

Glossary

Word	Description
ADWG	Australian Drinking Water Guidelines
CCP	Critical Control Point
DWMS	Drinking Water Management System
NSW	New South Wales
NTU	Nephelometric Turbidity Units
pH	An expression of the intensity of the basic or acid condition of a liquid. Natural waters usually have a pH between 6.5 and 8.5
PHU	Public Health Unit
WTP	Water Treatment Plant

Appendix A

Reticulation Water Quality Monitoring

19NS16.1-REC-20-199-1.0
December 2020

Table 14 Batlow Verification Monitoring

Analysis Type	Characteristic	Guideline Value	Units	Mean	Median	Standard Deviation	Min	Max	Sample Count	Exception Count	95th Percentile	5th Percentile	% meeting guideline values
Chemistry													
	Aluminium	0.2000	mg/L	0.0250	0.0250	0.0212	0.01	0.04	2	0	0.04	0.01	100.00
	Antimony	0.0030	mg/L	0.0005	0.0005	0.0000	0	0.0005	2	0	0.0005	0.0005	100.00
	Arsenic	0.0100	mg/L	0.0005	0.0005	0.0000	0	0.0005	2	0	0.0005	0.0005	100.00
	Barium	2.0000	mg/L	0.0075	0.0075	0.0007	0.01	0.008	2	0	0.008	0.007	100.00
	Boron	4.0000	mg/L	0.0500	0.0500	0.0000	0.05	0.05	2	0	0.05	0.05	100.00
	Cadmium	0.0020	mg/L	0.0003	0.0003	0.0000	0	0.00025	2	0	0.00025	0.00025	100.00
	Calcium	10000.0000	mg/L	7.5000	7.5000	5.5154	3.6	11.4	2	0	11.4	3.6	100.00
	Chloride	250.0000	mg/L	5.5000	5.5000	0.7071	5	6	2	0	6	5	100.00
	Chromium	0.0500	mg/L	0.0025	0.0025	0.0000	0	0.0025	2	0	0.0025	0.0025	100.00
	Copper	2.0000	mg/L	0.0808	0.0808	0.1107	0	0.159	2	0	0.159	0.0025	100.00
	Fluoride	1.5000	mg/L	0.9300	0.9300	0.1273	0.84	1.02	2	0	1.02	0.84	100.00
	Iodine	0.5000	mg/L	0.0100	0.0100	0.0000	0.01	0.01	2	0	0.01	0.01	100.00
	Iron	0.3000	mg/L	0.0075	0.0075	0.0035	0.01	0.01	2	0	0.01	0.005	100.00
	Lead	0.0100	mg/L	0.0010	0.0010	0.0000	0	0.001	2	0	0.001	0.001	100.00
	Magnesium	10000.0000	mg/L	1.3600	1.3600	0.8627	0.75	1.97	2	0	1.97	0.75	100.00
	Manganese	0.5000	mg/L	0.0063	0.0063	0.0053	0	0.01	2	0	0.01	0.0025	100.00
	Mercury	0.0010	mg/L	0.0001	0.0001	0.0000	0	0.00005	2	0	0.00005	0.00005	100.00
	Molybdenum	0.0500	mg/L	0.0025	0.0025	0.0000	0	0.0025	2	0	0.0025	0.0025	100.00
	Nickel	0.0200	mg/L	0.0075	0.0075	0.0035	0.01	0.01	2	0	0.01	0.005	100.00
	Nitrate	50.0000	mg/L	0.7500	0.7500	0.3536	0.5	1	2	0	1	0.5	100.00
	Nitrite	3.0000	mg/L	0.0500	0.0500	0.0000	0.05	0.05	2	0	0.05	0.05	100.00
	pH	6.5 - 8.5		7.4500	7.4500	0.3536	7.2	7.7	2	0	7.7	7.2	100.00
	Selenium	0.0100	mg/L	0.0010	0.0010	0.0000	0	0.001	2	0	0.001	0.001	100.00
	Silver	0.1000	mg/L	0.0010	0.0010	0.0000	0	0.001	2	0	0.001	0.001	100.00
	Sodium	180.0000	mg/L	20.5000	20.5000	####	4	37	2	0	37	4	100.00
	Sulfate	500.0000	mg/L	0.7500	0.7500	0.3536	0.5	1	2	0	1	0.5	100.00
	Total Dissolved Solids (TDS)	600.0000	mg/L	25.0000	25.0000	2.8284	23	27	2	0	27	23	100.00
	Total Hardness as CaCO3	200.0000	mg/L	24.3500	24.3500	####	12.1	36.6	2	0	36.6	12.1	100.00
	True Colour	15.0000	Hazen Units (HU)	0.5000	0.5000	0.0000	0.5	0.5	2	0	0.5	0.5	100.00
	Turbidity	5.0000	NTU	0.9500	0.9500	0.2121	0.8	1.1	2	0	1.1	0.8	100.00
	Uranium	0.0170	mg/L	0.0025	0.0025	0.0000	0	0.0025	2	0	0.0025	0.0025	100.00
	Zinc	3.0000	mg/L	0.0075	0.0075	0.0035	0.01	0.01	2	0	0.01	0.005	100.00
Fluoride Barcode													
	Fluoride	1.5000	mg/L	0.8636	0.8900	0.0863	0.68	1	11	0	1	0.68	100.00
	Fluoride (WU result)	1.5000	mg/L	1.0300	1.0300	0.0000	1.03	1.03	1	0	1.03	1.03	100.00
	Fluoride Ratio	0.8 - 1.2		1.2000	1.2000	0.0000	1.2	1.2	1	0	1.2	1.2	100.00
Microbiology													
	E. coli	0.0000	mpn/100 mL	0.0000	0.0000	0.0000	0	0	48	0	0	0	100.00
	Free Chlorine	0.2 - 5	mg/L	0.5135	0.4800	0.2651	0.04	1.01	48	6	0.95	0.1	87.50
	pH	6.5 - 8.5		7.6347	7.6050	0.2187	7.24	8.12	32	0	8.1	7.27	100.00
	Total Chlorine	5.0000	mg/L	0.6133	0.5750	0.2862	0.04	1.09	42	0	1.05	0.14	100.00
	Total Coliforms	0.0000	mpn/100 mL	0.0000	0.0000	0.0000	0	0	48	0	0	0	100.00
	Turbidity	5.0000	NTU	0.2013	0.1700	0.1532	0.02	0.84	32	0	0.4	0.03	100.00
Operational Monitoring													
	Fluoride (daily WU)	0.9 - 1.5	mg/L	0.9462	0.9500	0.0977	0.43	1.25	365	83	1.08	0.77	77.26
	Fluoride (weekly WU)	0.9 - 1.5	mg/L	0.9064	0.9200	0.0820	0.47	1.05	86	29	1.01	0.79	66.28

Table 15 Brungle Verification Monitoring

Analysis Type	Characteristic	Guideline Value	Units	Mean	Median	Standard Deviation	Min	Max	Sample Count	Exception Count	95th Percentile	5th Percentile	% meeting guideline values
Chemistry													
	Aluminium	0.2000	mg/L	0.0075	0.0075	0.0035	0.01	0.01	2	0	0.01	0.005	100.00
	Antimony	0.0030	mg/L	0.0005	0.0005	0.0000	0	0.0005	2	0	0.0005	0.0005	100.00
	Arsenic	0.0100	mg/L	0.0005	0.0005	0.0000	0	0.0005	2	0	0.0005	0.0005	100.00
	Barium	2.0000	mg/L	0.0060	0.0060	0.0000	0.01	0.006	2	0	0.006	0.006	100.00
	Boron	4.0000	mg/L	0.0500	0.0500	0.0000	0.05	0.05	2	0	0.05	0.05	100.00
	Cadmium	0.0020	mg/L	0.0003	0.0003	0.0000	0	0.00025	2	0	0.00025	0.00025	100.00
	Calcium	10000.0000	mg/L	4.5500	4.5500	2.3335	2.9	6.2	2	0	6.2	2.9	100.00
	Chloride	250.0000	mg/L	3.0000	3.0000	0.0000	3	3	2	0	3	3	100.00
	Chromium	0.0500	mg/L	0.0025	0.0025	0.0000	0	0.0025	2	0	0.0025	0.0025	100.00
	Copper	2.0000	mg/L	0.0180	0.0180	0.0156	0.01	0.029	2	0	0.029	0.007	100.00
	Fluoride	1.5000	mg/L	0.0500	0.0500	0.0000	0.05	0.05	2	0	0.05	0.05	100.00
	Iodine	0.5000	mg/L	0.0100	0.0100	0.0000	0.01	0.01	2	0	0.01	0.01	100.00
	Iron	0.3000	mg/L	0.0075	0.0075	0.0035	0.01	0.01	2	0	0.01	0.005	100.00
	Lead	0.0100	mg/L	0.0010	0.0010	0.0000	0	0.001	2	0	0.001	0.001	100.00
	Magnesium	10000.0000	mg/L	0.8800	0.8800	0.0283	0.86	0.9	2	0	0.9	0.86	100.00
	Manganese	0.5000	mg/L	0.0025	0.0025	0.0000	0	0.0025	2	0	0.0025	0.0025	100.00
	Mercury	0.0010	mg/L	0.0001	0.0001	0.0000	0	0.0001	2	0	0.0001	0.0001	100.00
	Molybdenum	0.0500	mg/L	0.0025	0.0025	0.0000	0	0.0025	2	0	0.0025	0.0025	100.00
	Nickel	0.0200	mg/L	0.0075	0.0075	0.0035	0.01	0.01	2	0	0.01	0.005	100.00
	Nitrate	50.0000	mg/L	0.5000	0.5000	0.0000	0.5	0.5	2	0	0.5	0.5	100.00
	Nitrite	3.0000	mg/L	0.0500	0.0500	0.0000	0.05	0.05	2	0	0.05	0.05	100.00
	pH	6.5 - 8.5		7.4500	7.4500	0.0707	7.4	7.5	2	0	7.5	7.4	100.00
	Selenium	0.0100	mg/L	0.0010	0.0010	0.0000	0	0.001	2	0	0.001	0.001	100.00
	Silver	0.1000	mg/L	0.0010	0.0010	0.0000	0	0.001	2	0	0.001	0.001	100.00
	Sodium	180.0000	mg/L	4.0000	4.0000	0.0000	4	4	2	0	4	4	100.00
	Sulfate	500.0000	mg/L	1.0000	1.0000	0.0000	1	1	2	0	1	1	100.00
	Total Dissolved Solids (TDS)	600.0000	mg/L	22.0000	22.0000	2.8284	20	24	2	0	24	20	100.00
	Total Hardness as CaCO3	200.0000	mg/L	14.9500	14.9500	5.7276	10.9	19	2	0	19	10.9	100.00
	True Colour	15.0000	Hazen Units (HU)	1.0000	1.0000	0.0000	1	1	2	0	1	1	100.00
	Turbidity	5.0000	NTU	1.4500	1.4500	1.4849	0.4	2.5	2	0	2.5	0.4	100.00
	Uranium	0.0170	mg/L	0.0025	0.0025	0.0000	0	0.0025	2	0	0.0025	0.0025	100.00
	Zinc	3.0000	mg/L	0.0075	0.0075	0.0035	0.01	0.01	2	0	0.01	0.005	100.00
Microbiology													
	E. coli	0.0000	mpn/100 mL	0.0000	0.0000	0.0000	0	0	34	0	0	0	100.00
	Free Chlorine	0.2 - 5	mg/L	0.7776	0.7900	0.4325	0.13	1.9	34	4	1.42	0.19	88.24
	pH	6.5 - 8.5		7.9035	8.0000	0.2499	7.37	8.23	23	0	8.2	7.57	100.00
	Total Chlorine	5.0000	mg/L	0.9460	0.9350	0.4583	0.13	1.94	30	0	1.63	0.19	100.00
	Total Coliforms	0.0000	mpn/100 mL	0.0000	0.0000	0.0000	0	0	34	0	0	0	100.00
	Turbidity	5.0000	NTU	0.1981	0.1500	0.1316	0.04	0.6	27	0	0.47	0.06	100.00

Table 16 Khancoban Verification Monitoring

Analysis Type	Characteristic	Guideline Value	Units	Mean	Median	Standard Deviation	Min	Max	Sample Count	Exception Count	95th Percentile	5th Percentile	% meeting guideline values
Chemistry													
	Aluminium	0.2000	mg/L	0.0300	0.0300	0.0000	0.03	0.03	1	0	0.03	0.03	100.00
	Antimony	0.0030	mg/L	0.0005	0.0005	0.0000	0	0.0005	1	0	0.0005	0.0005	100.00
	Arsenic	0.0100	mg/L	0.0005	0.0005	0.0000	0	0.0005	1	0	0.0005	0.0005	100.00
	Barium	2.0000	mg/L	0.0025	0.0025	0.0000	0	0.0025	1	0	0.0025	0.0025	100.00
	Boron	4.0000	mg/L	0.0500	0.0500	0.0000	0.05	0.05	1	0	0.05	0.05	100.00
	Cadmium	0.0020	mg/L	0.0003	0.0003	0.0000	0	0.00025	1	0	0.00025	0.00025	100.00
	Calcium	10000.0000	mg/L	2.3000	2.3000	0.0000	2.3	2.3	1	0	2.3	2.3	100.00
	Chloride	250.0000	mg/L	4.0000	4.0000	0.0000	4	4	1	0	4	4	100.00
	Chromium	0.0500	mg/L	0.0025	0.0025	0.0000	0	0.0025	1	0	0.0025	0.0025	100.00
	Copper	2.0000	mg/L	0.1290	0.1290	0.0000	0.13	0.129	1	0	0.129	0.129	100.00
	Fluoride	1.5000	mg/L	0.0500	0.0500	0.0000	0.05	0.05	1	0	0.05	0.05	100.00
	Iodine	0.5000	mg/L	0.0100	0.0100	0.0000	0.01	0.01	1	0	0.01	0.01	100.00
	Iron	0.3000	mg/L	0.0300	0.0300	0.0000	0.03	0.03	1	0	0.03	0.03	100.00
	Lead	0.0100	mg/L	0.0010	0.0010	0.0000	0	0.001	1	0	0.001	0.001	100.00
	Magnesium	10000.0000	mg/L	0.8500	0.8500	0.0000	0.85	0.85	1	0	0.85	0.85	100.00
	Manganese	0.5000	mg/L	0.0025	0.0025	0.0000	0	0.0025	1	0	0.0025	0.0025	100.00
	Mercury	0.0010	mg/L	0.0001	0.0001	0.0000	0	0.00005	1	0	0.00005	0.00005	100.00
	Molybdenum	0.0500	mg/L	0.0025	0.0025	0.0000	0	0.0025	1	0	0.0025	0.0025	100.00
	Nickel	0.0200	mg/L	0.0050	0.0050	0.0000	0.01	0.005	1	0	0.005	0.005	100.00
	Nitrate	50.0000	mg/L	0.5000	0.5000	0.0000	0.5	0.5	1	0	0.5	0.5	100.00
	Nitrite	3.0000	mg/L	0.0500	0.0500	0.0000	0.05	0.05	1	0	0.05	0.05	100.00
	pH	6.5 - 8.5		6.9000	6.9000	0.0000	6.9	6.9	1	0	6.9	6.9	100.00
	Selenium	0.0100	mg/L	0.0010	0.0010	0.0000	0	0.001	1	0	0.001	0.001	100.00
	Silver	0.1000	mg/L	0.0010	0.0010	0.0000	0	0.001	1	0	0.001	0.001	100.00
	Sodium	180.0000	mg/L	2.0000	2.0000	0.0000	2	2	1	0	2	2	100.00
	Sulfate	500.0000	mg/L	1.0000	1.0000	0.0000	1	1	1	0	1	1	100.00
	Total Dissolved Solids (TDS)	600.0000	mg/L	8.0000	8.0000	0.0000	8	8	1	0	8	8	100.00
	Total Hardness as CaCO3	200.0000	mg/L	9.2000	9.2000	0.0000	9.2	9.2	1	0	9.2	9.2	100.00
	True Colour	15.0000	Hazen Units (HU)	1.0000	1.0000	0.0000	1	1	1	0	1	1	100.00
	Turbidity	5.0000	NTU	0.0500	0.0500	0.0000	0.05	0.05	1	0	0.05	0.05	100.00
	Uranium	0.0170	mg/L	0.0025	0.0025	0.0000	0	0.0025	1	0	0.0025	0.0025	100.00
	Zinc	3.0000	mg/L	0.0100	0.0100	0.0000	0.01	0.01	1	0	0.01	0.01	100.00
Microbiology													
	E. coli	0.0000	mpn/100 mL	0.0000	0.0000	0.0000	0	0	23	0	0	0	100.00
	Free Chlorine	0.2 - 5	mg/L	0.7500	0.7800	0.2104	0.41	1.26	23	0	1.06	0.44	100.00
	pH	6.5 - 8.5		6.8961	6.8500	0.2190	6.6	7.7	23	0	7.2	6.7	100.00
	Temperature	30.0000	C	21.1429	22.0000	3.0237	17	26	7	0	26	17	100.00
	Thermotolerant Coliforms	0.0000	cfu/100 mL	0.5500	0.5500	0.0000	0.55	0.55	1	1	0.55	0.55	0.00
	Total Chlorine	5.0000	mg/L	0.8045	0.8400	0.2266	0.41	1.41	22	0	1.1	0.46	100.00
	Total Coliforms	0.0000	mpn/100 mL	0.0435	0.0000	0.2085	0	1	23	1	0	0	95.65
	Turbidity	5.0000	NTU	0.5488	0.5300	0.1505	0.38	0.8	8	0	0.8	0.38	100.00

Table 17 Talbingo Verification Monitoring

Analysis Type	Characteristic	Guideline Value	Units	Mean	Median	Standard Deviation	Min	Max	Sample Count	Exception Count	95th Percentile	5th Percentile	% meeting guideline values
Chemistry													
	Aluminium	0.2000	mg/L	0.0550	0.0550	0.0354	0.03	0.08	2	0	0.08	0.03	100.00
	Antimony	0.0030	mg/L	0.0005	0.0005	0.0000	0	0.0005	2	0	0.0005	0.0005	100.00
	Arsenic	0.0100	mg/L	0.0005	0.0005	0.0000	0	0.0005	2	0	0.0005	0.0005	100.00
	Barium	2.0000	mg/L	0.0070	0.0070	0.0028	0.01	0.009	2	0	0.009	0.005	100.00
	Boron	4.0000	mg/L	0.0500	0.0500	0.0000	0.05	0.05	2	0	0.05	0.05	100.00
	Cadmium	0.0020	mg/L	0.0003	0.0003	0.0000	0	0.00025	2	0	0.00025	0.00025	100.00
	Calcium	10000.0000	mg/L	5.9500	5.9500	1.7678	4.7	7.2	2	0	7.2	4.7	100.00
	Chloride	250.0000	mg/L	2.5000	2.5000	0.7071	2	3	2	0	3	2	100.00
	Chromium	0.0500	mg/L	0.0025	0.0025	0.0000	0	0.0025	2	0	0.0025	0.0025	100.00
	Copper	2.0000	mg/L	0.0025	0.0025	0.0000	0	0.0025	2	0	0.0025	0.0025	100.00
	Fluoride	1.5000	mg/L	0.0500	0.0500	0.0000	0.05	0.05	2	0	0.05	0.05	100.00
	Iodine	0.5000	mg/L	0.0100	0.0100	0.0000	0.01	0.01	2	0	0.01	0.01	100.00
	Iron	0.3000	mg/L	0.0150	0.0150	0.0071	0.01	0.02	2	0	0.02	0.01	100.00
	Lead	0.0100	mg/L	0.0010	0.0010	0.0000	0	0.001	2	0	0.001	0.001	100.00
	Magnesium	10000.0000	mg/L	0.6300	0.6300	0.3394	0.39	0.87	2	0	0.87	0.39	100.00
	Manganese	0.5000	mg/L	0.0025	0.0025	0.0000	0	0.0025	2	0	0.0025	0.0025	100.00
	Mercury	0.0010	mg/L	0.0001	0.0001	0.0000	0	0.00005	2	0	0.00005	0.00005	100.00
	Molybdenum	0.0500	mg/L	0.0025	0.0025	0.0000	0	0.0025	2	0	0.0025	0.0025	100.00
	Nickel	0.0200	mg/L	0.0075	0.0075	0.0035	0.01	0.01	2	0	0.01	0.005	100.00
	Nitrate	50.0000	mg/L	0.5000	0.5000	0.0000	0.5	0.5	2	0	0.5	0.5	100.00
	Nitrite	3.0000	mg/L	0.0500	0.0500	0.0000	0.05	0.05	2	0	0.05	0.05	100.00
	pH	6.5 - 8.5		7.8000	7.8000	0.1414	7.7	7.9	2	0	7.9	7.7	100.00
	Selenium	0.0100	mg/L	0.0010	0.0010	0.0000	0	0.001	2	0	0.001	0.001	100.00
	Silver	0.1000	mg/L	0.0010	0.0010	0.0000	0	0.001	2	0	0.001	0.001	100.00
	Sodium	180.0000	mg/L	10.0000	10.0000	2.8284	8	12	2	0	12	8	100.00
	Sulfate	500.0000	mg/L	8.0000	8.0000	2.8284	6	10	2	0	10	6	100.00
	Total Dissolved Solids (TDS)	600.0000	mg/L	31.0000	31.0000	####	13	49	2	0	49	13	100.00
	Total Hardness as CaCO3	200.0000	mg/L	17.4500	17.4500	5.8690	13.3	21.6	2	0	21.6	13.3	100.00
	True Colour	15.0000	Hazen Units (HU)	0.5000	0.5000	0.0000	0.5	0.5	2	0	0.5	0.5	100.00
	Turbidity	5.0000	NTU	0.1750	0.1750	0.1768	0.05	0.3	2	0	0.3	0.05	100.00
	Uranium	0.0170	mg/L	0.0025	0.0025	0.0000	0	0.0025	2	0	0.0025	0.0025	100.00
	Zinc	3.0000	mg/L	0.0100	0.0100	0.0000	0.01	0.01	2	0	0.01	0.01	100.00
Microbiology													
	E. coli	0.0000	mpn/100 mL	0.0400	0.0000	0.2000	0	1	25	1	0	0	96.00
	Free Chlorine	0.2 - 5	mg/L	0.5500	0.5400	0.2738	0.1	1.07	25	3	0.94	0.15	88.00
	pH	6.5 - 8.5		7.9533	8.0000	0.2124	7.51	8.2	18	0	8.2	7.51	100.00
	Total Chlorine	5.0000	mg/L	0.6332	0.6600	0.2801	0.14	1.13	22	0	0.96	0.17	100.00
	Total Coliforms	0.0000	mpn/100 mL	0.1200	0.0000	0.6000	0	3	25	1	0	0	96.00
	Turbidity	5.0000	NTU	0.1862	0.1400	0.1776	0.01	0.82	21	0	0.39	0.03	100.00

Table 18 Tumbarumba Verification Monitoring

Analysis Type	Characteristic	Guideline Value	Units	Mean	Median	Standard Deviation	Min	Max	Sample Count	Exception Count	95th Percentile	5th Percentile	% meeting guideline values
Chemistry													
	Aluminium	0.2000	mg/L	0.9250	0.9250	1.2799	0.02	1.83	2	1	1.83	0.02	50.00
	Antimony	0.0030	mg/L	0.0005	0.0005	0.0000	0	0.0005	2	0	0.0005	0.0005	100.00
	Arsenic	0.0100	mg/L	0.0005	0.0005	0.0000	0	0.0005	2	0	0.0005	0.0005	100.00
	Barium	2.0000	mg/L	0.0055	0.0055	0.0007	0.01	0.006	2	0	0.006	0.005	100.00
	Boron	4.0000	mg/L	0.0500	0.0500	0.0000	0.05	0.05	2	0	0.05	0.05	100.00
	Cadmium	0.0020	mg/L	0.0003	0.0003	0.0000	0	0.00025	2	0	0.00025	0.00025	100.00
	Calcium	10000.0000	mg/L	1.7000	1.7000	0.1414	1.6	1.8	2	0	1.8	1.6	100.00
	Chloride	250.0000	mg/L	4.0000	4.0000	1.4142	3	5	2	0	5	3	100.00
	Chromium	0.0500	mg/L	0.0025	0.0025	0.0000	0	0.0025	2	0	0.0025	0.0025	100.00
	Copper	2.0000	mg/L	0.0480	0.0480	0.0141	0.04	0.058	2	0	0.058	0.038	100.00
	Fluoride	1.5000	mg/L	0.9400	0.9400	0.1131	0.86	1.02	2	0	1.02	0.86	100.00
	Fluoride (WU result)	1.5000	mg/L	0.8300	0.8300	0.0000	0.83	0.83	1	0	0.83	0.83	100.00
	Fluoride Ratio	0.8 - 1.2		0.8100	0.8100	0.0000	0.81	0.81	1	0	0.81	0.81	100.00
	Iodine	0.5000	mg/L	0.0100	0.0100	0.0000	0.01	0.01	2	0	0.01	0.01	100.00
	Iron	0.3000	mg/L	0.0450	0.0450	0.0495	0.01	0.08	2	0	0.08	0.01	100.00
	Lead	0.0100	mg/L	0.0010	0.0010	0.0000	0	0.001	2	0	0.001	0.001	100.00
	Magnesium	10000.0000	mg/L	0.6050	0.6050	0.2192	0.45	0.76	2	0	0.76	0.45	100.00
	Manganese	0.5000	mg/L	0.0025	0.0025	0.0000	0	0.0025	2	0	0.0025	0.0025	100.00
	Mercury	0.0010	mg/L	0.0001	0.0001	0.0000	0	0.00005	2	0	0.00005	0.00005	100.00
	Molybdenum	0.0500	mg/L	0.0025	0.0025	0.0000	0	0.0025	2	0	0.0025	0.0025	100.00
	Nickel	0.0200	mg/L	0.0050	0.0050	0.0000	0.01	0.005	2	0	0.005	0.005	100.00
	Nitrate	50.0000	mg/L	0.5000	0.5000	0.0000	0.5	0.5	2	0	0.5	0.5	100.00
	Nitrite	3.0000	mg/L	0.0500	0.0500	0.0000	0.05	0.05	2	0	0.05	0.05	100.00
	pH	6.5 - 8.5		7.5000	7.5000	0.1414	7.4	7.6	2	0	7.6	7.4	100.00
	Selenium	0.0100	mg/L	0.0010	0.0010	0.0000	0	0.001	2	0	0.001	0.001	100.00
	Silver	0.1000	mg/L	0.0010	0.0010	0.0000	0	0.001	2	0	0.001	0.001	100.00
	Sodium	180.0000	mg/L	19.0000	19.0000	4.2426	16	22	2	0	22	16	100.00
	Sulfate	500.0000	mg/L	19.0000	19.0000	0.0000	19	19	2	0	19	19	100.00
	Total Dissolved Solids (TDS)	600.0000	mg/L	44.5000	44.5000	####	30	59	2	0	59	30	100.00
	Total Hardness as CaCO3	200.0000	mg/L	6.7000	6.7000	1.2728	5.8	7.6	2	0	7.6	5.8	100.00
	True Colour	15.0000	Hazen Units (HU)	2.2500	2.2500	2.4749	0.5	4	2	0	4	0.5	100.00
	Turbidity	5.0000	NTU	2.6000	2.6000	2.1213	1.1	4.1	2	0	4.1	1.1	100.00
	Uranium	0.0170	mg/L	0.0025	0.0025	0.0000	0	0.0025	2	0	0.0025	0.0025	100.00
	Zinc	3.0000	mg/L	0.0100	0.0100	0.0000	0.01	0.01	2	0	0.01	0.01	100.00
Fluoride Barcode													
	Fluoride	1.5000	mg/L	0.8673	0.8900	0.0707	0.73	0.95	11	0	0.95	0.73	100.00
	Fluoride (WU result)	1.5000	mg/L	0.9173	0.9000	0.1006	0.81	1.1	11	0	1.1	0.81	100.00
	Fluoride Ratio	0.8 - 1.2		1.0627	1.1100	0.1337	0.86	1.27	11	1	1.27	0.86	90.91
Microbiology													
	E. coli	0.0000	mpn/100 mL	0.0000	0.0000	0.0000	0	0	50	0	0	0	100.00
	Free Chlorine	0.2 - 5	mg/L	0.4945	0.4400	0.2586	0.06	1.3	49	4	1.04	0.15	91.84
	pH	6.5 - 8.5		7.2712	7.3000	0.1756	6.75	7.55	50	0	7.5	6.85	100.00
	Thermotolerant Coliforms	0.0000	cfu/100 mL	0.2700	0.2700	0.0000	0.27	0.27	1	1	0.27	0.27	0.00
	Total Chlorine	5.0000	mg/L	0.6421	0.6300	0.2527	0.09	1.38	48	0	1.06	0.29	100.00
	Total Coliforms	0.0000	mpn/100 mL	0.0000	0.0000	0.0000	0	0	50	0	0	0	100.00
	Turbidity	5.0000	NTU	0.6800	0.8200	0.3236	0.31	0.91	3	0	0.91	0.31	100.00
Operational Monitoring													
	Fluoride (daily WU)	0.9 - 1.5	mg/L	0.9927	0.9940	0.0722	0.77	1.227	333	30	1.114	0.873	90.99
	Fluoride (weekly WU)	0.9 - 1.5	mg/L	0.9898	0.9950	0.0749	0.79	1.19	110	10	1.112	0.846	90.91

Table 19 Tumut Verification Monitoring

Analysis Type	Characteristic	Guideline Value	Units	Mean	Median	Standard Deviation	Min	Max	Sample Count	Exception Count	95th Percentile	5th Percentile	% meeting guideline values
Chemistry													
	Aluminium	0.2000	mg/L	0.0375	0.0200	0.0322	0.01	0.1	12	0	0.1	0.01	100.00
	Antimony	0.0030	mg/L	0.0005	0.0005	0.0000	0	0.0005	12	0	0.0005	0.0005	100.00
	Arsenic	0.0100	mg/L	0.0005	0.0005	0.0000	0	0.0005	12	0	0.0005	0.0005	100.00
	Barium	2.0000	mg/L	0.0059	0.0060	0.0003	0.01	0.006	12	0	0.006	0.005	100.00
	Boron	4.0000	mg/L	0.0500	0.0500	0.0000	0.05	0.05	12	0	0.05	0.05	100.00
	Cadmium	0.0020	mg/L	0.0003	0.0003	0.0000	0	0.00025	12	0	0.00025	0.00025	100.00
	Calcium	10000.0000	mg/L	3.6250	3.4500	0.6196	3	5.2	12	0	5.2	3	100.00
	Chloride	250.0000	mg/L	3.3333	3.0000	0.4924	3	4	12	0	4	3	100.00
	Chromium	0.0500	mg/L	0.0105	0.0025	0.0276	0	0.098	12	1	0.098	0.0025	91.67
	Copper	2.0000	mg/L	0.0095	0.0080	0.0051	0	0.018	12	0	0.018	0.0025	100.00
	Fluoride	1.5000	mg/L	0.9350	0.9300	0.0627	0.83	1.02	12	0	1.02	0.83	100.00
	Fluoride Ratio	0.8 - 1.2		0.0000	0.0000	0.0000	0	0	1	1	0	0	0.00
	Iodine	0.5000	mg/L	0.0100	0.0100	0.0000	0.01	0.01	12	0	0.01	0.01	100.00
	Iron	0.3000	mg/L	0.0100	0.0075	0.0077	0.01	0.03	12	0	0.03	0.005	100.00
	Lead	0.0100	mg/L	0.0010	0.0010	0.0000	0	0.001	12	0	0.001	0.001	100.00
	Magnesium	10000.0000	mg/L	1.0367	0.9950	0.2230	0.8	1.56	12	0	1.56	0.8	100.00
	Manganese	0.5000	mg/L	0.0025	0.0025	0.0000	0	0.0025	12	0	0.0025	0.0025	100.00
	Mercury	0.0010	mg/L	0.0001	0.0001	0.0000	0	0.0001	12	0	0.0001	0.00005	100.00
	Molybdenum	0.0500	mg/L	0.0098	0.0025	0.0246	0	0.088	12	1	0.088	0.0025	91.67
	Nickel	0.0200	mg/L	0.0413	0.0100	0.1131	0.01	0.4	12	1	0.4	0.005	91.67
	Nitrate	50.0000	mg/L	0.5417	0.5000	0.1443	0.5	1	12	0	1	0.5	100.00
	Nitrite	3.0000	mg/L	0.0500	0.0500	0.0000	0.05	0.05	12	0	0.05	0.05	100.00
	pH	6.5 - 8.5		7.4250	7.5000	0.1658	7	7.6	12	0	7.6	7	100.00
	Selenium	0.0100	mg/L	0.0010	0.0010	0.0000	0	0.001	12	0	0.001	0.001	100.00
	Silver	0.1000	mg/L	0.0010	0.0010	0.0000	0	0.001	12	0	0.001	0.001	100.00
	Sodium	180.0000	mg/L	4.9167	5.0000	0.5149	4	6	12	0	6	4	100.00
	Sulfate	500.0000	mg/L	1.0000	1.0000	0.3693	0.5	2	12	0	2	0.5	100.00
	Total Dissolved Solids (TDS)	600.0000	mg/L	21.1667	21.5000	6.2498	7	29	12	0	29	7	100.00
	Total Hardness as CaCO3	200.0000	mg/L	13.3250	12.3500	1.9094	11.2	17.3	12	0	17.3	11.2	100.00
	True Colour	15.0000	Hazen Units (HU)	0.8750	0.5000	0.5691	0.5	2	12	0	2	0.5	100.00
	Turbidity	5.0000	NTU	0.8542	0.8000	0.6959	0.05	2.4	12	0	2.4	0.05	100.00
	Uranium	0.0170	mg/L	0.0025	0.0025	0.0000	0	0.0025	12	0	0.0025	0.0025	100.00
	Zinc	3.0000	mg/L	0.0079	0.0100	0.0026	0.01	0.01	12	0	0.01	0.005	100.00
Microbiology													
	E. coli	0.0000	mpn/100 mL	0.0000	0.0000	0.0000	0	0	70	0	0	0	100.00
	Free Chlorine	0.2 - 5	mg/L	0.7264	0.7550	0.2057	0.08	1.17	70	1	1.04	0.31	98.57
	pH	6.5 - 8.5		7.7107	7.6600	0.2346	7.36	8.2	46	0	8.04	7.4	100.00
	Total Chlorine	5.0000	mg/L	0.8561	0.8700	0.1994	0.11	1.25	59	0	1.18	0.51	100.00
	Total Coliforms	0.0000	mpn/100 mL	0.0000	0.0000	0.0000	0	0	70	0	0	0	100.00
	Turbidity	5.0000	NTU	0.2043	0.1700	0.1232	0.05	0.57	46	0	0.51	0.06	100.00
Operational Monitoring													
	Fluoride (daily WU)	0.9 - 1.5	mg/L	1.0279	1.0400	0.0712	0.83	1.2	365	10	1.13	0.91	97.26
	Fluoride (weekly WU)	0.9 - 1.5	mg/L	0.9737	0.9700	0.0557	0.85	1.12	82	3	1.08	0.9	96.34

Table 20 Morgans Reserve Verification Monitoring

Analysis Type	Characteristic	Guideline Value	Units	Mean	Median	Standard Deviation	Min	Max	Sample Count	Exception Count	95th Percentile	5th Percentile	% meeting guideline values
Chemistry													
	Aluminium	0.2000	mg/L	0.0150	0.0150	0.0071	0.01	0.02	2	0	0.02	0.01	100.00
	Antimony	0.0030	mg/L	0.0005	0.0005	0.0000	0	0.0005	2	0	0.0005	0.0005	100.00
	Arsenic	0.0100	mg/L	0.0005	0.0005	0.0000	0	0.0005	2	0	0.0005	0.0005	100.00
	Barium	2.0000	mg/L	0.0060	0.0060	0.0000	0.01	0.006	2	0	0.006	0.006	100.00
	Boron	4.0000	mg/L	0.0500	0.0500	0.0000	0.05	0.05	2	0	0.05	0.05	100.00
	Cadmium	0.0020	mg/L	0.0003	0.0003	0.0000	0	0.00025	2	0	0.00025	0.00025	100.00
	Calcium	10000.0000	mg/L	4.3000	4.3000	0.5657	3.9	4.7	2	0	4.7	3.9	100.00
	Chloride	250.0000	mg/L	4.0000	4.0000	1.4142	3	5	2	0	5	3	100.00
	Chromium	0.0500	mg/L	0.0025	0.0025	0.0000	0	0.0025	2	0	0.0025	0.0025	100.00
	Copper	2.0000	mg/L	0.0073	0.0073	0.0067	0	0.012	2	0	0.012	0.0025	100.00
	Fluoride	1.5000	mg/L	1.0000	1.0000	0.0283	0.98	1.02	2	0	1.02	0.98	100.00
	Iodine	0.5000	mg/L	0.0100	0.0100	0.0000	0.01	0.01	2	0	0.01	0.01	100.00
	Iron	0.3000	mg/L	0.0075	0.0075	0.0035	0.01	0.01	2	0	0.01	0.005	100.00
	Lead	0.0100	mg/L	0.0010	0.0010	0.0000	0	0.001	2	0	0.001	0.001	100.00
	Magnesium	10000.0000	mg/L	0.8950	0.8950	0.0495	0.86	0.93	2	0	0.93	0.86	100.00
	Manganese	0.5000	mg/L	0.0025	0.0025	0.0000	0	0.0025	2	0	0.0025	0.0025	100.00
	Mercury	0.0010	mg/L	0.0001	0.0001	0.0000	0	0.00005	2	0	0.00005	0.00005	100.00
	Molybdenum	0.0500	mg/L	0.0025	0.0025	0.0000	0	0.0025	2	0	0.0025	0.0025	100.00
	Nickel	0.0200	mg/L	0.0075	0.0075	0.0035	0.01	0.01	2	0	0.01	0.005	100.00
	Nitrate	50.0000	mg/L	0.5000	0.5000	0.0000	0.5	0.5	2	0	0.5	0.5	100.00
	Nitrite	3.0000	mg/L	0.0500	0.0500	0.0000	0.05	0.05	2	0	0.05	0.05	100.00
	pH	6.5 - 8.5		7.6000	7.6000	0.1414	7.5	7.7	2	0	7.7	7.5	100.00
	Selenium	0.0100	mg/L	0.0010	0.0010	0.0000	0	0.001	2	0	0.001	0.001	100.00
	Silver	0.1000	mg/L	0.0010	0.0010	0.0000	0	0.001	2	0	0.001	0.001	100.00
	Sodium	180.0000	mg/L	5.5000	5.5000	0.7071	5	6	2	0	6	5	100.00
	Sulfate	500.0000	mg/L	0.7500	0.7500	0.3536	0.5	1	2	0	1	0.5	100.00
	Total Dissolved Solids (TDS)	600.0000	mg/L	18.5000	18.5000	####	8	29	2	0	29	8	100.00
	Total Hardness as CaCO3	200.0000	mg/L	14.4500	14.4500	1.6263	13.3	15.6	2	0	15.6	13.3	100.00
	True Colour	15.0000	Hazen Units (HU)	0.5000	0.5000	0.0000	0.5	0.5	2	0	0.5	0.5	100.00
	Turbidity	5.0000	NTU	0.3000	0.3000	0.1414	0.2	0.4	2	0	0.4	0.2	100.00
	Uranium	0.0170	mg/L	0.0025	0.0025	0.0000	0	0.0025	2	0	0.0025	0.0025	100.00
	Zinc	3.0000	mg/L	0.0100	0.0100	0.0000	0.01	0.01	2	0	0.01	0.01	100.00
Microbiology													
	E. coli	0.0000	mpn/100 mL	0.0000	0.0000	0.0000	0	0	15	0	0	0	100.00
	Free Chlorine	0.2 - 5	mg/L	0.8933	0.9900	0.3394	0.25	1.47	15	0	1.47	0.25	100.00
	pH	6.5 - 8.5		7.8088	7.8050	0.1876	7.56	8.1	8	0	8.1	7.56	100.00
	Total Chlorine	5.0000	mg/L	1.0479	1.0900	0.3952	0.26	1.54	14	0	1.54	0.26	100.00
	Total Coliforms	0.0000	mpn/100 mL	0.0000	0.0000	0.0000	0	0	15	0	0	0	100.00
	Turbidity	5.0000	NTU	0.1767	0.1600	0.0711	0.12	0.35	9	0	0.35	0.12	100.00

Appendix B

Improvement Plan Status

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