

Drinking Water Management system
Bogan Shire Council

Annual Report 2016



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Executive Summary

This report provides the performance of drinking water system and the review of DWMS implementation and is based on the current reporting requirements and guidelines in place with the Australian Drinking Water Guidelines (ADWG; 2011), and the reporting requirements of NSW Health.

Critical Control Points

	CCP1 Settling Process (Turbidity)	CCP1 Settling Process (pH)	CCP2 Filtering Process (Turbidity)	CCP3 Disinfection Process (Free Cl)	CCP4 Fluoridation Process (Fluoride)
Number Of Exceedances	0	0	0	0	N/A

Water quality

Characteristics	Sample Count	Number Of Characteristics	Number Of Characteristics Non-Compliant	Percent Compliant
Physical Characteristics	2	10	0	100%
Chemical Characteristics	2	38	0	100%
E coli	45	1	0	100%

Action and improvement plan

	Completed	In progress	Short term not started	Long term	Total
Number of actions	30	20	0	12	62

DWMS Reviews

Hunter Water reviews the Bogan DWMS at progress monitoring meetings as LMWUA's project

Date	Reviewer	Scope	Summary of outcomes	Actions taken
19/02/2015	Glenn Frnandes	Reviewing Chlorination system	Calculation of C.t value	Confirm the effective disinfection
		Reviewing Chemical dosing system	Proposed an alternative dosing arrangement	If current process fails only
	Lisa Procter	Reviewing CCPs and introducing COPs. Reviewing the Health Based Targets (HBTs)	New CCPs and new COPs.	Established 4- CCPs and 3- COPs

Reservoir inspections

The entry hatch covers are not sealed and they need to be replaced with sealed hatch design. The existing hatches may cause to contaminate the drinking water. Upper cages on the internal ladder has to be removed to make the tank safe for diving.

Date	Reservoirs inspected	Recommendations	Category	Corrective actions
15/07/2014	Cobar St	Seal the entry hatch	Priority-1	Hatch has been sealed.
		Remove the upper cage of internal ladder	Priority-4	In progress
15/07/2014	Terangion St	Seal the entry hatch	Priority-1	Hatch has been sealed.
		Remove the upper cage of internal ladder	Priority-4	In progress

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1 Report purpose

This reports documents DWMS implementation and drinking water performance for 2016 and satisfies the reporting (Element 10), evaluation (Element 11) and review and continual improvement (Element 12) requirements of Councils Drinking Water Management System (DWMS).

2 Scheme summary

The Bogan WTP pumps potable water to reticulation system and to two town reservoirs in reticulation system. Potable water is sourced from the Bogan River weir pool. The treatment plant consists of PAC dosing, coagulation, flocculation, sedimentation and filtration prior to disinfection and fluoridation. Fully automated new fluoridation plant has been granted by NSW Health but yet to be commissioned. Nyngan WTP has been upgraded with new clear SCADA system in 2016 and treated water is tested and delivered via pumping into the distribution system to over 1079 connections in Nyngan town supply.

Checklist	
Have there been any system upgrades within the reporting period?	<input type="checkbox"/>
Upgrade or system improvements details have been provided	<input checked="" type="checkbox"/>

3 DWMS document control

Any updates to DWMS documentation should be summarised here. Major changes should be submitted to NSW Health.

Document	Version	Updates	Submitted to NSW Health and date submitted?
1 st Draft	Version-1	07/06/2017-	
	Version-2	08/06/2017	08/06/2017

4 Critical control points

The initial CCPs were reviewed in year 2016 to achieve the ADWG targets. Following changes were adopted

CCP number	Monitoring Parameter	Initial Critical Limit	New Critical limit	Reasons
1. Settling Process after Pre-Chemical Dosing Process	Turbidity	NTU < 5	NTU < 10	pH and Turbidity parameters are monitored under one CCP 1 (Settling Process After Pre dosing)
2. Filtering Process After Duel Media Filters	Turbidity	NTU < 1.5 0.5 NTU (Target) 0.8 NTU (Adjustment)	NTU < 1.5 0.2 NTU (Target) 0.5 NTU (Adjustment)	Filtered water sampling point was changed to filter outlets and filtered water can be achieved lower turbidity value than earlier. However Health Based Targets cannot be achieved without any filter improvement. Filtering process is monitored as CCP 2
3. Disinfection Process After Filtering	Chlorine (Free)	> 3.5 mg/L	1 > mg/L > 4	Free Chlorine level in Clear Water Sump is monitored to check the disinfection process as CCP 3.

The reviewed **CCPs** (Critical Control Points) and new **COPs** (Critical Operating Points) for year 2016 for Nyngan Town Water system are shown in Table 4-1.

Table 4-1. Summary of critical control points (CCP s) and critical operating points (COP s)

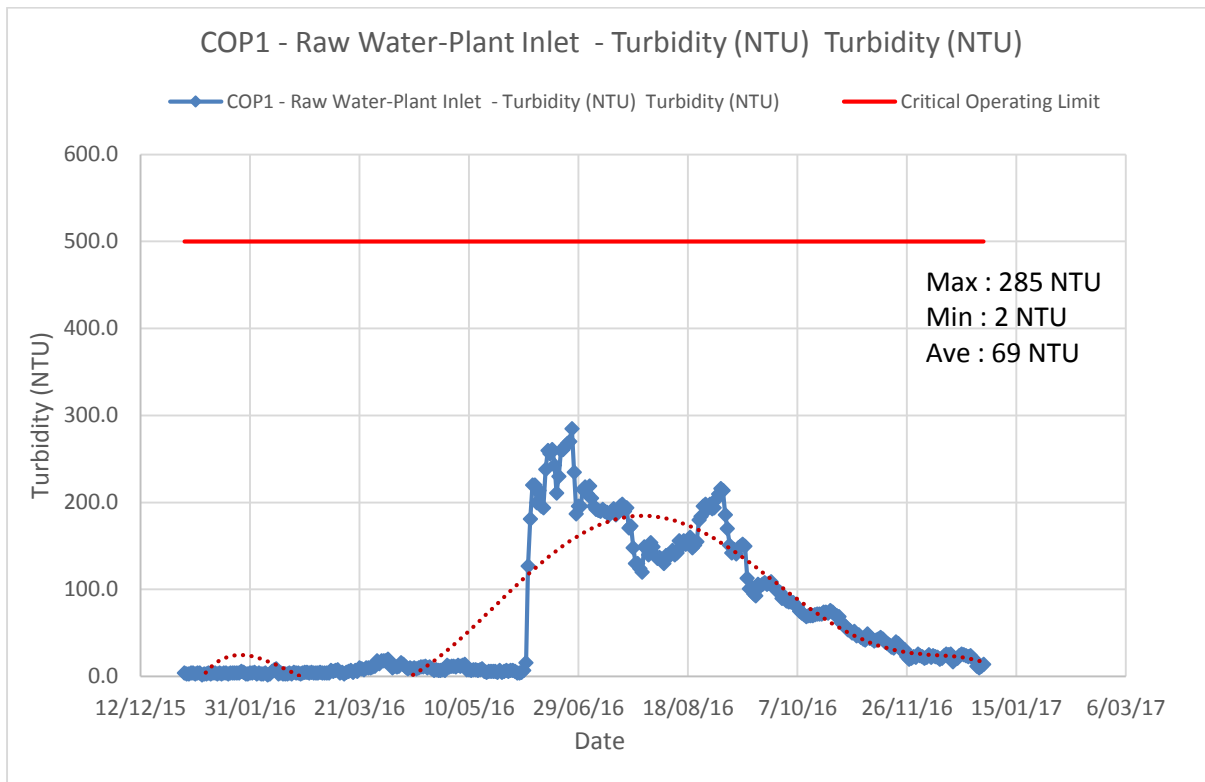
CCP number	Monitoring Parameter	Target criterion	Adjustment limit	Critical limit
1. Settling Process after Pre-Chemical Dosing Process	pH Turbidity	6 to 7 < 3 NTU	6 > pH > 7.8 5 > NTU > 3	5 > pH > 8 NTU < 10
2. Filtering Process After Duel Media Filters	Turbidity	0.2 NTU	0.2 > NTU > 0.5	NTU < 1.5
3. Disinfection Process After Filtering	Chlorine (Free)	2.0 mg/L	2.5 > mg/L > 1.5	1 > mg/L > 4
4. Fluoridation Process After Filtering	Fluoride	1.0 mg/L	1.3 > mg/L < 1.0	1.5 > mg/L > 0.9 mg/L for grater than 72 hours
COP - Critical Operating Points				
1. Raw Water Plant Inlet	Turbidity	N/A	N/A	NTU > 500
2. Fluoride Dosing Pumps	Fluoride	1.0 mg/L	1.3 > mg/L > 1.0	1.5 > mg/L > 0.9 mg/L for grater than 72 hours
3. Free Chlorine in Reticulation System	Chlorine (Free)	0.5 mg/L	2.5 > mg/L > 0.2	mg/L < 0.2

4.1 Critical limit exceedance

The performance of the critical control points should be reported in this section. A monitoring template is available that can be used to record and plot monitoring data.

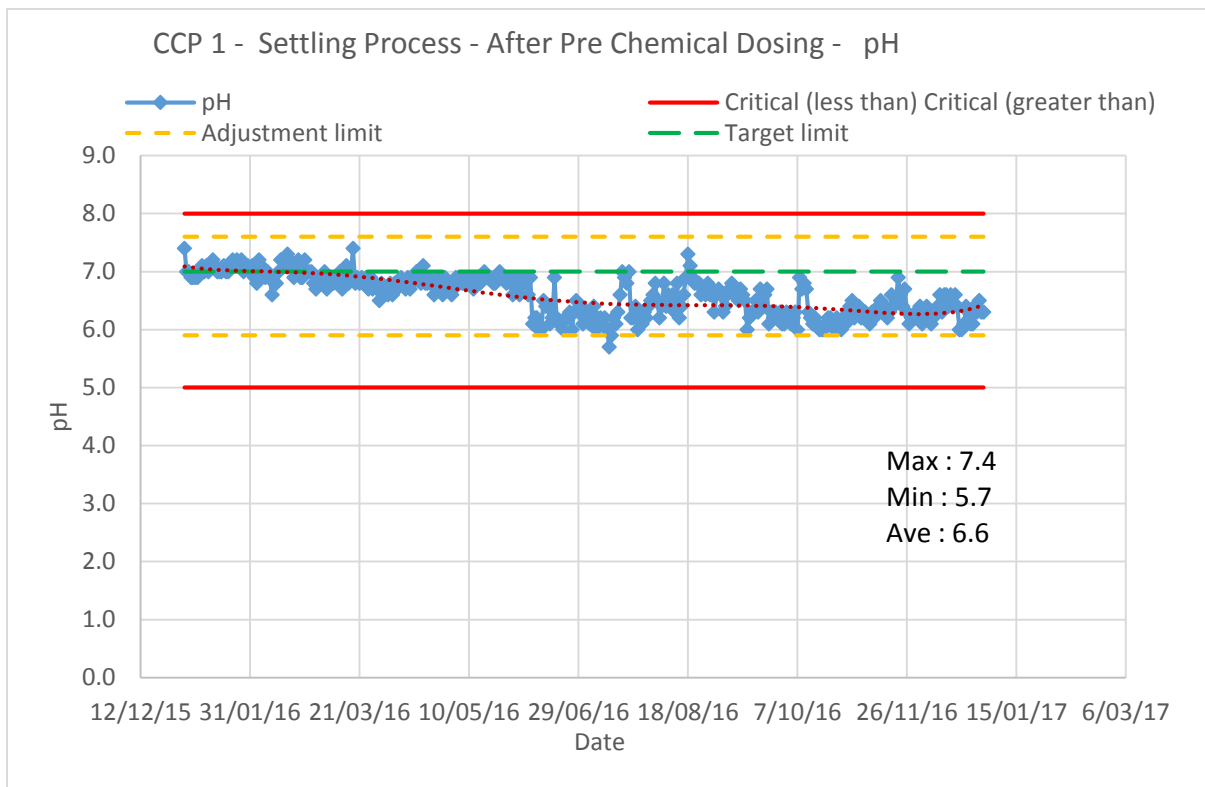
Process	Parameter	Min	Ave	Max	Lower Critical Limit	Upper Critical Limit	Number of Exceedances	No. of Samples	% Compliance
CCP 1 Settling Process	Turbidity (NTU)	1.3	3.1	6.0		10.0	0	366	100%
	pH	5.7	6.6	7.4	5	8	0	366	100%
CCP 2 Treated Water Filters	Turbidity (NTU)	0.2	0.5	1.0		1.5	0	366	100%
CCP 3 Disinfection Process	Free Cl (mg/L)	1.5	2.2	3.8	1.0	4.0	0	366	100%
CCP 4 Fluoridation Process	Fluoride (mg/L)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

COP-1- Turbidity in Raw water



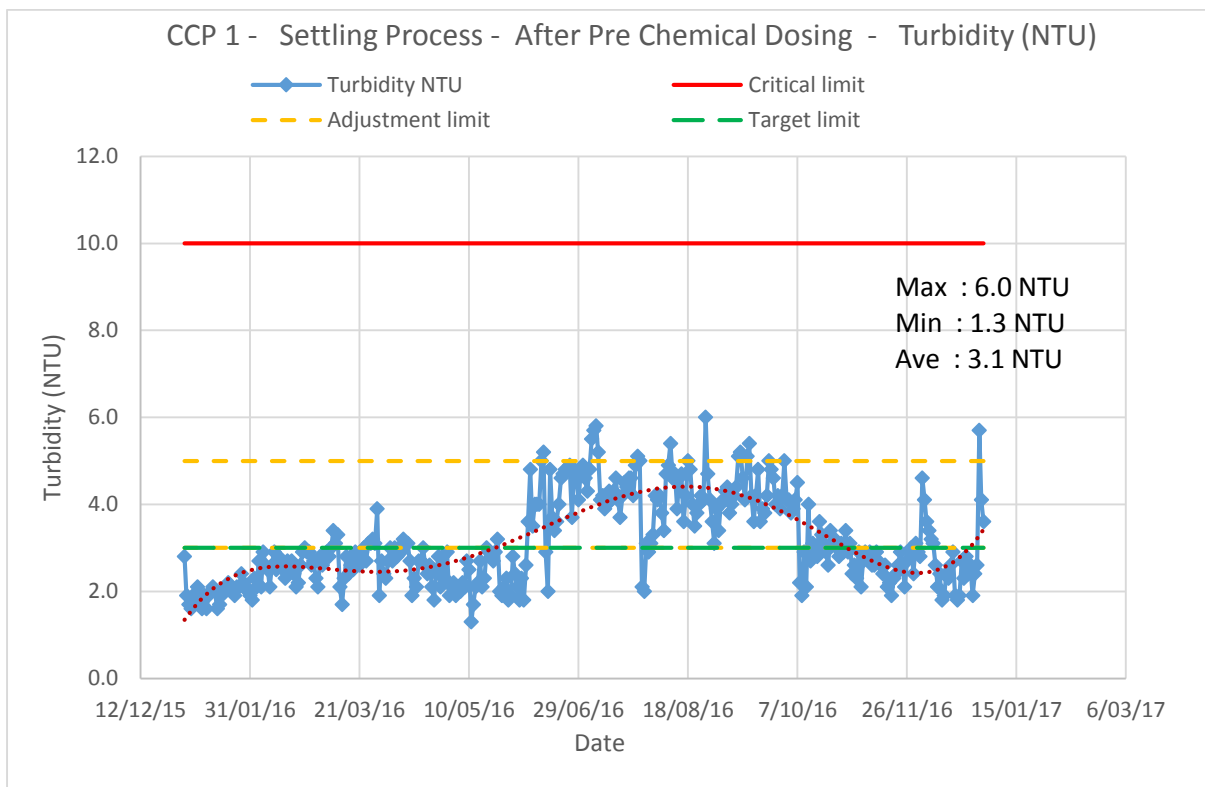
Turbidity in raw water is well below the critical operating turbidity value of 500 NTU.

CCP-1 – pH in settling water



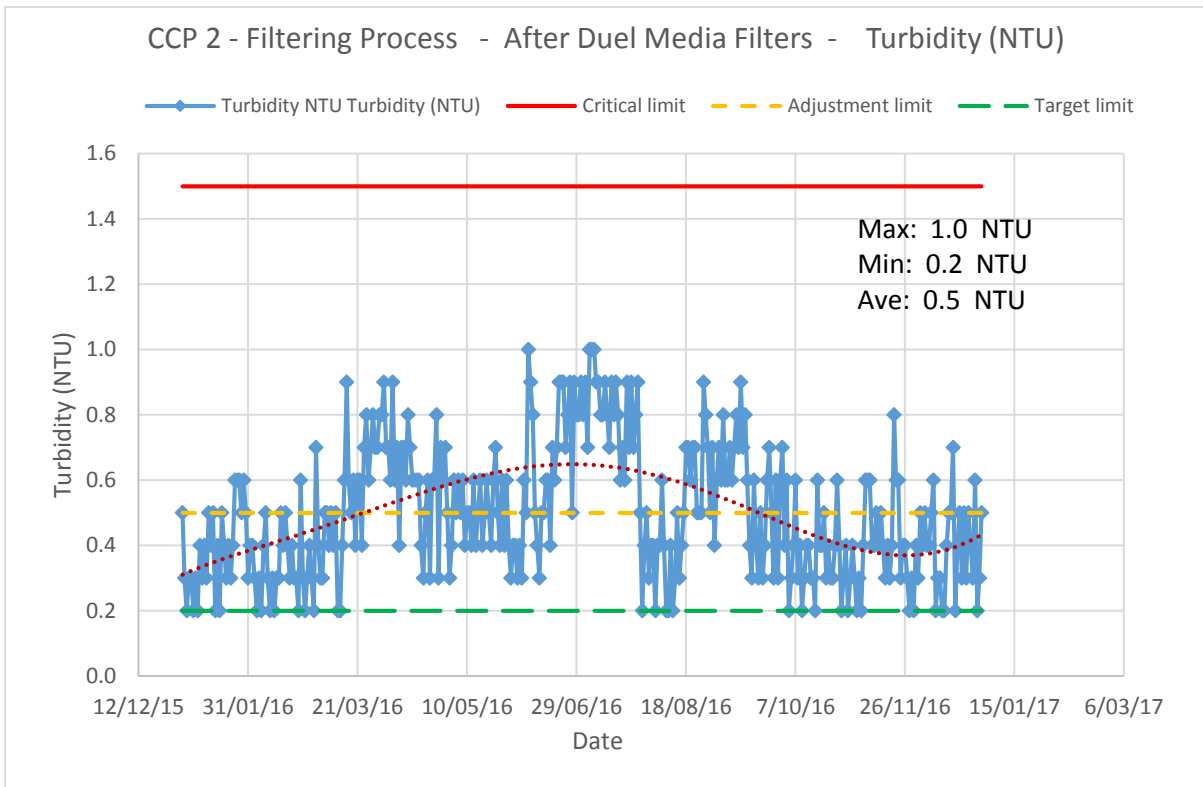
pH in Settling is 100% compliance with critical control limits.

CCP- 1 – Turbidity in Settling Water



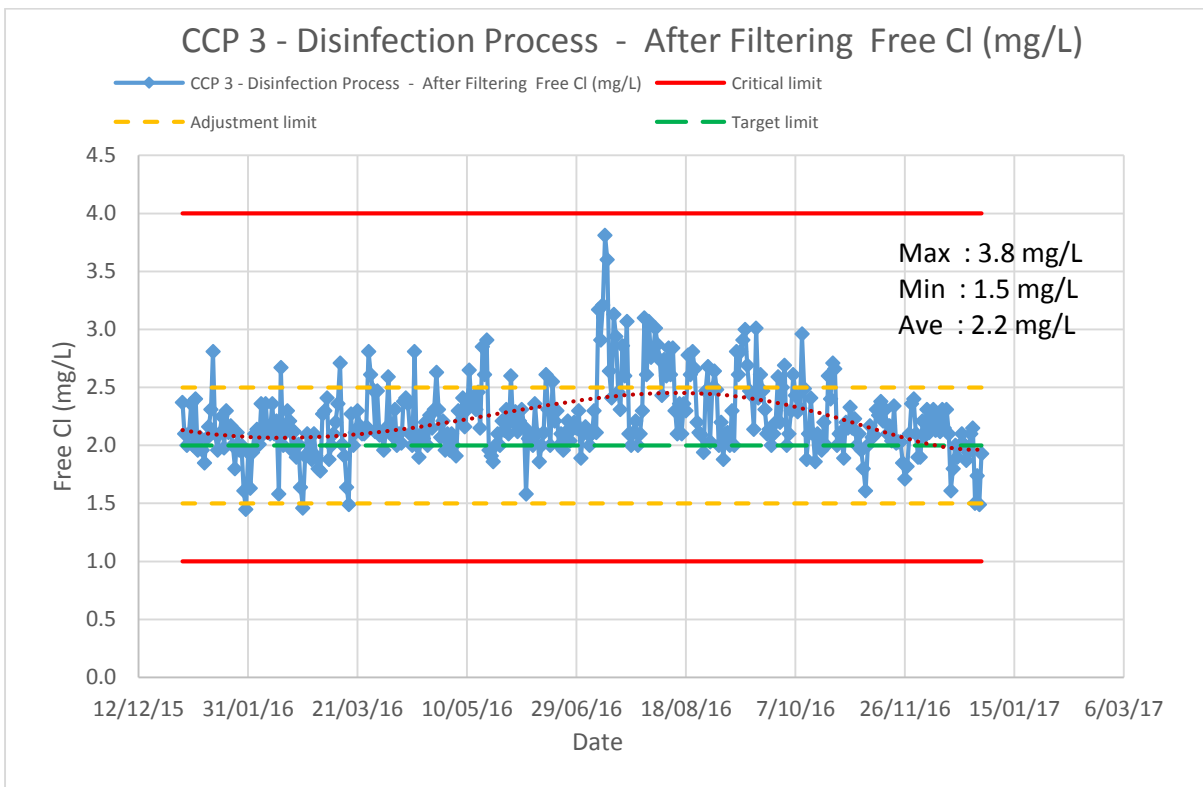
Turbidity in Settling is 100% compliance with critical control limits.

CCP -2– Turbidity in Filtered water



Turbidity in Filtered water is 100% compliance with critical control limits. But filter improvement is required to achieve Health Based Targets.

CCP-3– Free Chlorine in Treated water

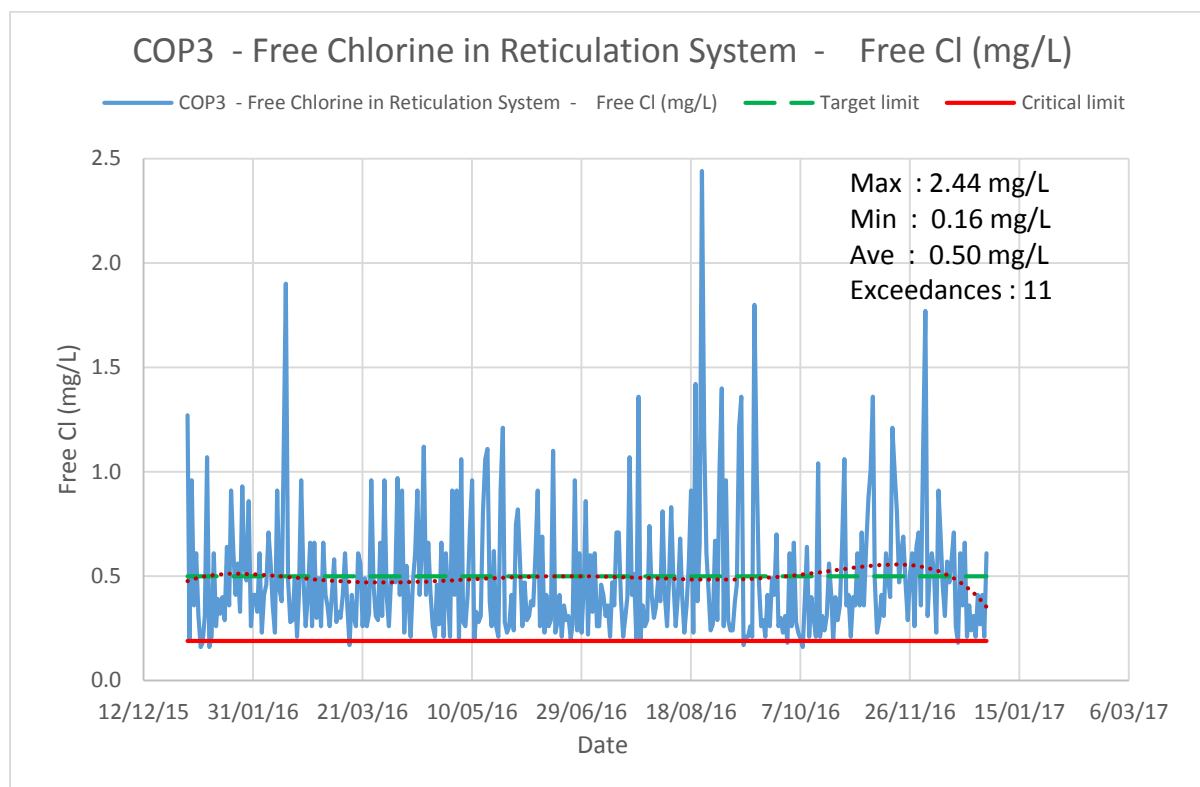


Free chlorine in treated water is 100% compliance with critical control limits.

CCP-4– Fluoride in Treated water / COP -2 Fluoride in Reticulation System

The existing fluoridation plant (system), has been already identified to replace in 2016, and this system is not working any more. Fully automated new fluoridation plant was granted by NSW Health in 2017 and yet to be commissioned with new SCADA system in July 2017.

COP -3 – Free chlorine in Reticulation system.



Existing hypo chlorination system is insufficient and inconsistent to maintain the ADWG value of 0.2 mg/L free chlorine in reticulation system. Presently, water towers are manually chlorinated with chlorine tablets to maintain the free chlorine levels in reticulation system. This system can achieve the minimum level 0.16 mg/L of free chlorine in reticulation system and 97% of critical operational limits. Therefore installation of in line chlorine booster or complete gas chlorination system has been proposed as a corrective action.

However, there were no E-Coli incidents recorded in reporting period.

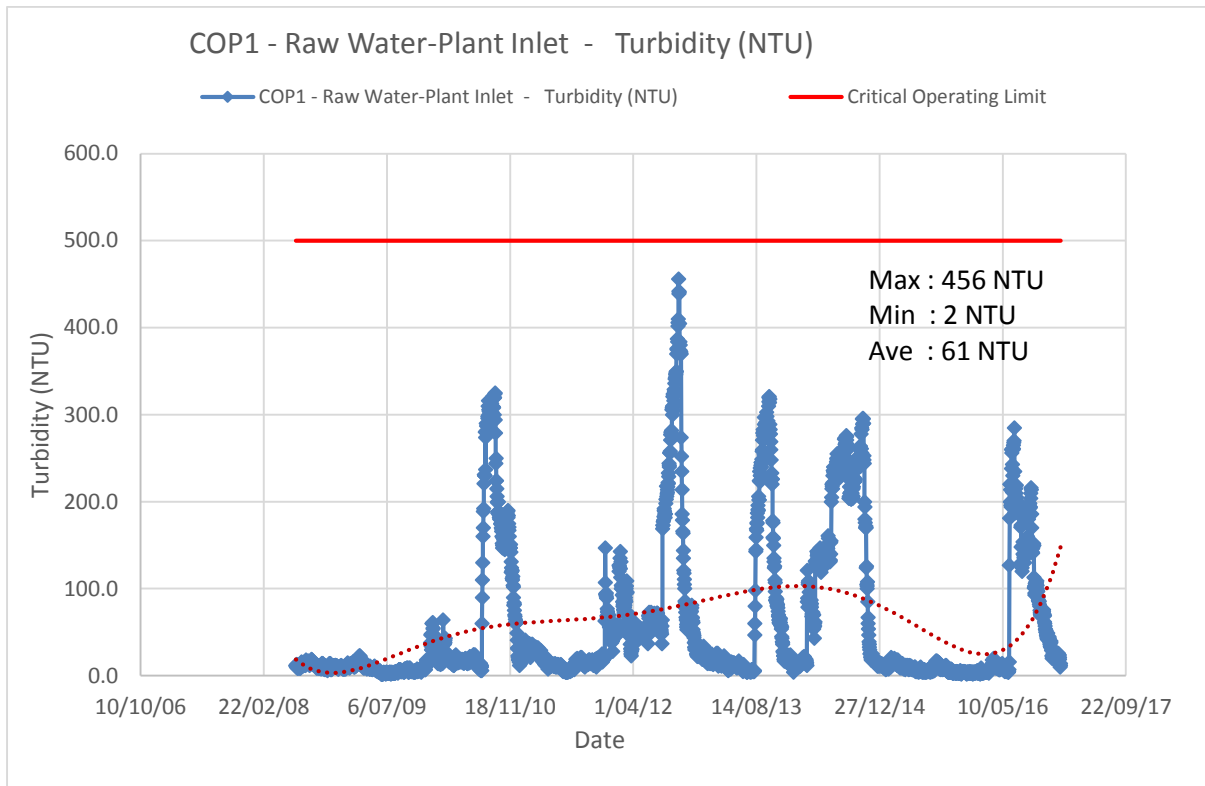
Table 4-2. Critical limit exceedances

None of the CCP's has not been exceeded the defined critical limits.

5 Water Quality

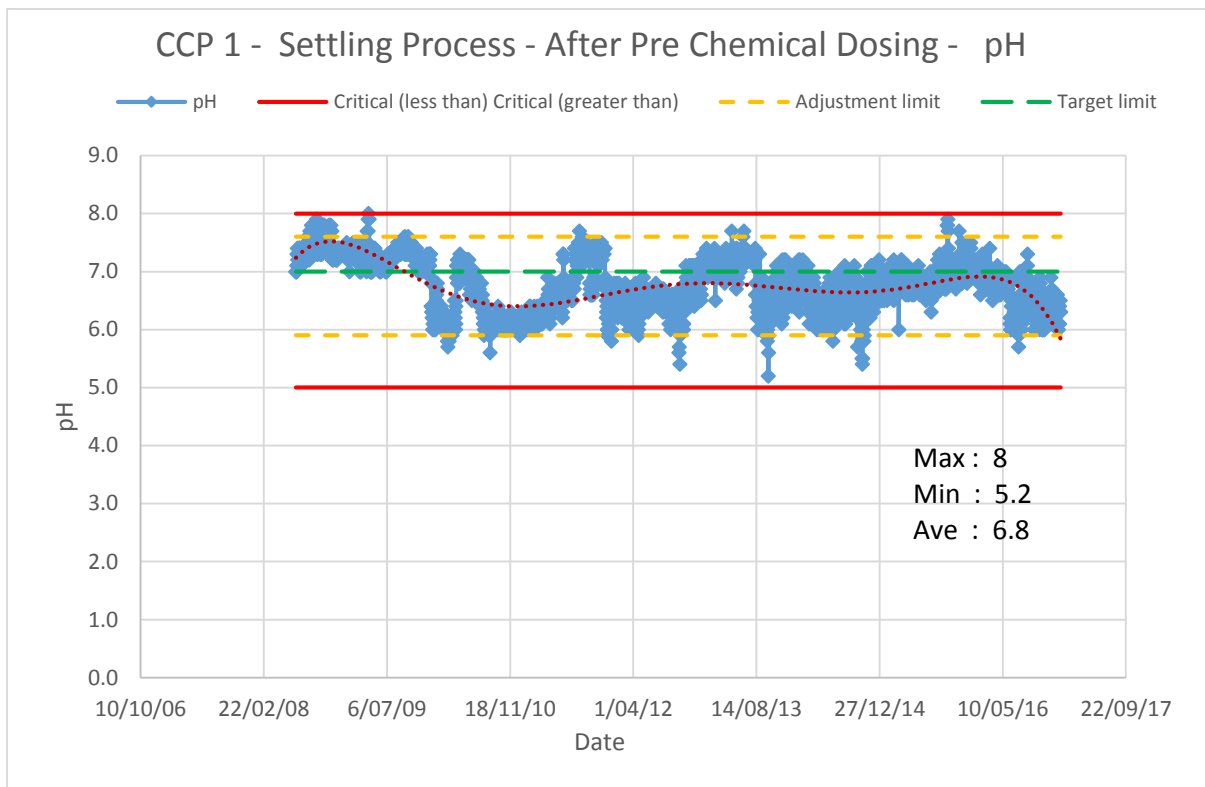
Reviewing of water quality data and longer term trends from 2008 to 2017.

COP1 – Turbidity in Raw Water



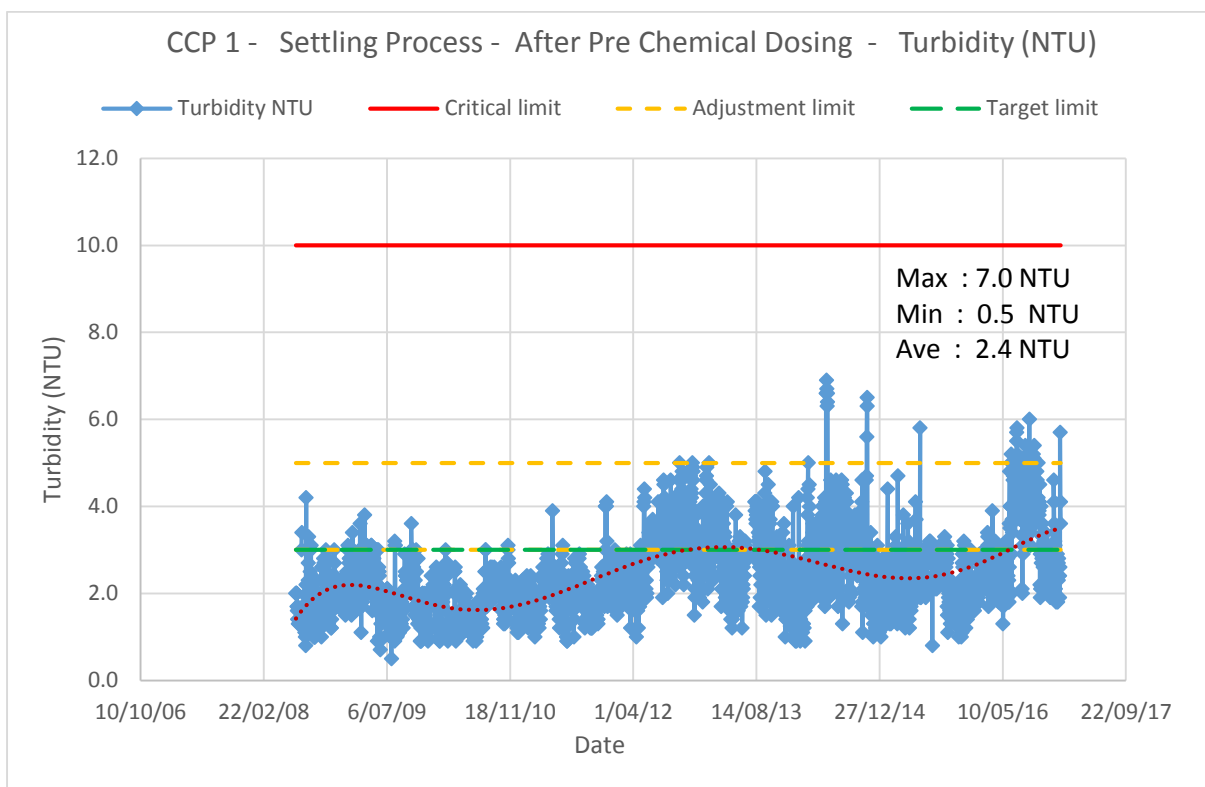
Generally, Nyngan gets heavy rains in spring time from September to November. During this season Bogan river flows with high turbid water. This is the only time Nyngan water supply can use the river water. Otherwise Nyngan gets low turbid water from Albert Priest Chanel. As per the trend we could expect some high turbid Bogan flows in spring seasons.

CCP-1 – pH in settling water



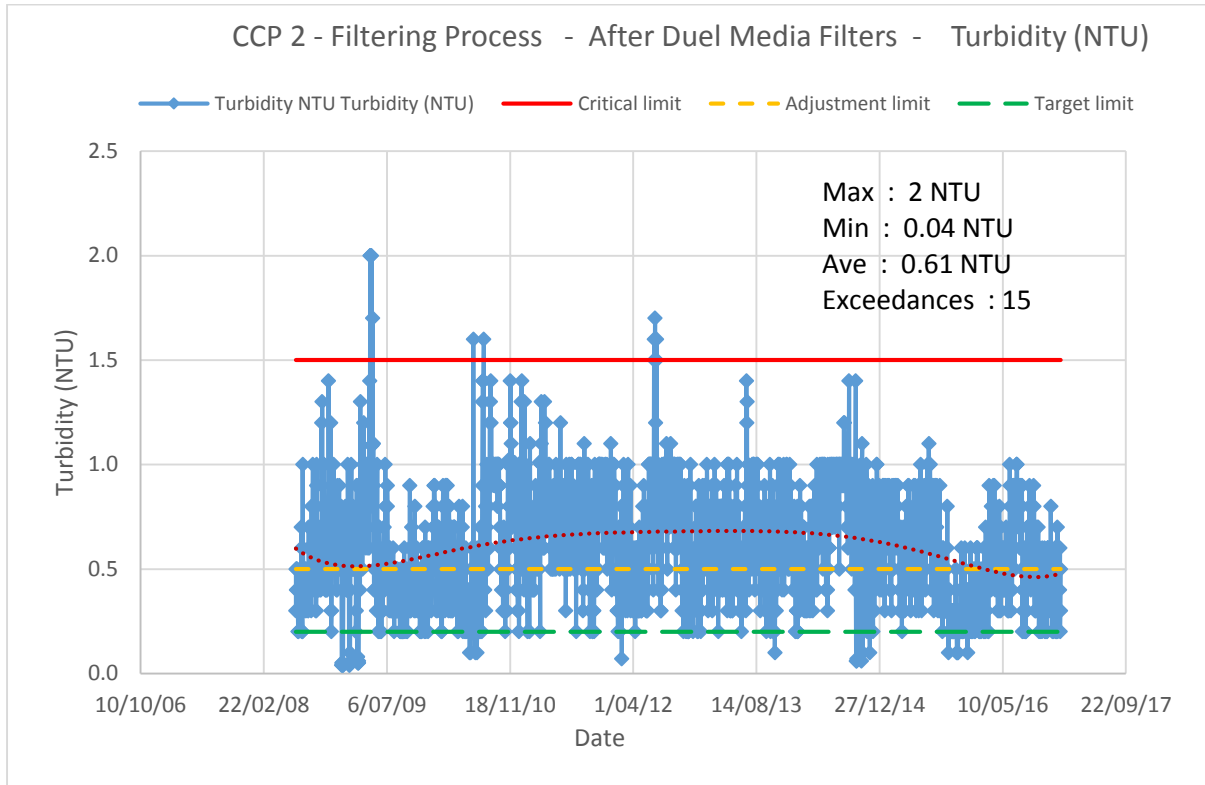
Pre dose soda ash dosing system does operate reliably within the adjustment limits since 2008. There were no incidents recorded since 2008 and pH correction is consistence and uniform over the period.

CCP- 1 – Turbidity in settling water



Water flocculation and sedimentation process is within the critical control limits over a period of 8 years. Trend line shows that this system produces average of 2.4 NTU water.

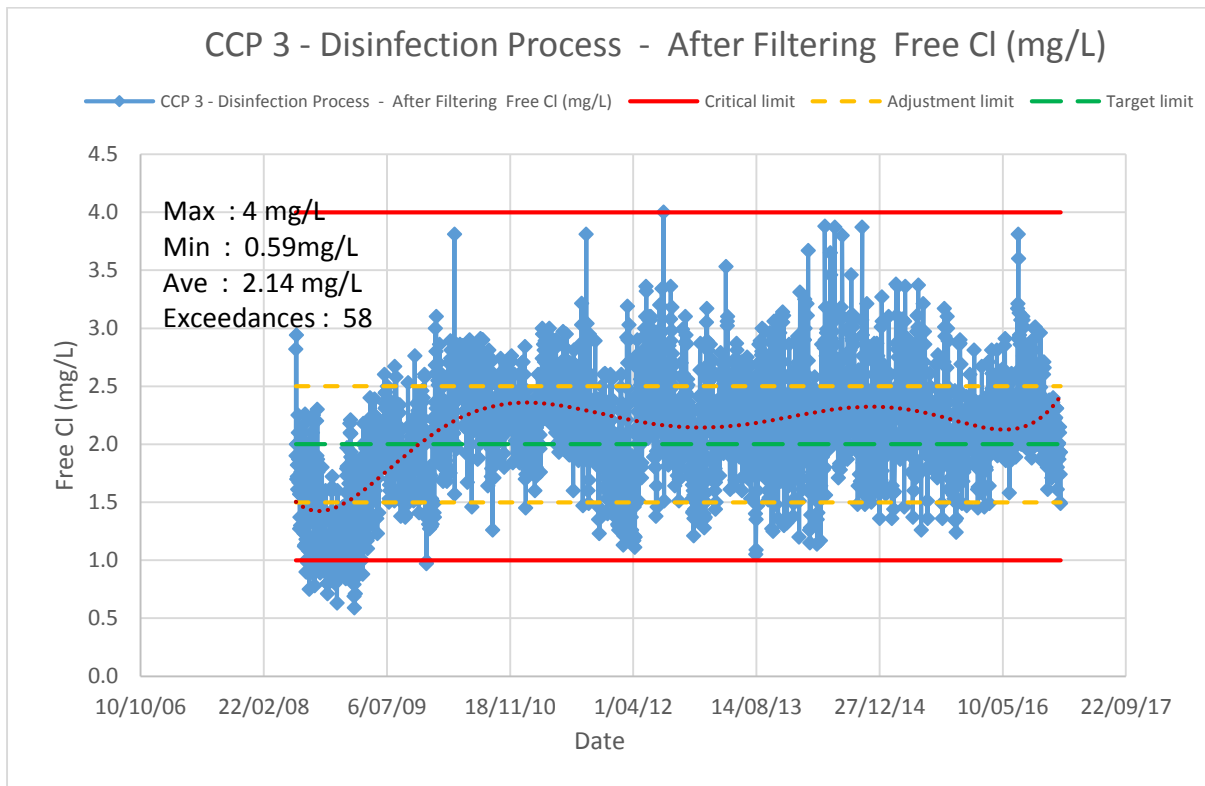
CCP -2 – Turbidity in Filtered water



There was an error of sampling procedure .Samples have been taken out from the distribution line to monitor the filtered water turbidity since 2008. Therefore 15 exceedances were recorded .However this error was rectified by taking samples from filter outlets from mid of 2015 and trend of filter operation has been improved to average of 0.6 NTU and no incidents were recorded in 2016.

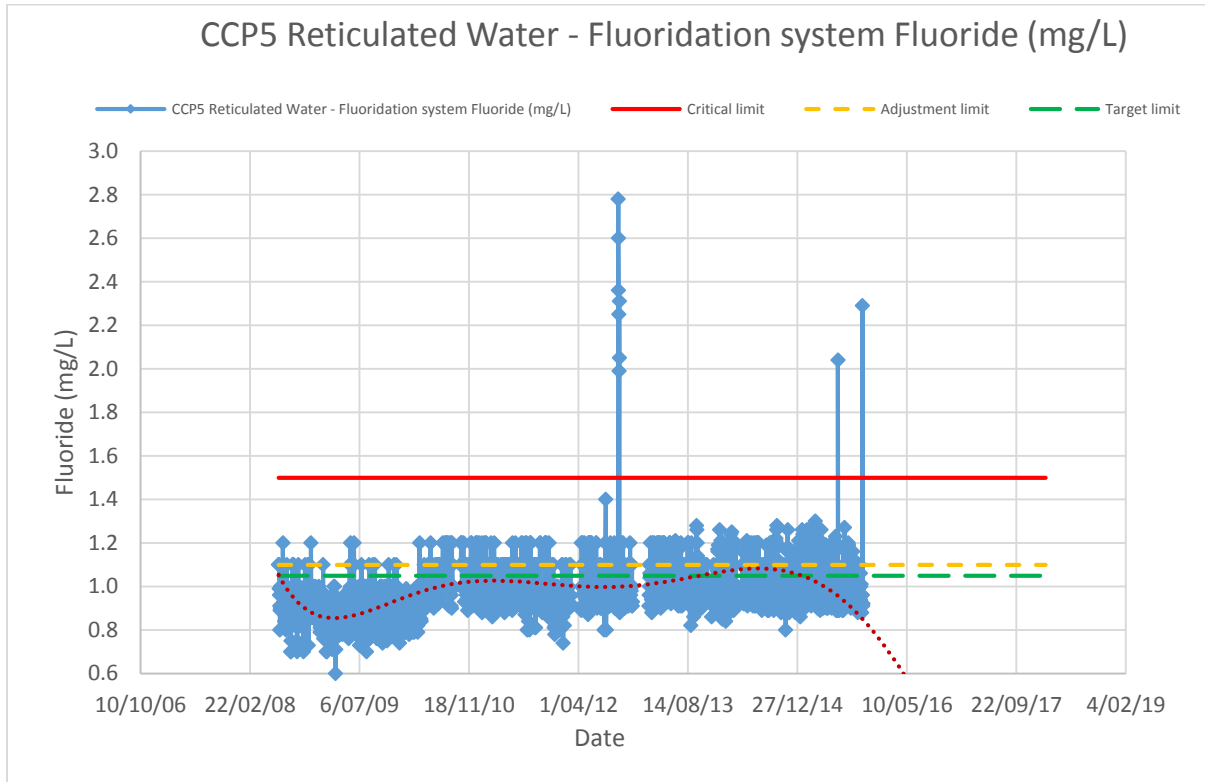
But still significant filter improvements are required to achieve the Health benefit targets.

CCP-3– Free Chlorine in Treated water



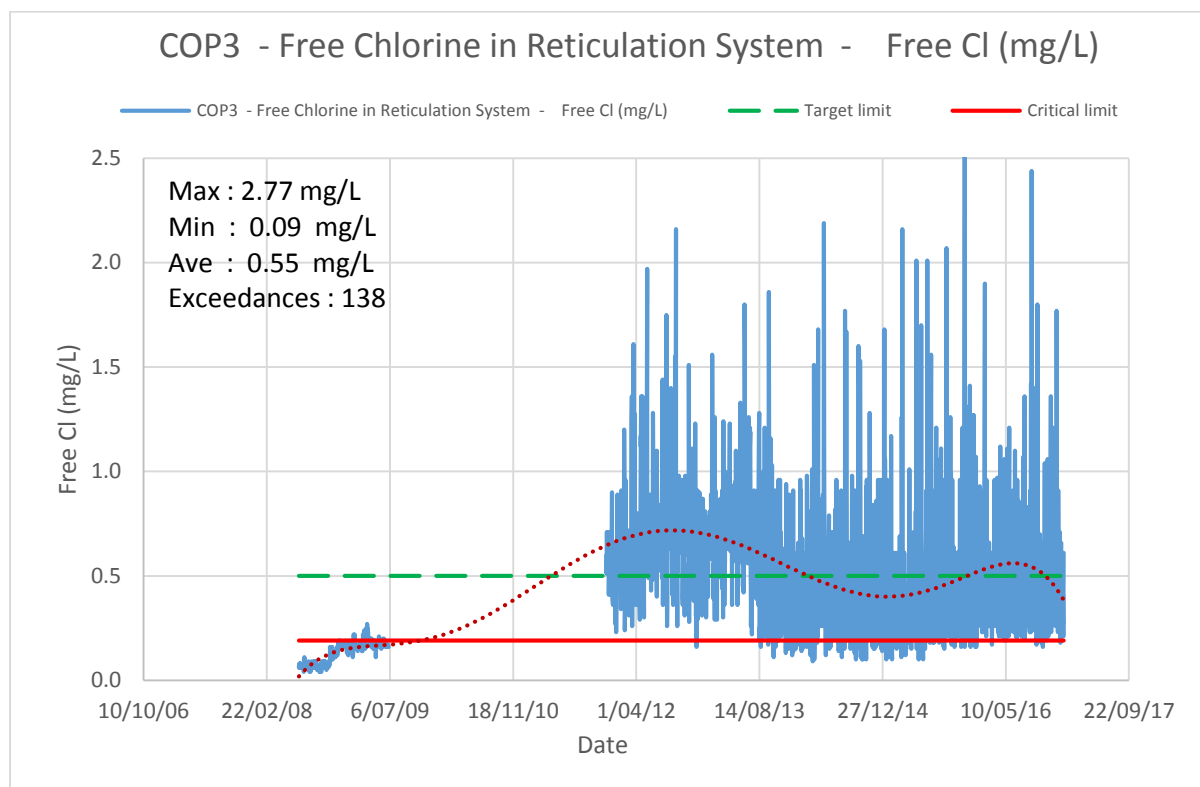
There were 58 exceedance events were recorded in 2008, but after that the hypochlorite dosing process operates within the critical control limits. Trend shows that the free chlorine level of treated water has been gradually increased and approximately fluctuating around 2.5 mg/L to maintain the free chlorine level in reticulation.

COP-2– Fluoride in Reticulation System



The existing Fluoridation system is not compliant with the NSW guidelines. There were 513 noncompliance incidents were recorded over a period of 8 years and the percentage of exceedences is 21%. There is a trend of increasing fluoride concentration with current operation. However, the fluoridation system was shut down from 23rd of October 2015, due to reporting of high concentration of fluoride in reticulation system.

COP-3 – Free chlorine in Reticulation system.



Data available only for four year period since 2012. There were 138 incidents recorded as exceedances in last four years. The major issue is to maintain the minimum free chlorine concentration above the 0.2 mg/L level in reticulation system. Trend line shows that average level of free chlorine level is increasing approximately from 0.5 to 1. Therefore, inline chlorine booster system has been proposed as a corrective action.

5.1 Data collection

Nyngan water supply system has established daily data collection and weekly data entering system. Four data sheets provide the all relevant data for critical control point monitoring. Each data sheet provides following information.

Water Data Sheet 1

- Weather condition (temperature) , River water levels and Channel operations

Water Data Sheet 2

- Raw water quality (Turbidity, Colour, pH, Fluoride)
- Treated water quality (Turbidity, Colour, pH, Free Chlorine, Total Chlorine, Fluoride)
- Clarifier water quality (Turbidity, pH)
- Chemical usage (Alum, Soda Ash (pre), Soda Ash (post), Polyelectrolyte, Pre- Chloride, Post-Chloride, Fluoride)

Water Data Sheet 3

- Raw water flow rate, rated water flow rate, backwash flow rate, Sludge pumping rate

Water Data Sheet 4

- Water quality of reticulation system (pH, Free Chlorine, Total chlorine, Fluoride, Turbidity)

Water data collection procedure is given below.



WATER PROCEDURES DATA ENTRY

Weekly Water Data Inputs

Water 1 - Water & Filtration Plant Report – Blue Sheet

In the first section:

Find this data off the internet by going into the site:

<http://www.bom.gov.au/climate/dwo/201309/html/IDCJDW2103.201309.shtml>

Select the month and enter off the data

All the rest follow the sheets as the setup is the same as the document you are entering off just look for the tabs and columns that correspondence.



Water 1 – Water & Filtration Plant

Water 2 – Filtration Plant Water Quality – Green Sheet

Water 3 – Water Consumption Report – Pink Sheet

Water 4 – Reticulation System Quality Samples – White Sheet



All in one excel documents under different tabs down the bottom.

Where to find it to enter:

<S:\Engineering\Water and Sewerage\REGISTER - WATER.xlsx>

5.2 Non-compliant data

Except the recorded eight incidents with high total coliform in reticulation system no any non-compliant data findings or water quality issues in addition to critical limit exceedances during the reporting year.

Table 5-1. Summary of non-compliant water quality data (Source of data: NSW Health)

Date	Location	Parameter	Exceedance	Correction	Corrective action	Notes
05/01/2016	Reticulation	Total Coliforms	3 mpn/ 100 ml	Flushing, retest	Review of maintenance schedule	Pipe break
16/02/2016	Reticulation	Total Coliforms	9 mpn/ 100 ml	Flushing, retest	Review of maintenance schedule	Pipe break
01/03/2016	Reticulation	Total Coliforms	8 mpn / 100 ml	Flushing, retest	Review of maintenance schedule	Pipe break
12/04/2016	Reticulation	Total Coliforms	36 mpn/ 100 ml	Flushing, retest	Review of maintenance schedule	Pipe break
20/09/2016	Reticulation	Total Coliforms	1 mpn/ 100 ml	Flushing, retest	Review of maintenance schedule	Pipe break
18/10/2016	Reticulation	Total Coliforms	1 mpn/ 100 ml	Flushing, retest	Review of maintenance schedule	Pipe break
14/12/2016	Reticulation	Total Coliforms	5 mpn/ 100 ml	Flushing, retest	Review of maintenance schedule	Pipe break

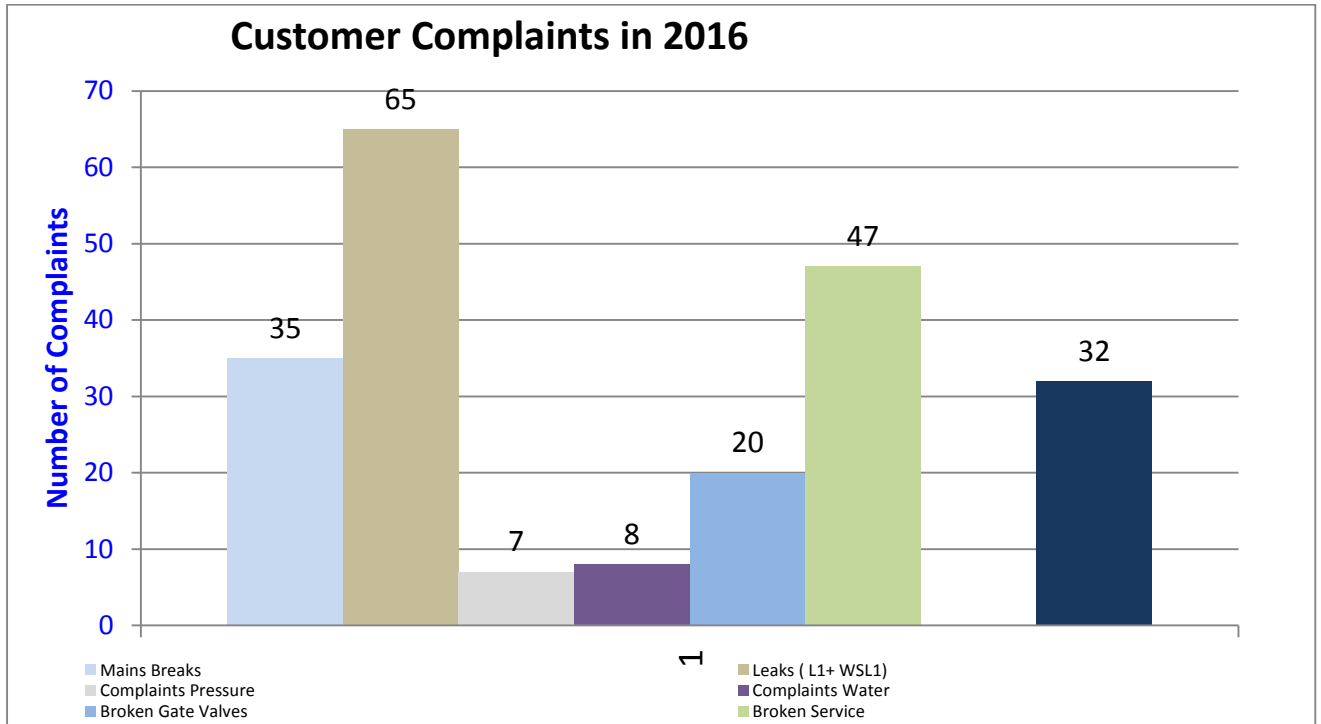
Analysis Type	Characteristic	Guideline Value	Units	Mean	Median	Standard Deviation	Min	Max	Sample Count	Exception Count	95th Percentile	5th Percentile	% meeting guideline
Chemistry	Aluminium	0.2000	mg/L	0.1950	0.1950	0.0495	0.16	0.23	2	1	0.23	0.16	50.00
	Antimony	0.0030	mg/L	0.0005	0.0005	0.0000	0.0005	0.0005	2	0	0.0005	0.0005	100.00
	Arsenic	0.0100	mg/L	0.0008	0.0008	0.0004	0.0005	0.001	2	0	0.001	0.0005	100.00
	Barium	2.0000	mg/L	0.1250	0.1250	0.1386	0.027	0.223	2	0	0.223	0.027	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	0.00025	0.00025	2	0	0.00025	0.00025	100.00
	Calcium	#####	mg/L	17.0500	17.0500	16.3342	5.5	28.6	2	0	28.6	5.5	100.00
	Chloride	250.0000	mg/L	27.5000	27.5000	24.7487	10	45	2	0	45	10	100.00
	Chromium	0.0500	mg/L	0.0025	0.0025	0.0000	0.0025	0.0025	2	0	0.0025	0.0025	100.00
	Copper	2.0000	mg/L	0.0025	0.0025	0.0000	0.0025	0.0025	2	0	0.0025	0.0025	100.00
	Fluoride	1.5000	mg/L	0.0950	0.0950	0.0636	0.05	0.14	2	0	0.14	0.05	100.00
	Iodine	0.5000	mg/L	0.0250	0.0250	0.0212	0.01	0.04	2	0	0.04	0.01	100.00
	Iron	0.3000	mg/L	0.0225	0.0225	0.0247	0.005	0.04	2	0	0.04	0.005	100.00
	Lead	0.0100	mg/L	0.0025	0.0025	0.0021	0.001	0.004	2	0	0.004	0.001	100.00
	Magnesium	#####	mg/L	7.8750	7.8750	7.7145	2.42	13.33	2	0	13.33	2.42	100.00
	Manganese	0.5000	mg/L	0.0073	0.0073	0.0067	0.0025	0.012	2	0	0.012	0.0025	100.00
	Mercury	0.0010	mg/L	0.0001	0.0001	0.0000	0.00005	0.0001	2	0	0.0001	0.00005	100.00
	Molybdenum	0.0500	mg/L	0.0025	0.0025	0.0000	0.0025	0.0025	2	0	0.0025	0.0025	100.00
	Nickel	0.0200	mg/L	0.0050	0.0050	0.0000	0.005	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		7.4500	7.4500	0.2121	7.3	7.6	2	0	7.6	7.3	100.00
	Selenium	0.0100	mg/L	0.0010	0.0010	0.0000	0.001	0.001	2	0	0.001	0.001	100.00
	Silver	0.1000	mg/L	0.0010	0.0010	0.0000	0.001	0.001	2	0	0.001	0.001	100.00
	Sodium	180.0000	mg/L	44.0000	44.0000	15.5563	33	55	2	0	55	33	100.00
	Sulfate	500.0000	mg/L	63.0000	63.0000	35.3553	38	88	2	0	88	38	100.00
	Total Dissolved Solids	600.0000	mg/L	196.5000	196.5000	47.3762	163	230	2	0	230	163	100.00
	Total Hardness as Calcium	200.0000	mg/L	75.0000	75.0000	72.5492	23.7	126.3	2	0	126.3	23.7	100.00
	True Colour	15.0000	Hazen Units (HU)	4.5250	4.5250	3.5709	2	7.05	2	0	7.05	2	100.00
	Turbidity	5.0000	NTU	0.9500	0.9500	0.2121	0.8	1.1	2	0	1.1	0.8	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	45	0	0	0
Free Chlorine		0.2 - 5	mg/L	0.4478	0.4050	0.2000	0.17	1.31	46	1	0.76	0.21	97.83
pH		6.5 - 8.5		7.4891	7.5000	0.1622	7	7.8	46	0	7.7	7.2	100.00
Total Chlorine		5.0000	mg/L	0.8070	0.7350	0.2802	0.4	2.11	46	0	1.26	0.49	100.00
Total Coliforms		0.0000	mpn/100 mL	1.4000	0.0000	5.6182	0	36	45	7	8	0	84.44
Turbidity		5.0000	NTU	0.6848	0.7500	0.1966	0.3	1	46	0	0.9	0.4	100.00

5.3 Water quality discussion

There were no any positive microbiological results recorded in this reporting year.

A summary of water quality data available as an Appendix.

6 Consumer complaints (optional)



7 Water quality incidents

No Incidents

Table 7-1. Summary of incident and emergencies, recommendations and corrective actions

8 Action plan/Improvement plan

A summary of the action/improvement plan activities that have been implemented during the period 2012/2015 is included in Table 8-1. The full action and improvement plan is included in Appendix B.

Table 8-1. Action/improvement plan activities that have been completed during the period 2012/2015

Action no.	Item	Status
4.1	<i>Develop and implement a reticulation monitoring program to ensure the free chlorine residual in the distribution system is in-line with the NOW office of Water guidance (greater than 0.2 mg/L throughout the system).</i>	<i>Implemented as CCP 7</i>
4.2	<i>Develop procedures and log sheets for the calibration of chemical dosing systems</i>	<i>Instrument calibration LMWUA s project- In progress</i>
5.4	<i>Document daily testing procedures including the review of the water quality results at the water treatment plant.</i>	<i>Implemented</i>
5.5	<i>The DWMS document must be updated to state who is responsible for reviewing the results in the NSW Drinking Water Database. Reviews must be conducted after the results of each microbial sample and monthly for trends and water quality implications.</i>	<i>Implemented- In progress</i>
5.6	<i>Document daily testing procedures including who undertakes the daily review of the water quality results at the water treatment plant.</i>	<i>Implemented</i>
6.8	<i>Develop a contact list of key people, agencies and businesses for a water quality emergency in line with the NSW Guidance.</i>	<i>Part of IRP</i>
6.9	<i>Document in the DWMS where controlled copies of the emergency contact list is kept.</i>	<i>controlled</i>
6.10	<i>Document which agencies should be notified and under what circumstances and who is authorised to notify.</i>	<i>Part of IRP</i>
11.9	<i>C.t should be calculated.</i>	<i>Done by Public Work</i>
1.13	<i>Ensure Staff and Councillors are aware of the National Health Guidelines which include the development of a Drinking Water Quality Management Plan.</i>	<i>Implemented</i>
2.14	<i>Prepare relevant SOPs and make sure they are practised by the operators.</i>	<i>Implemented</i>
3.15	<i>Ensure Critical Control Points are documented.</i>	<i>Implemented</i>
3.16	<i>Ensure Critical Control Points are monitored.</i>	<i>Implemented</i>
4.17	<i>Implement the operational procedures that were developed</i>	<i>Implemented</i>
4.18	<i>Include these procedures in the O&M manual and ensure they are also located where the activity is undertaken</i>	<i>Displayed in the plant room</i>
4.19	<i>Document corrective actions for critical control points</i>	<i>Implemented</i>
5.20	<i>Document all operational procedures</i>	<i>Implemented</i>
6.21	<i>Formalise how incidents and emergencies and reviewed and protocols updated.</i>	<i>Implemented</i>
1.22	<i>Ensure regular (weekly or fortnightly) toolbox style meetings are held with technical and operational staff</i>	<i>Implemented</i>

Action no.	Item	Status
	<i>to ensure staff understands the practical implications and application of formal and regulatory requirements and to allow two way communication of issues. Minutes should be kept of these meetings.</i>	
2.23	<i>Develop a formal maintenance schedule for sludge rake and other equipment in the water supply system.</i>	<i>Implemented</i>
2.25	<i>Consider daily recording of weather conditions and river flows with raw water turbidity.</i>	<i>Implemented</i>
2.26	<i>Consider installing an on-line turbidity meter to measured filtered water</i>	<i>Implemented</i>
2.27	<i>Consider automating filter backwash</i>	<i>SCADA system-In progress</i>
2.28	<i>Monitor filtered water turbidity data over a filter run to determine filter characteristics</i>	<i>SCADA system-In progress</i>
2.29	<i>Formalise reticulation testing program and log all results. Test for chlorine prior to flushing.</i>	<i>Implemented</i>
4.30	<i>Ensure these procedures are held in an operations and maintenance manual</i>	<i>In progress</i>
4.31	<i>Extend the documentation to include the daily monitoring;</i>	<i>Implemented</i>
4.32	<i>Document all corrective actions and formalise associated communication protocol</i>	<i>In Progress</i>
5.33	<i>Ensure turbidity, Cl, pH and F are added to the daily log sheet.</i>	<i>Implemented</i>
5.34	<i>Formalise water quality monitoring schedule for the distribution.</i>	<i>Implemented</i>
5.35	<i>Improve complaint recording through TRIM</i>	<i>In progress</i>
6.36	<i>Document what information is assessed for the NOW performance reporting forms</i>	<i>Implemented</i>
7.37	<i>Regular (weekly or fortnightly) toolbox style meetings should be held with technical and operational staff to ensure two way communication of issues. Minutes should be kept.</i>	<i>Implemented</i>
7.38	<i>Develop and maintain a formalised training program for the employees.</i>	<i>Implemented- In progress</i>
7.39	<i>Share knowledge among the members of LMWUA and other neighbour Councils.</i>	<i>Implemented- In progress</i>
8.40	<i>Ensure water quality is considered during the community consultation as planned under objectives 6 and 7 of SBP 2007/08.</i>	<i>Implemented- In progress</i>
9.42	<i>Participate in research programs and technical/operational workshops organised by LMWUA.</i>	<i>Implemented - In progress</i>
9.43	<i>Undertaking investigative work to determine suitable upgrading method for the existing Nyngan WTP</i>	<i>SCADA system-In progress</i>
11.44	<i>Long term water quality and performance data logs including trends and results should be kept in a designated electronic file location</i>	<i>Implemented SCADA system-In progress</i>
4.50	<i>Ensure sufficient funds are available to fund asset maintenance and replacement, through the development of the management plan or strategic business plan</i>	<i>Implemented \$60,000 budget allocated for main replacement in 2015</i>
5.52	<i>Document how customer complaints are used to inform system maintenance programs (e.g. flushing programs or pipeline replacement).</i>	<i>Implemented- Mainly on breaks and asset life – In progress</i>
5.53	<i>Document internal and external reporting measures for water quality monitoring.</i>	<i>Implemented</i>

Action no.	Item	Status
5.54	<i>Document corrective procedures and communication systems for other non-conformances.</i>	<i>Implemented- In progress</i>
6.55	<i>Develop formal incident log sheets for recording of incident and management actions undertaken and for use in debriefing sessions</i>	<i>Implemented- In progress</i>
6.56	<i>Develop and incident and emergency response plan which contains information to guide staff in an incident and emergency. Ensure hard copies are controlled and available.</i>	<i>Part of IRP</i>
8.57	<i>Review Council's involvement in the Save Water alliance to improve communication with consumers.</i>	<i>Implemented with LMWUA</i>
11.61	<i>Establish procedures for long term performance evaluation of the water business within LMWUA.</i>	<i>Involved in the Water Security Program – In progress</i>
12.62	<i>Formalise management review of the water business</i>	<i>Involved in the Water Security Program – In progress</i>
4.67	<i>Replace the existing fluoridation system with a new system that complies with the NSW Code of Practice for Fluoridation of Public Water Supplies.</i>	<i>In progress with NSW Health and Public Work Dept</i>

9 Review of DWMS implementation

NSW Public Works has done a review on 19h February 2015

Table 9-1. Summary of internal reviews

<i>Element</i>	<i>Component</i>	<i>Finding</i>	<i>Action</i>
N/A	N/A	N/A	N/A

Table 9-2. Summary of external reviews

<i>Date</i>	<i>Reviewer</i>	<i>Scope</i>	<i>Summary of outcomes</i>	<i>Actions taken</i>
19/02/2015	Glenn Frnandes	Reviewing Chlorination system	Calculation of C.t value	Confirm the effective disinfection
		Reviewing Chemical dosing system	Proposed an alternative dosing arrangement	If current process fails only
	Lisa Procter	Reviewing CCPs and introducing COPs.	New CCPs and new COPs.	Established 4- CCPs and 3- COPs
		Reviewing the Health Based Targets (HBTs)	Level of Turbidity of filtered water	

10 Reservoir inspections

Reservoir inspection progress

<i>Date</i>	<i>Reservoirs inspected</i>	<i>Issue</i>	<i>Corrective actions</i>
15/07/2014	Cobar St	Entry hatch is not sealed	Hatch has been sealed.
		Upper cage of internal ladder needs to be removed	In progress
15/07/2014	Terangion St	Entry hatch is not sealed	Hatch has been sealed.
		Upper cage of internal ladder needs to be removed	In progress

Appendix A Water quality data

A.1 Water quality graphs

- *Provided in Section-5*

A.2 Water quality data summary

This section includes the summary of available water quality data over the reporting period:

- *Raw water – Council reported data*
- *Treated water - Council reported data*
- *Reticulation - Council reported data*
- *Verification – NSW Health reported data*

A.2.1 Raw Water

Parameter	Min	5 th per-centile	Median	95 th per-centile	Critical Limits	No. samples
Turbidity (NTU)	2	3	24	215	500	366
Colour (HU)	30	30	180	500	N/A	366
pH	6.6	7	7.2	7.9	8	366
Fluoride (mg/L)	N/A	N/A	N/A	N/A	N/A	N/A

A.2.2 Treated Water

Parameter	Min	5 th per-centile	Median	95 th per-centile	Critical Limits	No. samples
Turbidity (NTU)	0.2	0.2	0.5	0.9	1.5	366
Colour (HU)	0	0	0	0.7	0	366
pH	7	7.4	7.6	7.8	8	366
Fluoride	N/A	N/A	N/A	N/A	0.9-1.5	N/A
Free Chlorine (mg/L)	1.86	2.16	2.73	3.45	4.0 -1.0	366

A.2.3 Reticulation

Parameter	Min	5 th per-centile	Median	95 th per-centile	Critical Limits	No. samples
Turbidity (NTU)	0.3	0.4	0.7	0.9	1.5	364
pH	7.0	7.2	7.5	7.8	8	366
Fluoride	N/A	N/A	N/A	N/A	1.5	N/A
Free Chlorine (mg/L)	0.16	0.21	0.41	1.07	3.5	366

A.2.4 Verification monitoring (optional)

A summary of NSW Health's Drinking Water Quality Monitoring Program data is included here.

Parameter	Location	Min	5 th per- centile	Median	95 th per- centile	ADWG Limit	Unit	No. excee- d- ances	No. samples
E. coli	Reticulation	0	0	0	0	0	mpn /100ml	0	45
Free Chlorine	Reticulation	0.17	0.21	0.40	0.76	0.2-5	mg/L	1	46
pH	Reticulation	7.0	7.2	7.5	7.7	6.5-8.5		0	46
Turbidity	Reticulation	0.3	0.4	0.75	0.9	5	NTU	0	46
Fluoride	Reticulation	0.09	0.05	0.09	0.14	1.5	mg/L	0	2

NSW Health Performance comparison report for Nyngan water supply system

Physical Sample Count	Number Of Physical Characteristics	Number Of Physical Characteristics Non Compliant	Physical Percent Compliant	Chemical Sample Count	Number Of Chemical Characteristics	Number Of Chemical Characteristics Non Compliant	Chemical Percent Compliant	Micro Sample Count	Number Of Ecoli Non Compliant	Micro Percent Compliant	Micro Allocation	Chemical Allocation
2	10	0	100%	2	38	0	100%	45	0	100%	52	2

Appendix B Improvement / Action Plan

Element 1	Commitment to Drinking Water Quality Management
Element 2	Assessment of the Drinking Water Supply System
Element 3	Preventive Measures for Drinking Water Quality Management
Element 4	Operational Procedures and Process Control
Element 5	Verification of drinking water quality
Element 6	Management of incidents and emergencies
Element 7	Employee awareness and training
Element 8	Community involvement and awareness
Element 9	Research and development
Element 10	Documentation and record keeping
Element 11	Evaluation and audit
Element 12	Review and continual improvement

Task No	Element	To Do Actions	Time	By whom	By when	Completed
1	4	Develop and implement a reticulation monitoring program to ensure the free chlorine residual in the distribution system is in line with NSW Office of Water (NOW)	DWMS			A typical format has been provided
2	4	Develop procedures and log sheets for the calibration of chemical dosing systems	DWMS			
3	4	Council must develop procedures for the delivery of chemicals	DWMS			Council to develop procedures based on the templates provided in the DWMS
4	5	Document daily testing procedures including the review of the water quality results at the water treatment plant.	DWMS		30/09/12	Has been prepared. Operators implement
5	5	The DWMS document must be updated to state who is responsible for reviewing the results in the NSW Drinking Water Database. Reviews must be conducted after the results of each microbial sample and monthly for trends and water quality implications.	DWMS			
6	5	Document daily testing procedures including who undertakes the daily review of the water quality results at the water treatment plant.	DWMS			Procedure to be developed

7	5	Document communication system to deal with unexpected water quality results at the water treatment plant.	DWMS			Not completed
8	6	Develop a contact list of key people, agencies and businesses for a water quality emergency in line with the NSW Guidance.	DWMS			Part of the IRP
9	6	Document in the DWMS where controlled copies of the emergency contact list is kept.	DWMS			Control
10	6	Document which agencies should be notified and under what circumstances and who is authorised to notify.	DWMS			As shown in the IRP
11	9	C.t should be calculated.	DWMS			NSW PW
12	11	An internal and external audit schedule should be developed in consultation with NSW Health and NOW.	DWMS			NSW Health
13	1	Ensure Staff and Councillors are aware of the National Health Guidelines which include the development of a Drinking Water Quality Management Plan.	Immediate			Complete
14	2	Prepare relevant SOPs and make sure they are practised by the operators.	Immediate		30/09/12	Have been prepared. Operators implement
15	3	Ensure Critical Control Points are documented.	Immediate		30/09/12	Have been prepared. Operators implement
16	3	Ensure Critical Control Points are monitored.	Immediate		30/09/12	Have been prepared. Operators implement
17	4	Implement the operational procedures that were developed	Immediate			
18	4	Include these procedures in the O&M manual and ensure they are also located where the activity is undertaken.	Immediate		30/09/12	These are displayed in the plant room.
19	4	Document corrective actions for critical control points	Immediate		30/09/12	Have been prepared. Operators implement
20	5	Document all operational procedures	Immediate		30/09/12	Have been prepared.

						Operators implement
21	6	Formalise how incidents and emergencies and reviewed and protocols updated.	Immediate		30/09/12	Have been prepared. Operators implement
22	1	Ensure regular (weekly or fortnightly) toolbox style meetings are held with technical and operational staff to ensure staff understands the practical implications and application of formal and regulatory requirements and to allow two way communication of issues. Minutes should be kept of these meetings.	Short term			Minutes to be kept.
23	2	Develop a formal maintenance schedule for sludge rake and other equipment in the water supply system.	Short term			The sludge rake is identified as critical. This needs to be addressed

24	2	Consider participating in CMA catchment management programs.	Short term			
25	2	Consider daily recording of weather conditions and river flows with raw water turbidity.	Short term			Done
26	2	Consider installing an on-line turbid meter to measure filtered water turbidity.	Short term		2017	Test chlorine sample on site rather than bring back to lab. There is a common turbid meter on-line, however it would be more beneficial to add individual turbid meters with the SCADA upgrade.
27	2	Consider automating filter backwash	Short term		2018	Included in SCADA upgrade
28	2	Monitor filtered water turbidity data over a filter run to determine filter characteristics.	Short term		2017	Included in SCADA upgrade
29	2	Formalise reticulation testing program and log all results. Test for chlorine prior to flushing.	Short term		2018	In progress
30	4	Ensure these procedures are held in an operations and maintenance manual;	Short term			

31	4	Extend the documentation to include the daily monitoring;	Short term		2017	Done
32	4	Document all corrective actions and formalise associated communication protocol.	Short term			
33	5	Ensure turbidity, Cl, pH and F are added to the daily log sheet.	Short term			This may be element 4 rather than 5.
34	5	Formalise water quality monitoring schedule for the distribution.	Short term			Done
35	5	Improve complaint recording through TRIMS.	Short term			Currently only a spreadsheet.
36	6	Document what information is accessed for the NOW performance Reporting Forms	Short term			
37	7	Regular (weekly or fortnightly) toolbox style meetings should be held with technical and operational staff to ensure two way communication of issues. Minutes should be kept.	Short term			Done
38	7	Develop and maintain a formalised training program for the employees.	Short term			Done
39	7	Share knowledge among the members of LMWUA and other neighbour Councils.	Short term			Done
40	8	Ensure water quality is considered during the community consultation as planned under objectives 6 and 7 of SBP 2007/08.	Short term			on-going
41	8	Council must develop an education program to ensure consumers understand the quality difference between the raw water and potable system.	Short term			Village water is non-potable. Advising rental agencies in currently in progress
42	9	Participate in research programs and technical/operational workshops organised by LMWUA.	Short term			Done
43	9	Undertake investigative work to determine suitable upgrading method for the existing Nyngan WTP	Short term		2017	Included in the SCADA upgrade
44	11	Long-term water quality and performance data logs, including trends and results should be kept in a designated electronic file location.	Short term		2017	Included in the SCADA upgrade
45	12	Implement the actions identified in the drinking water quality management improvement plan (Reference 3)	Short term			

46	1	When the Water Strategic Business Plan is updated ensure that levels of service include public health/water quality objectives	Medium term		Not Yet	The next WSBP will be in 2016
47	1	When the Water Strategic Business Plan is updated document public health/water quality implications of the operating environment review	Medium term		Not Yet	The next WSBP will be in 2016
48	1	When the Water Strategic Business Plan is updated ensure the operating review captures responsibilities in other documents such as Codes of Practice and Standards.	Medium term		Not Yet	The next WSBP will be in 2016
49	2	Ensure the risk assessment is reviewed every five years or if conditions or system knowledge changes.	Medium term		Not Yet	The next WSBP will be in 2016
50	4	Ensure sufficient funds are available to fund asset maintenance and replacement, through the development of the management plan or strategic business plan	Medium term			Mains replacement program in is progress. \$80k/year for pipe replacement work. 2014/15 there has been 500m of AC pipe replaced.
51	4	Formally document the maintenance program.	Medium term			
52	5	Document how customer complaints are used to inform system maintenance programs (e.g. flushing programs or pipeline replacement).	Medium term			Mainly on breaks and asset life
53	5	Document internal and external reporting measures for water quality monitoring.	Medium term			Done - Every Monday put onto Council database
54	5	Document corrective procedures and communication systems for other non-conformances.	Medium term			CCP report quarterly
55	6	Develop formal incident log sheets for recording of incident and management actions undertaken and for use in debriefing sessions	Medium term			Done
56	6	Develop and incident and emergency response plan which contains information to guide staff in an incident and emergency. Ensure hard copies are controlled and available.	Medium term			IRPs

57	8	Review Council's involvement in the Save Water alliance to improve communication with consumers.	Medium term			15 December - TV ads, school programs, info inserts with customer bills. \$5k/year allocated
58	9	Replace or upgrade the WTP with affordable appropriate technology.	Medium term		2017	
59	10	Formalise document control system.	Medium term		2017	On-going - formalised with the SCADA upgrade
60	10	Formalise documentation review system.	Medium term		2017	On-going - formalised with the SCADA upgrade
61	11	Establish procedures for long term performance evaluation of the water business within LMWUA.	Medium term			Involved in the Water Security Program - \$10M grant for 2000ML off-river storage

62	12	Formalise management review of the water business	Medium term		Not Yet	
63	4	Provide a calibration cylinder for the sodium hypochlorite dosing pumps	Immediate			
64	4	Rearrange the chemical dosing points as shown in this report and assess the performance.	Immediate			
65	4	After completion of switchboard replacement and SCADA upgrade, flowpace all chemical dosing systems with the starting and stopping of the plant.	Immediate			
66	5	Measure chlorine residual at the outlet of the town reservoir from the sample point recommended by NSW Public Works.	Immediate			
67	4	Replace the existing fluoridation system with a new system that complies with the NSW Code of Practice for Fluoridation of Public Water Supplies.	Immediate			
68	4	Investigate replacing Alum with PACI for coagulation.	Medium term		Not Yet	
69	4	Consider diluting sodium hypochlorite to 6% for storage. Calculate the sodium hypochlorite	Medium term		Not Yet	

		dosage (for 6% solution strength) and check if the dosing pump capacity is suitable				
70	4	Install on-line turbidimeter and backwash filters on turbidity breakthrough once SCADA upgrade is completed.	Medium term		Not Yet	
71	4	Interlock starting and stopping of the fluoride dosing system with the operation and flowrate of the plant.	Medium term		Not Yet	

Figure: 4.1 CCP (Critical Control Points) –Nyngan Water Treatment Plant

