Drinking Water Management System

Annual Report 2022/23

Goldenfields Water County Council

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Document Control

Date	Version	Change made	Person	Date submitted to NSW Health
August 2017	2.0	Drinking Water Management System annual report created	Chris Breen/Geoff Veneris	March 2017
October 2019	3.0	Updated annual report with relevant data	Chris Breen/Geoff Veneris	October 2019
October 2020	3.1	Updated annual report with relevant data	Chris Breen/Geoff Veneris	October 2020
September 2021	3.2	Updated annual report with relevant data for 2020/21 reporting period	Chris Breen/Geoff Veneris	September 2021
October 2022	3.3	Updated annual report with relevant data for 2021/22 reporting period	Chris Breen/Geoff Veneris	November 2022
July 2023	3.4	Updated annual report with relevant data for 2022/23 reporting period	Mitchell Farlow/Chris Breen/Geoff Veneris	December 2023

Guidance

This report is designed to address the reporting (Element 10), evaluation (Element 11) and review and continual improvement (Element 12) requirements of Goldenfields Water County Council's Drinking Water Management System (DWMS).

The NSW Guidelines for Drinking Water Management Systems (2013) recommends review of the following areas:

- Performance of critical control points
- Water quality review (raw, treated and distribution water quality including verification monitoring in the NSW Health Drinking Water Database)
- Levels of Service (including consumer complaints)
- Incident and emergencies (including follow up)
- Drinking Water Management System implementation
- Continuous improvement plan implementation

Review of system performance should be against ADWG, levels of service, NSW Water Supply and Sewerage Performance Monitoring Reports and other regulatory requirements (Element 1).

Shortcomings should be captured in the Improvement Plan (Element 12).

Executive Summary

Critical Control Points

The following tables provide the total number of CCP exceedances registered throughout the 2022/23 financial year with the corresponding CCP number for each scheme.

Table 1. Number of CCP exceedances in the Jugiong supply scheme.

Jugiong	CCP1	CCP2	CCP3	CCP4	CCP5	CCP6
Number of CCP exceedances	0	0	3	10	0	10

Table 2. Number of CCP exceedances in the Oura supply scheme.

Oura	CCP1	CCP2	CCP3	CCP4
Number of CCP exceedances	2	6	0	1

Table 3. Number of CCP exceedances in the Mt Daylight supply scheme.

Mt Daylight	CCP1	CCP2
Number of CCP exceedances	18	0

Table 4. Summary of CCPs across all schemes.

CCP Number	Monitoring Parameter	Target Criterion	Adjustment Limit	Critical Limit
1 - Jugiong	Turbidity (Continuous online) Raw Water	Dependant on raw Water Quality		20% above set point for > 20minutes
2 - Jugiong	Turbidity (Continuous online) Filter Outlet	≤ 0.2 NTU	≥ 0.5 NTU	≥ 1.0 NTU
3 - Jugiong	Free Chlorine residual (Continuous online & alarmed) Finished Water	1.8mg/L	≤ 1.2mg/L or ≥ 2.0mg/L	**Summer**: ≤ 0.8mg/L for > 30min or ≥ 5.0mg/L **Winter**: ≤ 0.5mg/L for > 30min or ≥ 5.0mg/L
4 - Jugiong	Fluoride (Daily) Finished Water	1.0mg/L	< 0.95mg/L or > 1.05mg/L	< 0.9mg/L for > 72hrs or > 1.5mg/L
5 - Jugiong	System Integrity (monthly) Reservoir inspection	Secure, no evidence of break in or vermin	Visual identification of breach or vermin access to reservoir	Visual identification of vermin or containment in reservoir
6 - Jugiong	Free chlorine residual (continuous online & alarmed) Prunevale and Cootamundra	0.8mg/L	≤ 0.5mg/L or ≥ 2.0mg/L	≤ 0.2mg/L or ≥ 5.0mg/L
1 - Oura	Free Chlorine residual (Daily) Treated Water	0.5mg/L	≤ 0.3mg/L or ≥ 1.0mg/L	≤ 0.2mg/L or ≥ 5.0mg/L

CCP Number	Monitoring Parameter	Target Criterion	Adjustment Limit	Critical Limit
2 – Oura	Fluoride (Daily) Treated Water	1.0mg/L	< 0.9mg/L or > 1.2mg/L	< 0.9mg/L for > 72hrs or ≥ 1.5mg/L
3 – Oura	System Integrity (monthly) Reservoir inspection	Secure, no evidence of break in or vermin	Visual identification of breach or vermin access to reservoir	Visual identification of vermin or containment in reservoir
4 - Oura	Chlorine Residual (weekly) Wyalong and Thanowring Rd	0.5mg/L	≤ 0.35mg/L	≤ 0.25mg/L
1 – Mt Arthur	Free Chlorine residual (3 x weekly) Tank 4 Outlet	0.8mg/L	≤ 0.5mg/L or ≥ 2.0mg/L	≤ 0.3mg/L or ≥ 5.0mg/L
2 – Mt Arthur	System Integrity (monthly) Reservoir inspection	Secure, no evidence of break in or vermin	Visual identification of breach or vermin access to reservoir	Visual identification of vermin or containment in reservoir
1 – Mt Daylight	Free Chlorine Residual (continuous Online) Naradhan Reservoir	0.8mg/L	≤ 0.5mg/L or ≥ 2.0mg/L	≤ 0.3mg/L or ≥ 5.0mg/L
2 – Mt Daylight	System Integrity (monthly) Reservoir Inspection	Secure, no evidence of break in or vermin	Visual identification of breach or vermin access to reservoir	Visual identification of vermin or containment in reservoir

Water Quality

Verification monitoring has been undertaken over the entire GWCC scheme during the reporting period. Majority of data is compliant with the Australian Drinking Water Guidelines and limits set by public Health (NSW Health) with exceedances summarised in Tables 12, 13, 14 and 15.

A majority of these events were related to fluoride dosing issues due to aged assets, and chlorine events due to unreliable analysers. Council is currently operating Berkert analysers for Free and Total chlorine. These units appear to be significantly impacted in locations with high concentrations of Manganese. Council is seeking alternative analysers that are more reliable and will look to remove Total from the specification due to its unreliable nature for online monitoring requirements of plant control.

GWCC did record two incidents of E. coli detected in the Dirnaseer reservoirs as detailed in Table 25, which were communicated at the time to NSW Health and resulted in the reservoirs being emptied and cleaned of frogs, with potential avenues for contamination sealed.

Operational monitoring has also been conducted over the entire scheme with some non-compliances reported. These non-compliances have been summarised in Table 23. The non-compliances have been mainly for low residual chlorines and elevated temperatures in the furthest extremities in each of the water source systems.

Continuous Improvement Plan

GWCC review and update their Action and Implementation Plan as per Appendix B - Continuous Improvement Plan of this report. A summary of items that have been addressed or ongoing are detailed in the below Table 5.

Table 5. Summary of Council's Action and Implementation Plan.

	Completed or closed	In progress	Not Started	Implemented/Ongoing	Items added
Number of actions	68	2	0	9	0

*Note that there are a number of items reported in previous years that haven't been counted above, as they have been rolled into other action item. Full Continuous Improvement Plan can be seen in Appendix B.

DWMS Reviews

The 2017/18 DWMS was the first to be undertaken by GWCC. The 2017/18 report was conducted using only the data available at the time. The dataset used was limited to only a few months' worth of information.

This DWMS report is our latest annual review and has utilised the entire 2022/23 data for the Jugiong, Oura and Mt Daylight water supply systems. The Mt Arthur supply system will be included in the 2023/24 DWMS report as it is currently being updated into the GWCC SCADA system. This data was made available from the implementation of WaterOutlook and ClearSCADA. Data is also extracted and utilised from NSW Health's Drinking Water Database.

In addition to the general progression of the DWMS, GWCC engaged its internal Auditor (National Audits Group) in 2019 to review the DWMS and provide recommendations for improvement.

A key finding was that more transparency of data reported and adopted by the Board should occur. A full list of audit findings can be found in Appendix D - External Auditor Report Summary.

Review	Scope	Findings	Actions taken
26/09/2019	*Internal Audit*	*Listed in Appendix D*	*Responses noted in Appendix D and added to continuous improvement plan for GWCC to action*

Reservoir Inspections

A total of 126 reservoirs, 8 surge tanks and 2 Break Pressure tanks are visually inspected weekly via a 'drive-by'. A more comprehensive inspection conducted on the above is conducted on a quarterly basis. The findings of the inspections are summarised in the section, headed Reservoir Inspections (page 54). A more comprehensive reservoir inspection report has been downloaded from the ASAM website, this is the database that Aqualift provide when undertaking GWCC reservoir cleaning and maintenance, the report for reservoirs inspected during the 2022/23 FY is available in Appendix C of this report. Additional internal inspection reports are completed and submitted to the Engineering division for corrective action on prioritisation of issued works.

Report Purpose

The purpose of the report is to inform and keep up to date New South Wales Department of Health (NSW Health) of Goldenfields Water County Councils (GWCC) implementation and ongoing assessment of its Drinking Water Management System. It also demonstrates that GWCC is compliant with requirement s25 Public Health Act 2010 to develop a Quality Assurance Program (QAP) in line with the framework for Drinking Water Quality Management in the Australian Drinking Water Guidelines.

Scheme Summary

GWCC provides the essential water requirements of approximately 40,000 people spread over an area in excess of 22,000 sq. km, between the Lachlan & Murrumbidgee Rivers in the Southwest of NSW.

GWCC's water supply system consists of five separate water schemes, Jugiong, Oura, Mt Arthur, Mt Daylight and Hylands Bridge. GWCC carries out water supply functions within the Local Government areas of Bland, Coolamon, Cootamundra-Gundagai Regional Council, Junee, Temora, Hilltops Council previously (Harden, Young), parts of Narrandera and Wagga Wagga.

Harden and Young Councils, now Hilltops Council are retailers who purchase bulk water from GWCC and supply the water to retail customers in their respective local government areas. Cootamundra-Gundagai Regional Council receives bulk supply from GWCC and retails water to customers in the township of Cootamundra, with GWCC supplying water to retail customers in the Cootamundra Shire outside the urban centre. GWCC also supplies small quantities of bulk water to Riverina Water County Council to service their northern supply areas.

At the end of the 2022/23 reporting period, there were 11776 water connections across the entire drinking water scheme, broken down in Table 6. This is an increase of 57 new connections across the Goldenfields County Council Drinking Water scheme. It should be noted that the bulk connections are identified as single connections only.

Table 6. Total GWCC connections, broken down by scheme.

Oura	Jugiong	Mt Arthur	Daylight	Hylands Bridge (non-potable)	Total
9159	688	1577	266	86	11776

A number of projects were also undertaken that encompassed the entirety of all Drinking Water schemes; these projects and current costings are summarised below:

- Microwave link sites for Scada $241,783.98
- Emergency Works - GWCC Wide $82,160.90
- Urban Meter & Taggle Replacement Program $165,487.65
- Rural Meter and Taggle Replacement Program $179,149.65
- Gantry Cranes $35,998.12
- Supply and install new Switchboards $19,756.18
- Internal Reservoir Adhoc Renewals $90,802.04
- External Reservoir Adhoc Renewals $319,249.02
- Water Quality Instrumentation Renewal $23,886.55

Jugiong Scheme

The Jugiong drinking water supply system is one of the largest water supply systems managed by Goldenfields Water. Most of the water produced in the Jugiong system supplies the bulk water Councils of Cootamundra Gundagai and Hilltops. Water is also delivered to a small number of retail customers in rural properties and the villages of Stockinbingal, Wallendbeen and Springdale. Approximately 18,000 people are supplied water from the Jugiong system.

Source Water

Goldenfields Water is licenced to extract water from the Murrumbidgee River via two submersible pumps operated in a duty / stand-by configuration. The submersible pumps are fixed speed; pump 1 operates at 185 L/s and pump 2 operates at 300 L/s.

The Jugiong source has been categorised as having a “Low” risk regarding Cryptosporidium. NSW Public Health’s preliminary outcome assessment for Cryptosporidium for the Jugiong scheme was reported to GWCC on 27th November 2019. A listed action for the Jugiong Scheme was:

‘Maintaining the operation and monitoring (ideally continuously) of individual filters to consistently reduce turbidity to <0.2 NTU’

Goldenfields can confirm that individual turbidity meters have now been installed during the 2021/22 financial year. Commissioning was completed in the 2022/23 financial year.

An additional assessment of the Jugiong Catchment was undertaken by Public Works Advisory in 2023 as part of the development of Goldenfields Water’ Integrated Water Cycle Management Strategy. The results of this assessment identified the catchment to be ‘high risk’. GWCC will continue to develop and upgrade any future process requirements in accordance with a high risk catchment.

Water Treatment Process

The Jugiong Water Treatment Plant (WTP) is located on Waterworks Road in the township of Jugiong. The plant is a conventional WTP with a nominal capacity of 40 ML/day. It should be noted that the current pump arrangements at the plant can only produce around 23.8ML a day. Recent stress testing of the plant indicates that the plant is only capable of achieving an estimated 29ML of process whilst still maintain compliance with all CCP’s for a 22 hour run time.

The treatment process at Jugiong WTP comprises of the following process steps:

- Water from the Murrumbidgee River is pumped via 120 m rising main to Jugiong WTP (capacity 23.8 ML/day) by two pumps in a duty/standby configuration
- Water passes through a flow meter, where a flow of greater than 101 L/s starts the chlorine and soda ash pre-dosing systems for oxidisation of metals and pH adjustment, respectively. The chlorine pre-dose is optional, and is switched on or off by the operator, depending on water quality conditions
- The pre-dosed water enters the rapid mix tank which consists of baffles and two mixers in series. Polymer and aluminium sulphate are dosed into the rapid mix tank to aid flocculation
- Water then flows into the two flocculation tanks which has three mixers in series operating at declining speeds to allow for floc formation

- Flocculated water then enters the two clarifiers and sludge is removed by a travelling sludge rake. Sludge is sent to the duty sludge lagoon
- Clarified water enters the filter block, where it is dosed with chlorine and subsequently distributed across six gravity sand filters
- Filtered water enters a common channel. When flow in the filtered water channel is above 101 L/s, post-dosing of soda ash and chlorine are activated for pH adjustment and increased disinfection capacity, respectively. Water is also dosed with fluoride in the filtered water channel
- Flow from the filtered water channel enters the 3 ML clear water tank through a mid-level inlet and bottom outlet configuration
- Water from the clear water tank proceeds to clear water pumping station 1 (CWPS1), which has two 680 kW pumps and a smaller 400 kW pump that operate in a duty/standby/standby mode. CWPS1 distributes water to Jugiong drinking water supply system
- Treated water is distributed through 14 reservoirs and by 8 pumping stations. There are 138 km of trunk mains and 182 km of reticulation mains in the Jugiong system

Connections

The Jugiong drinking Water scheme has 688 connections. The system also supplies GWCCs bulk customers, Hilltops and Cootamundra-Gundagai. Jugiong GWCC retail Connections are broken down as follows:

- 20mm = 526
- 25mm = 152
- 32mm = 3
- 40mm = 4
- 50mm = 3

Included in this data are 3 stand pipe connections: 1 x 32mm, 1 x 40mm and 1 x 50mm.

For the Hilltops and Cootamundra-Gundagai Regional Council (CGRC) connections that are supplied via bulk service, Table 7 shows the breakdown of connections as sourced from Hilltops and Coota-Gundagai Regional Councils. (Spreadsheet located in CM9 Doc. 21/13324). When we get new connections Special Schedule 7 will give us a further breakdown:

Table 7. Breakdown of bulk service connections based off size.

Bulk Customer	20mm	25mm	32mm	40mm	50mm	63mm	65mm	80mm	100mm	150mm	Sub Total
Hilltops Council (21/22FY)	6058	347	30	38	48	0	2	5	9	0	6537
Bulk Customer	**20mm**	**25mm**	**32mm**	**40mm**	**50mm**	**63mm**	**75mm**	**80mm**	**100mm**	**150mm**	**Sub Total**
CGRC	3994	124	33	45	58	1	3	2	8	0	4269

Upgrade to the System/System Improvements

GWCC staff have undertaken works to upgrade several assets within the Jugiong Drinking water scheme a summary of those works are provided below:

• Cootamundra Abattoirs New Connections - Developer Paid Mains	$17,803
• New Water Service Connections - Jugiong	$2,331
• New Non Residential Backflow - Jugiong	$2,747
• Rosehill Pipeline	$94,154
• Rosehill to Young - 2022	$4,283
• Cooney's Creek Replacement - Replace approx 60m of exposed pipeline through Cooney's creek and rock armour section of erosion	$17,186
• PRV Replacement - Jugiong	$14,649
• Mains Valve Renewals - Jugiong	$3,965
• Wombat BT to Young TS Pipeline Upgrade	$109,228
• Rosehill Pump Station	$68,395
• Jugiong Raw water well Renewal	$91,231
• Jugiong CWPS1 P1 and P2 Inlet Manifold 2022	$121,007
• Pump Station Valve Renewals - Jugiong	$11,171
• Demondrille Pump 2 - 2022	$29,191
• Jugiong CWPS1 Pump 1 - 2022	$181,866
• Wombat BT Renewal	$45,418
• Jugiong High Voltage	$3,416,953
• Jugiong PLC Upgrade	$43,263
• Jugiong WTP - Valve & Pneumatic Upgrade	$68,088
• Jugiong Raw Water PS Renewal	$11,011

A total of $4,353,939 has been spent on the Jugiong scheme for the 2022/23 Financial year.

Oura Scheme

The Oura drinking water supply system is one of the largest water supply systems managed by Goldenfields Water. The majority of water is delivered to retail customers; however, a small amount is supplied to Riverina Water in bulk to customers along the Goldenfields Water pipeline. Approximately 15,000 people are supplied water from the Oura system. The Oura drinking water supply system can be connected to Goldenfields Water's Mt Arthur drinking water supply scheme at Coolamon and Ganmain, as well as the Hyland's Bridge non-drinking water supply at Barellan.

Source Water

Water is sourced from the Oura Borefield, which is located at Gumly Gumly Island to the north of Murrumbidgee River. Goldenfields Water is licensed to draw from four groundwater bores: Bore 2, Bore 3, Bore 4 and Bore 6. Bores are located in bore huts.

Water in the Murrumbidgee Inland Alluvial Aquifer is recharged by the Murrumbidgee River and is managed by the Natural Resource Access Regulator in NSW. There are two alluvial formations in this region: the Lachlan formation is a confined aquifer system that is overlain by the semi-confined to unconfined Cowra formation (NSW Dept. of Water and Energy, 2007).

According to the DPI Water (NSW Office of Water, 2011), groundwater in the Oura system is fresh, with total dissolved solids (TDS) ranging from zero to 500 mg/L and is suitable for domestic stock, some irrigation purposes and municipal use. NSW Public Health has issued preliminary advice regarding the risk of the Gumly Gumly source which has been deemed "protected". The Oura source has been categorised as having a "Low" risk regarding

Cryptosporidium. NSW Public Health's preliminary outcome assessment for Cryptosporidium for the Oura scheme was reported to GWCC on 27th November 2019.

Water Treatment Process

Water for the Oura drinking water supply system undergoes aeration, disinfection and fluoridation prior to distribution.

The treatment process for Oura drinking water supply system comprises of the following process steps:

- Groundwater is pumped from the Oura Borefield by line shaft bore pumps in each bore. The bores are operated in sequential mode where increased water demand will increase the number of bores online. The order of bore start up is operator adjustable, with the current order of preference set as: Bore No. 4, 6 and 3. Bore 2 was placed into service in November 2020, however, less than desirable water quality was achieved and it was decided to remove the bore from production until such time as it can be cleaned and flushed properly. The bore was removed from service and cleaned by an external contractor in early 2021 with a substantial amount of sand removed. It has since been placed back into service and is currently only used as a secondary pump. It is unable to be utilised as the lead pump due to high iron, manganese which strips free chlorine from the water.
- The groundwater is dosed with chlorine prior to entering a tray aerator. The aerator serves to oxidate dissolved iron and manganese from the raw water.
- After aeration, water is transferred to the Oura Contact Tank (2.2 ML), where chlorine contact time is achieved before being pumped by Oura pumping station to Marrar Pinnacle (Marrar Pinnacle 1.6 ML, 1 reservoir) or the Junee BT Reservoir (Junee 17 ML, 3 reservoirs).
- The Oura pumping station consists of two 605 kW pumps and a smaller 400 kW pump that operate on a duty/duty/standby configuration.
- Fluoride is dosed on the outlet of the Oura pumping station.

The Oura drinking water supply system is one of the largest distribution systems managed by Goldenfields Water.

Treated water is distributed through 35 reservoirs and by 19 pumping stations. There are 201km of trunk mains and 1,055km of reticulation mains in the Oura system. There are two chlorine booster pumping stations located at Thanowring Road and Reefton pumping stations to ensure adequate free chlorine residual is maintained throughout the system.

Connections

The Oura drinking water scheme has 9159 connections. This scheme also supplies bulk water to Riverina Water County Council. The Oura connections are broken down as follows:

- 20mm = 7969 connections
- 25mm = 807 connections
- 32mm = 86 connections
- 40mm = 61 connections
- 50mm = 57 connections
- 80mm = 8 connections

- 100mm = 5 connections

Included in this data are 19 standpipe connections: 8 x 32mm, 5 x 40mm, 4 x 50mm and 4 x 80mm.

Upgrade to the System/System Improvements

GWCC staff have undertaken works to upgrade several assets within the Oura Drinking water scheme a summary of those works are provided below:

• Dustin Rose Estate	$61,325
• Oura WTP PRV to customer	$5,067
• New Water Service Connections - Oura	$11,856
• New Non Residential Backflow - Oura	$575
• North Street West Wyalong - Approx 120m extension along North Street to Operator St in West Wyalong	$22,873
• Mandamah Stage 2 - 4	$13,359
• West Wyalong Transfer Pump Station	$419,790
• Wyalong Standpipe Res	$3,661,820
• Storage Shed located at Oura Approx. 18 x 16m	$47,771
• Wyalong Reliability Project Investigation & Design	$61,792
• Wyalong Reliability Project Pipeline Construction	$5,132,213
• Eurollie Road, Cartwrights rural - Smith Replacement	$17,485
• Water Service Renewals - Oura	$6,056
• Water Main Replacement - Beach St Junee	$206,303
• Marrar Urban Renewal - Replacement of old sections of pipeline within Marrar township and trunk main downstream of PRV	$157,573
• Lisgar St Junee Replacement	$18,680
• Thanowring Road Pipeline	$543,050
• Talbingo Lane Pipeline Renewal	$110,436
• Oura to Junee COnnection Upgrades	$5,082
• PRV Replacement - Oura	$77,813
• Mains Valve Renewals - Oura	$5,287
• Bygoo Road Replacement - Ardlethan	$33,737
• South from Jail Break Inn Junee	$108,896
• Oura New Connections from Riv Water (50% Contribution)	$26,299
• Temora WPS SB Upgrade - Oura	$12,260
• Ariah Park Pump Station Investigation	$6,115
• Oura Pump Station Renewal	$31,165
• Temora Transfer Pump 1 - 2022	$1,822
• Marinna Pump 2 - 2022	$1,569
• Junee Silos Pump 2023	$1,788
• Pump Station Valve Renewals - Oura	$4,052
• Eurollie Pump 2 - 2022	$8,062
• Junee Reefs Magflow Install - 2022	$34,417
• Oura Bore 4 - Emergency Bore Reline	$396,825
• Oura Reservoirs and aerator	$424,718
• Oura High Voltage	$1,123,245
• Oura Bore 3 - 2022	$10,153

A total of $12,811,328 has been spent on the Oura scheme for the 2022/23 financial year.

Oura Water Scheme – Periodic inspection

The Mt Arthur Drinking Water Scheme was inspected by the Department of Planning, Industry and Environment (DPIE) Senior Inspector Pat Freeman. This inspection was in accordance with statutory requirements of the Local government Act 1993. At the time of inspection (18th August, 2022) the system was reported as "performing satisfactorily" and "CCPs were adequately understood and monitored". A further comment was made stating "it is pleasing to see Councils water infrastructure being upgraded". The onsite water quality results taken at time of inspection are as per Table 8 Table 9below.

Table 8. Water quality results from Mt Arthur inspection by DPIE.

Sub-Matrix: WATER (Matrix: WATER)				Sample ID	Oura WTP - OW3 Temora Retic	Oura WTP - OW1 Final	Oura WTP - OW2 Junee Retic
				Sampling date / time	18-Aug-2022 00:00	18-Aug-2022 00:00	18-Aug-2022 00:00
Compound	CAS Number	LOR	Unit		CA2205696-001	CA2205696-002	CA2205696-003
					Result	Result	Result
EA005CA: pH							
pH	----	0.01	pH Unit		8.33	7.85	8.08
EA010CA: Conductivity							
Electrical Conductivity @ 25°C	----	2	µS/cm		370	397	370
EA041CA: Colour - True							
Colour (True)	----	1	PCU		<1	<1	<1
EA045CA: Turbidity							
Turbidity	----	0.1	NTU		0.4	0.4	0.8
EA043CA: UV Absorbance - Filtered							
ø UV Absorbance @ 254nm	----	0.01	AU		0.02	0.01	<0.01
ED037CA: Alkalinity							
Hydroxide Alkalinity as CaCO3	DMO-210-001	0.1	mg/L		<0.1	<0.1	<0.1
Carbonate Alkalinity as CaCO3	3812-32-6	0.1	mg/L		5.0	<0.1	<0.1
Bicarbonate Alkalinity as CaCO3	71-52-3	0.1	mg/L		110	112	111
Total Alkalinity as CaCO3	----	1	mg/L		115	112	111
EP002CA: Dissolved Organic Carbon							
ø Dissolved Organic Carbon (as NPOC)	----	1	mg/L		<1	<1	<1
EG005CA: Dissolved Metals by ICP-OES							
Calcium	7440-70-2	0.10	mg/L		19.9	20.3	19.2
Magnesium	7439-95-4	0.10	mg/L		12.8	15.0	13.9
EG005CA: Total Metals by ICP-OES							
Aluminium	7429-90-5	0.02	mg/L		<0.02	<0.02	<0.02
Iron	7439-89-6	0.02	mg/L		0.07	<0.02	0.05
Manganese	7439-96-5	0.001	mg/L		0.016	0.021	0.013
EA066CA: Calcium Hardness as CaCO3							
ø Calcium Hardness as CaCO3	----	1	mg/L		50	51	48
EA065CA: Total Hardness							
ø Total Hardness as CaCO3	----	1	mg/L		102	112	105

These results indicate that the treatment process was being managed well and the quality of the water complies with ADWG (for parameters tested).

Mt Arthur Scheme

The Mt Arthur drinking water supply system supplies approximately 2,300 people. The Mt Arthur System can be supplemented by the Oura drinking Water supply system through Coolamon and Ganmain, however this is not common practice.

Water for the Mt Arthur drinking water supply system is drawn from the Lachlan Fold Belt fractured rock aquifer system, near the Murrumbidgee River at Matong. According to the DPI Water (NSW Office of Water, 2011), groundwater in this region is of moderate quality with TDS between 500 to 1500mg/L and is suitable for domestic stock and some irrigation purposes.

Source Water

Water is sourced from Mt Arthur Borefield, which is located near the Murrumbidgee River at Matong. GWCC is licenced to draw 762ML per annum from two groundwater bores. These bores are located in Bore Huts on the corner of Old Narrandera Rd and Matong Rd.

The Mt Arthur source has been categorised as having a “Low” risk regarding Cryptosporidium. NSW Public Health’s preliminary outcome assessment for Cryptosporidium for the Mt Arthur scheme was reported to GWCC on 27th November 2019.

Water Treatment Process

The Water treatment of the Mt Arthur drinking water supply system comprises of the following steps:

- Groundwater is pumped to the surface by two 94kW bore pumps in a duty/standby configuration
- Water is injected with chlorine prior to entering the four Ganmain Low Level Reservoirs where iron and manganese are settled out.
- The water is then distributed to retail customers in Coolamon, Ganmain, Matong and Grong Grong

The Mt Arthur Drinking Water Supply system distributes water to the areas of Ganmain, Coolamon, Grong Grong and Matong. Treated Water is distributed through 9 reservoirs and by 6 pumping stations. There are 76km of trunk mains and 67km of reticulation mains in the Mt Arthur system.

Connections

The Mount Arthur drinking water scheme has 1577 connections; the Mount Arthur connections are broken down as follows:

- 20mm = 1473 connections
- 25mm = 56 connections
- 32mm = 34 connections
- 40mm = 7 connections
- 50mm = 7 connections

Included in this data are 4 standpipe connections: 1 x 32mm, 1 x 40mm and 1 x 50mm

Upgrades to the System/System Improvements

GWCC staff have undertaken works to upgrade several assets within the Mt Arthur drinking water scheme a summary of those works are provided below:

• Coolamon Industrial Subdivision	$76,696
• Loch St Ganmain	$19,669
• New Water Service Connections - Mr Arthur	$16,448
• New Non Residential Backflow - Mt Arthur	$341
• Water Service Renewals - Mr Athur	$1,333
• Coolamon Railway Underbore	$3,158
• Stinson Street Coolamon Replacement	$13,996
• Mains Valve Renewals - Mt Arthur	$1,428
• Lonsdale Control Panel	$31,527
• Matong Pump Station - 2022	$7,071

- Matong Bore 2 Switchboard Renewal $97,529
- Ganmain Pump Station Switchboard Renewal $65,015
- Coolamon Pump Station Switchboard Renewal $22,425
- Ganmain Pump 8 - 2022 $10,364
- Grong Grong Reservoir Switchboard Renewal $17,081
- Coolamon South Reservoir Switchboard Renewal $17,081
- Matong Reservoir Switchboard Renewal $26,691

A total of $427,853 has been spent on the Mt Arthur scheme for the 2022/23 financial year

Mt Arthur Water Scheme – Periodic inspection

The Mt Arthur Drinking Water Scheme was inspected by the Department of Planning, Industry and Environment (DPIE) Senior Inspector Pat Freeman. This inspection was in accordance with statutory requirements of the Local government Act 1993. At the time of inspection (19th August, 2022) the system was reported as “performing satisfactorily” and was being “well managed”. The onsite water quality results taken at time of inspection are as per Table 9 below.

Table 9. Water quality results from Mt Arthur inspection by DPIE.

Sub-Matrix: WATER (Matrix: WATER)				Sample ID	Mt Arthur WTP - CW1 Coolamon Retic
				Sampling date / time	18-Aug-2022 00:00
Compound	CAS Number	LOR	Unit	CA2205707-001	
				Result	
EA005CA: pH					
pH	----	0.01	pH Unit	7.58	
EA010CA: Conductivity					
Electrical Conductivity @ 25°C	----	2	µS/cm	302	
EA041CA: Colour - True					
Colour (True)	----	1	PCU	<1	
EA045CA: Turbidity					
Turbidity	----	0.1	NTU	1.2	
EA043CA: UV Absorbance - Filtered					
ø UV Absorbance @ 254nm	----	0.01	AU	<0.01	
ED037CA: Alkalinity					
Hydroxide Alkalinity as CaCO3	DMO-210-001	0.1	mg/L	<0.1	
Carbonate Alkalinity as CaCO3	3812-32-6	0.1	mg/L	<0.1	
Bicarbonate Alkalinity as CaCO3	71-52-3	0.1	mg/L	88.9	
Total Alkalinity as CaCO3	----	1	mg/L	89	
EP002CA: Dissolved Organic Carbon					
ø Dissolved Organic Carbon (as NPOC)	----	1	mg/L	<1	
EG005CA: Dissolved Metals by ICP-OES					
Calcium	7440-70-2	0.10	mg/L	10.2	
Magnesium	7439-95-4	0.10	mg/L	7.72	
EG005CA: Total Metals by ICP-OES					
Aluminium	7429-90-5	0.02	mg/L	<0.02	
Iron	7439-89-6	0.02	mg/L	0.15	
Manganese	7439-96-5	0.001	mg/L	0.026	
EA066CA: Calcium Hardness as CaCO3					
ø Calcium Hardness as CaCO3	----	1	mg/L	25	
EA065CA: Total Hardness					
ø Total Hardness as CaCO3	----	1	mg/L	57	

These results indicate that the treatment process was being managed well and the quality of the water complies with ADWG (for parameters tested).

Mt Daylight System

The Mt Daylight drinking water is a water supply system that supplies approximately 125 people in the villages and surrounds of Naradhan, Weethalle and Tallimba.

The Mt Daylight drinking water supply system draws its ground water from the lower Lachlan alluvium, located in the Lachlan River Catchment. The aquifers surrounding Lake Ballyrogan (Lake Brewster) from which the Mt Daylight system draws its water. This is hydraulically connected to surface waters. Meaning, that ground water quality in the daylight system is connected to surface water quality, although it is expected that the ground water turbidity would be much better due to filtration through subsurface flows. Both DPI Water (NSW Office of Water 2011) and Natural Resources Commission (2006) report that the groundwater in the Mt daylight scheme is relatively fresh with low salinity, making it suitable for municipal use.

Source Water

Water is sourced from the Daylight Borefield which consists of two bores located in the Carathool Shire local government area, between Lake Brewster and the Lachlan River. The bores are jointly owned and operated by Carathool Shire Council and GWCC. GWCC owns 71% of the assets in value and Carathool owns 29%. Carathool is responsible for the maintenance, repair, and replacement of all bores. Additionally, Carathool is the water entitlement licence holder without having GWCC listed as an entitled party. GWCC is the only provider of municipal potable water supply from this scheme.

The Mt Daylight source has been categorised as having a "Low" risk regarding Cryptosporidium. NSW Public Health's preliminary outcome assessment for Cryptosporidium for the Mt Daylight scheme was reported to GWCC on 27th November 2019.

Water Treatment Process

The treatment of the water in the Mt Daylight System comprises of the following:

- Groundwater is pumped to the surface by two 30kW pumps in a duty/standby configuration to the daylight reservoirs
- Water is injected with Chlorine at the inlet to the Mt daylight reservoirs
- Water is distributed to retail customers in Naradhan, Weethalle and Tallimba.

Treated Water is distributed through 7 reservoirs and by 5 pumping stations. There are 308km of trunk mains and 8 km of reticulation mains in the Mt Daylight system.

Connections

The Mount Daylight Drinking water supply has 266 connections, these connections are broken down as follows:

- 20mm = 141 connections
- 25mm = 121 connections
- 32mm = 2 connection
- 40mm = 1 connection
- 50mm = 1 Connection

Included in this data are 2 standpipe connections: 1 x 32mm and 1 x 50mm.

Rural Backflow Prevention Program

GWCC rural Backflow prevention Program sees a Reduced Pressure Zone Device (RPZD) installed on rural water connections to prevent the cross contamination of water supply.

An RPZD is a device that stops the reverse flow of contaminated water in rural areas from entering our rural water supply system.

All rural connections have been classified as high risk of cross contamination due to the use of hazardous chemicals and livestock on rural properties. Cross contamination caused by these factors can travel back into rural customers' water mains which can potentially harm health or cause death. Due to the risk, the installation of a testable RPZD is required to ensure compliance in accordance with the Australian Standard (AS3500 Part 1: Plumbing and Drainage Section 4).

GWCC adopted the Backflow Prevention policy (PP06) in August 2016 and works began in May 2017 to install backflow devices on all rural properties. To date a total of 1347 RPZD have

been installed within the GWCC area. GWCC have installed 119 RPZDs for Hilltops Council during the 2021/22 FY making it a total of 1466 installations. There are currently approximately 120 installations outstanding, or no certificate has been found and/or completed for their install.

In the 2022/23 FY, GWCC installed a further 114 RPZDs that GWCC retains ownership of and 14 for Hilltops Council. There are currently approximately 118 installations outstanding, or no certificate has been found and/or completed for their install. Additional RPZD installs may be required if new service connections in rural areas come online. A summary of this information can be viewed in Table 10

Table 10. Breakdown of total RPZDs within GWCC scheme.

# of RPZD Installed in 2022/23 FY	
# of RPZD Installed at Start of 2022/23 FY	1466
# of RPZD Installed in 2022/23 FY (GWCC Owned)	114
# of RPZD Installed in 2022/23 FY (Hilltops Owned)	14
Total RPZD Count	
GWCC Owned RPZDs	1461
Hilltops Council Owned RPZDs	133
# of RPZD Installs Outstanding	118

Critical Control Points

No changes have been made to the CCP's during the 2022/23 reporting period.

Table 11. Summary of critical control points.

CCP Number	Monitoring Parameter	Target Criterion	Adjustment Limit	Critical Limit
1 - Jugiong	Turbidity (Continuous online) Raw Water	Dependant on raw Water Quality		20% above set point for > 20minutes
2 - Jugiong	Turbidity (Continuous online) Filter Outlet	≤ 0.2 NTU	≥ 0.5 NTU	≥ 1.0 NTU
3 - Jugiong	Free Chlorine residual (Continuous online & alarmed) Finished Water	1.8mg/L	≤ 1.2mg/L or ≥ 2.0mg/L	**Summer**: ≤ 0.8mg/L for > 30min or ≥ 5.0mg/L **Winter**: ≤ 0.5mg/L for > 30min or ≥ 5.0mg/L
4 - Jugiong	Fluoride (Daily) Finished Water	1.0mg/L	< 0.95mg/L or > 1.05mg/L	< 0.9mg/L for > 72hrs or > 1.5mg/L
5 - Jugiong	System Integrity (monthly) Reservoir inspection	Secure, no evidence of break in or vermin	Visual identification of breach or vermin access to reservoir	Visual identification of vermin or containment in reservoir
6 - Jugiong	Free chlorine residual (continuous online & alarmed) Prunevale and Cootamundra	0.8mg/L	≤ 0.5mg/L or ≥ 2.0mg/L	≤ 0.2mg/L or ≥ 5.0mg/L
1 - Oura	Free Chlorine residual (Daily) Treated Water	0.5mg/L	≤ 0.3mg/L or ≥ 1.0mg/L	≤ 0.2mg/L or ≥ 5.0mg/L
2 – Oura	Fluoride (Daily) Treated Water	1.0mg/L	< 0.9mg/L or > 1.2mg/L	< 0.9mg/L for > 72hrs or ≥ 1.5mg/L
3 – Oura	System Integrity (monthly) Reservoir inspection	Secure, no evidence of break in or vermin	Visual identification of breach or vermin access to reservoir	Visual identification of vermin or containment in reservoir
4 - Oura	Chlorine Residual (weekly) Wyalong and Thanowring Rd	0.5mg/L	≤ 0.35mg/L	≤ 0.25mg/L
1 – Mt Arthur	Free Chlorine residual (3 x weekly) Tank 4 Outlet	0.8mg/L	≤ 0.5mg/L or ≥ 2.0mg/L	≤ 0.3mg/L or ≥ 5.0mg/L
2 – Mt Arthur	System Integrity (monthly) Reservoir inspection	Secure, no evidence of break in or vermin	Visual identification of breach or vermin access to reservoir	Visual identification of vermin or containment in reservoir
1 – Mt Daylight	Free Chlorine Residual (continuous Online) Naradhan Reservoir	0.8mg/L	≤ 0.5mg/L or ≥ 2.0mg/L	≤ 0.3mg/L or ≥ 5.0mg/L

CCP Number	Monitoring Parameter	Target Criterion	Adjustment Limit	Critical Limit
2 – Mt Daylight	System Integrity (monthly) Inspection Reservoir	Secure, no evidence of break in or vermin	Visual identification of breach or vermin access to reservoir	Visual identification of vermin or containment in reservoir

Critical Limit Exceedances

A breakdown of what each CCP represents can be seen in Table 11 above. Note that OCP1 relates to pH which is an operational control point with associated critical limits (<7 and >8) and is not a critical control point. However, exceedances related to this operational control point have been included in Table 12. Critical limit exceedances - Jugiong.

Table 12. Critical limit exceedances - Jugiong

Date	CCP 1	CCP 2	CCP 3	CCP 4	CCP 5	CCP 6	OCP 1	Reason	Immediate Correction	Preventive Action
04/07/2022				0.30				Fluoride hung up in hopper	Clear blockage	Monitor directly after filling hopper
08/09/2022				0.36				Hopper blockage	Hopper emptied and unblocked, scales re-calibrated	Completely empty hopper at regular intervals
08/09/2022							8.00	Repeated filter backwashing (3 washed)	Monitor	Monitor
09/10/2022				0.86				Drop in raw water fluoride from flood conditions	Increased dose	Monitor
24/11/2022				0.83				Blockage in soda ash outlet as clear water pH was low which stopped plant		
06/02/2023				0.87				Increased discharge to river	Monitor and check tomorrow's result	
13/02/2023				0.68				Fluoride hopper blockage	Located issue, tap on hopper	Monitor
19/02/2023			0.67					Plant hasn't run since approx. 3pm 18/2/23 due to power outage		
29/03/2023			0.75					No pumping from raw water or high level pumps for an extended period of hours. Works being carried out in raw water well	When plant restarted free chlorine residual increase to target level	Be aware and monitor chlorine decay when plant is not running
14/04/2023				0.45				Fluoride trapped in hopper, possible scale issue	Fluoride hopper emptied for cleaning	Monitor scales at lower levels
01/05/2023				0.80				Plant not operating due to valve	Investigate any possible cause and	Monitor and act

Date	CCP 1	CCP 2	CCP 3	CCP 4	CCP 5	CCP 6	OCP 1	Reason	Immediate Correction	Preventive Action
								replacement, possible moisture issue with hopper	follow up on heater replacement	
02/05/2023				0.60						
29/06/2023				0.88				Dose decreased due to higher reading previous days	Monitor and possibly increase dose	Monitor and react to water changes

Table 13. Critical limit exceedances - Oura

Date	CCP1	CCP2	CCP3	CCP4	Reason	Immediate Correction	Preventative Action
14/07/2022		0.81			Fluoride solution flow fault, possibly due to cold temperature	System reset	Monitor
16/07/2022	0.18				Plant not running for extended time	Retest came back within CCPs, monitor analyser and calibrate	Monitor and dose if necessary
17/07/2022	0.14				Possibly due to bore selection	Changed bore selection, dosed reservoirs up with liquid chlorine	Monitor chlorine and bore selection
25/07/2022				0.18			
09/09/2022		0.28			Pump not working	Swapped to backup pump	
20/09/2022		0.25			No power to fluoride plant		
21/09/2022		0.26			Power switch room changeover, no power		
22/09/2022		0.26			Electrical switch and SCADA communication connection error	Electricians investigated and rectified	
12/10/2022	0.00				Reservoir undergoing cleaning and swabbing		
13/10/2022	0.00				Reservoir undergoing cleaning and swabbing		
22/10/2022	0.06				Analyser issues	Bench tested at 0.31 mg/L	
31/10/2022	0.14				Analyser issues	Bench tested at 0.58 mg/L	
01/11/2022	0.01				Analyser issues	Bench tested at 0.27 mg/L	
03/11/2022	0.02				Number 4 bore	Grab sample taken	
04/11/2022	0.00				Number 4 bore	Grab sample taken	
09/11/2022	0.00				Analyser issues	Grab sample taken	
11/11/2022	0.05				Analyser issues	Grab sample taken	
16/11/2022		0.34			Hopper emptied for recalibration due to modifications	Hopper recalibrated	Monitor
10/12/2022	0.10				Analyser issues	Grab sample taken	
20/12/2022	0.18				Analyser issues	Grab sample taken	
22/12/2022	0.15				Analyser issues	Grab sample taken	
03/01/2023	0.16				Analyser issues	Bench tested at 0.34 mg/L	
12/01/2023	0.09				Analyser issues	Bench tested at 0.53 mg/L	
09/02/2023	0.18				Analyser issues	Bench tested at 0.52 mg/L	
17/02/2023	0.03				Analyser issues	Bench tested at 0.52 mg/L	

Date	CCP1	CCP2	CCP3	CCP4	Reason	Immediate Correction	Preventative Action
18/02/2023	0.08				Analyser issues	Bench tested at 0.52 mg/L	
19/02/2023	0.07				Analyser issues	Bench tested at 0.43 mg/L	
20/02/2023	0.09				Analyser issues	Bench tested at 0.40 mg/L	
21/02/2023	0.03				Analyser issues	Immediately downstream tested chlorine of 0.41 (Harefield Offtake), 0.37 (Junee BT) and 0.20 (Junee silos)	
22/02/2023	0.14				Analyser issues	Immediately downstream tested chlorine of 0.46 (Harefield Offtake), 0.38 (Junee BT) and 0.33 (Junee silos)	
28/02/2023	0.12				Analyser issues	Bench tested at 0.74 mg/L	
01/03/2023	0.15				Analyser issues	Bench tested at 0.82 mg/L	
02/03/2023	0.15				Analyser issues	Bench tested at 0.30 mg/L	
06/03/2023	0.17				Analyser issues	Grab sample taken	
01/04/2023	0.17				Bore 2	Removed bore 2 from duty	
06/04/2023	0.11				Bore 2	Removed bore 2 from duty	
08/04/2023	0.12				Analyser issues	Grab sample taken	
15/04/2023	0.18				Analyser issues	Bench tested at 0.36 mg/L	
19/06/2023	0.03				Bore 2	Removed bore 2 from duty	

Table 14. Critical limit exceedances - Mt Daylight

Date	CCP1	CCP2	Reason	Immediate Correction	Preventative Action
15/11/2022	0.13		Bore flooding event	Managed distribution system levels where required	
16/11/2022	0.07		Bore flooding event	Managed distribution system levels where required	
22/11/2022	0.04		Bore flooding event	Managed distribution system levels where required	
23/11/2022	0.04		Bore flooding event	Managed distribution system levels where required	
24/11/2022	0.22		Bore flooding event	Managed distribution system levels where required	
01/12/2022	0.04		Bore flooding event	Managed distribution system levels where required	

Date	CCP1	CCP2	Reason	Immediate Correction	Preventative Action
03/12/2022	0.24		Bore flooding event	Managed distribution system levels where required	
04/12/2022	0.26		Bore flooding event	Managed distribution system levels where required	
05/12/2022	0.08		Bore flooding event	Managed distribution system levels where required	
06/12/2022	0.05		Bore flooding event	Managed distribution system levels where required	
07/12/2022	0.01		Bore flooding event	Managed distribution system levels where required	
08/12/2022	0.29		Bore flooding event	Managed distribution system levels where required	
09/12/2022	0.25		Bore flooding event	Managed distribution system levels where required	
10/12/2022	0.15		Bore flooding event	Managed distribution system levels where required	
14/12/2022	0.12		Bore flooding event	Managed distribution system levels where required	
15/12/2022	0.05		Bore flooding event	Managed distribution system levels where required	
21/12/2022	0.14		Bore flooding event	Managed distribution system levels where required	
22/12/2022	0.09		Bore flooding event	Managed distribution system levels where required	

Fluoride Critical Limit exceedance

See Table 12. Critical limit exceedances - Jugiong and Table 13. Critical limit exceedances - Oura.

Table 15. Fluoride critical limit exceedances – summary all results in (mg/L)

Date	Scheme	Recorded Concentration (mg/L)	Amount Exceeded By (mg/L)
04/07/2022	Jugiong	0.30	-0.65
08/09/2022	Jugiong	0.36	-0.59
09/10/2022	Jugiong	0.86	-0.09
24/11/2022	Jugiong	0.83	-0.12
06/02/2023	Jugiong	0.87	-0.08
13/02/2023	Jugiong	0.68	-0.27
14/04/2023	Jugiong	0.45	-0.50
01/05/2023	Jugiong	0.80	-0.15
02/05/2023	Jugiong	0.60	-0.35
29/06/2023	Jugiong	0.88	-0.07

14/07/2022	Oura	0.81	-0.09
09/09/2022	Oura	0.28	-0.62
20/09/2022	Oura	0.25	-0.65
21/09/2022	Oura	0.26	--0.64
22/09/2022	Oura	0.26	-0.64
16/11/2022	Oura	0.34	-0.56

Other Reportable CCP Events

Oura Scheme

On the 28th of June, an anomaly was detected in the reticulation of the Oura scheme. Fluoride testing at both Junee and Temora indicated results of 0.83mg/L and 0.87mg/L respectively; however, the fluoride results at the treatment plant had not dropped below 0.9mg/L. The most recent CCP breach for fluoride below 0.9mg/L occurred on 16th November 2022, and while Council is aware of the potential for high-water age in the system, the delay in low fluoride from the plant to the test locations is deemed excessive and cannot be correlated. As such, this was not deemed a CCP breach, but rather an anomalous event. Instruments were calibrated and standards checked to ensure readings were correct for future testing.

At the Oura Water Treatment Plant, a total of 32 events occurred whereby the chlorine analyser detected concentrations below the CCP of 0.2mg/L while transfer pumps to the system were operating. This has been solely attributed to the levels of inorganics in the water which also interferes with the reading of the analyser. This has resulted in alarms, plant shutdowns, bench testing for verification of chlorine concentrations and consideration of replacing the current analysers with different technology that are more resilient to high inorganic content.

It should be noted that the Oura water source is classified as Category 1 – Secure Groundwater and the C.t. of 15mg.min/L is exceeded[1] and as such, these events do not present a health concern, but rather highlight the need to address inorganics in the source water and/or invest in alternative technologies to better manage the chlorine residual and its measurement. It is for this reason that Council intends to install a chlorine dosing system post aeration and storage, in order to maintain sufficient residual during periods of increased inorganics. GWCC have recently installed a new Analyser at Oura for trial to ensure reliability with the new unit is confirmed prior to implementation within Councils control system.

In any event whereby low chlorine concentrations are detected, GWCC monitors the residual at the Junee balance tanks which are considered part of the C.t calculations used. Residuals at this site have not been detected below CCP requirements; however, if they are manual hypo dosing is undertaken to ensure residual is detected to monitor the distribution and reticulation system/s.

Mt Daylight Scheme

Between November and December 2022, a large number of CCP exceedances were detected as a result of the Carrathool Shire Council flooding event. During this event, Council lost electrical supply to the bores and was unable to extract water from the bores. As a result,

[1] NSW Public Works (2023, April). *Health Based Target Water Quality Risk Assessment* [PowerPoint slides]. Department of Regional NSW

water was carted from the Oura scheme during this time and the analyser was not being utilised as the transfer pumps were not employed. For this reason, the above exceedances were due to chlorine decay and do not reflect concerns of the systems integrity and field samples were collected regularly to ensure customers were provided with safe water. Any low residuals detected within the system are corrected via manually dosing of hypo when detected.

Critical Control Point Graphs

Figure 1. Jugiong water treatment plant - free chlorine.

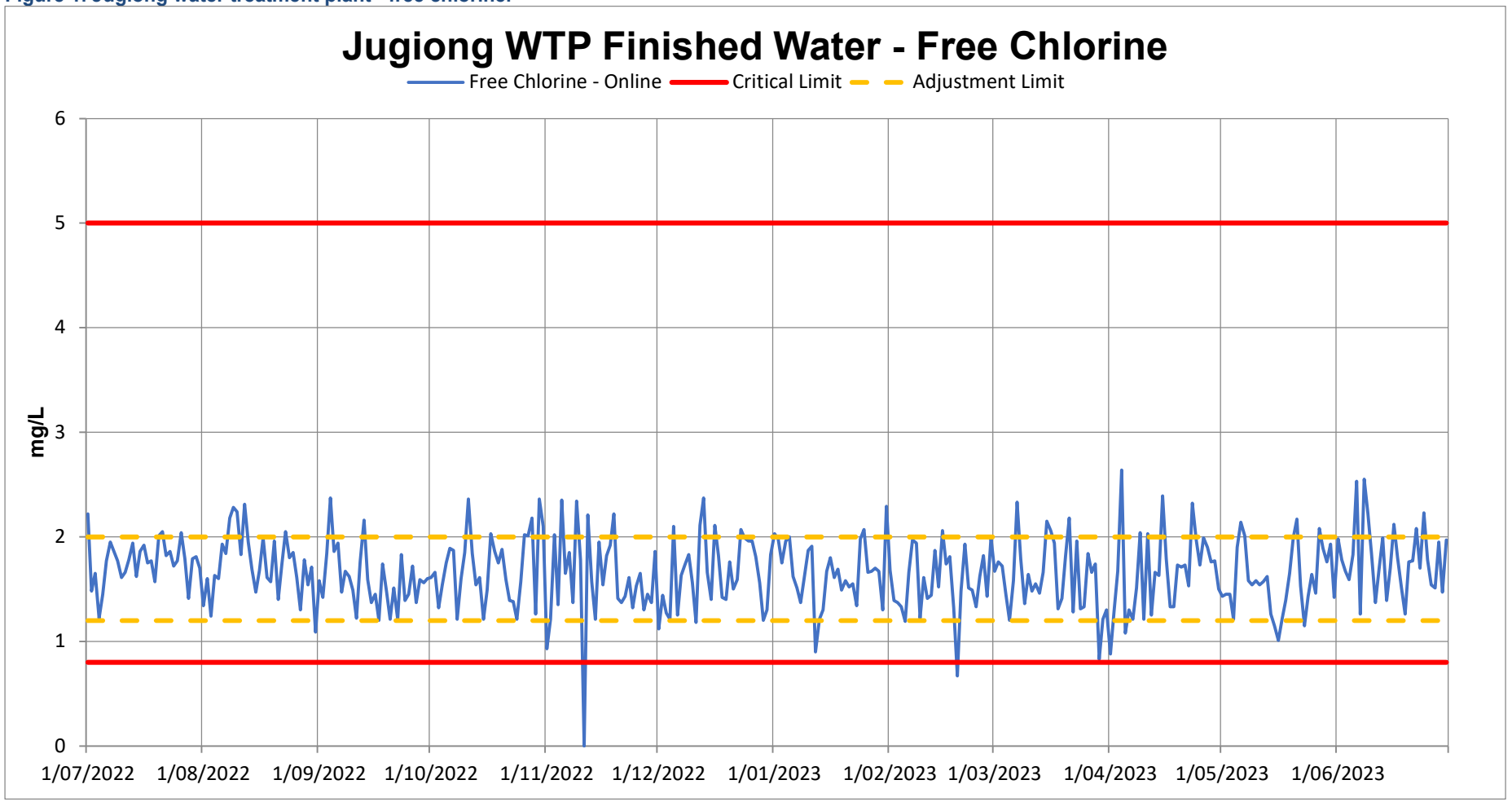


Figure 1 above is a representation of free chlorine in the water leaving the Jugiong Water Treatment Plant. The red lines are our Critical Control Points (CCP) for the concentration of chlorine in the water and the orange lines are our Operational Control Points. As is indicated above, GWCC is consistently within the CCP throughout the year with the exception of 2 exceedances. These exceedances are explained in Table 12 above.

Figure 2. Jugiong water treatment plant - finished fluoride.

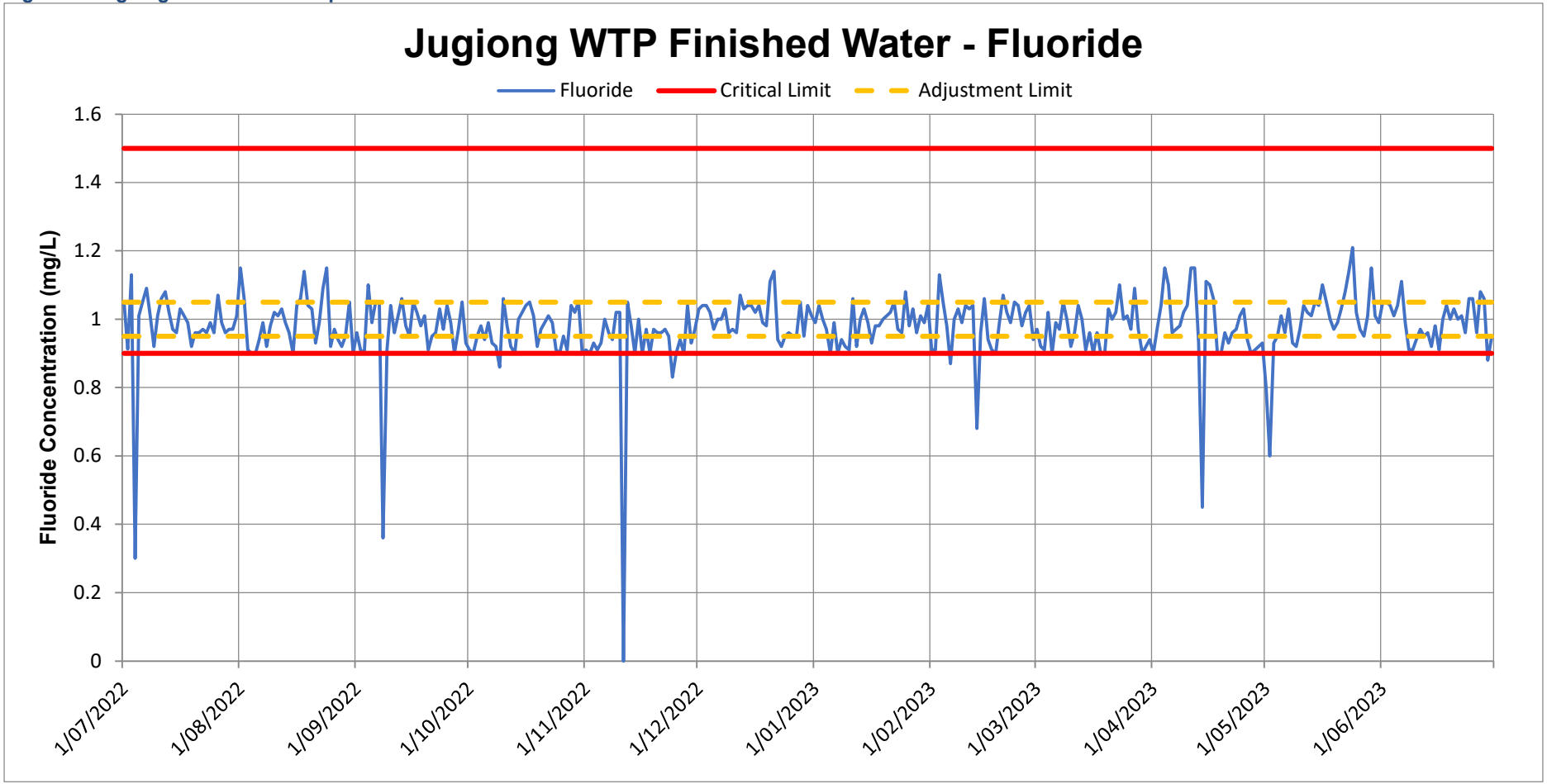


Figure 2 is a representation of the Finished Water Fluoride in the water leaving the Jugiong Water Treatment Plant. The red lines are our Critical Control Points (CCP) limits for the concentration of fluoride in the water and the orange lines are our Operational Control Points. As is indicated above, GWCC is generally within the CCP throughout the year with the exception of 10 exceedances as indicated above. These exceedances are explained in Table 12 above.

Figure 3. Oura water treatment plant - finished water free chlorine.

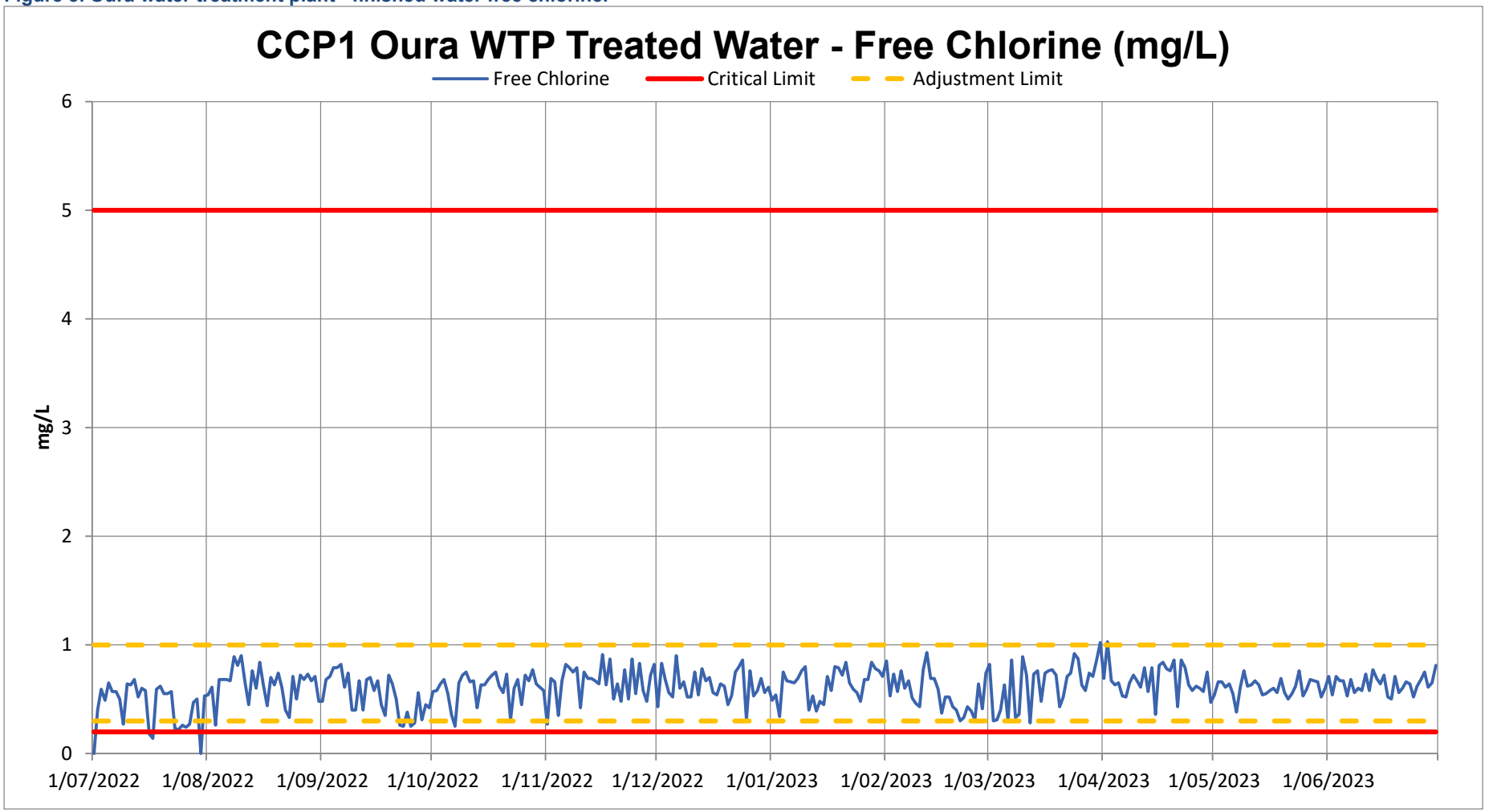


Figure 3 above is a representation of free chlorine in the water leaving the Oura Water Treatment Plant. The red lines are our Critical Control Points (CCP) for the concentration of chlorine in the water and the orange lines are our Operational Control Points. As is indicated above, GWCC is consistently within the CCP throughout the year with only 2 exceedances. These exceedances are explained in Table 13 above with a number of other exceedances excluded due to bench testing demonstrating incorrect analyser readings.

Figure 4. Oura water treatment plant - treated water fluoride.

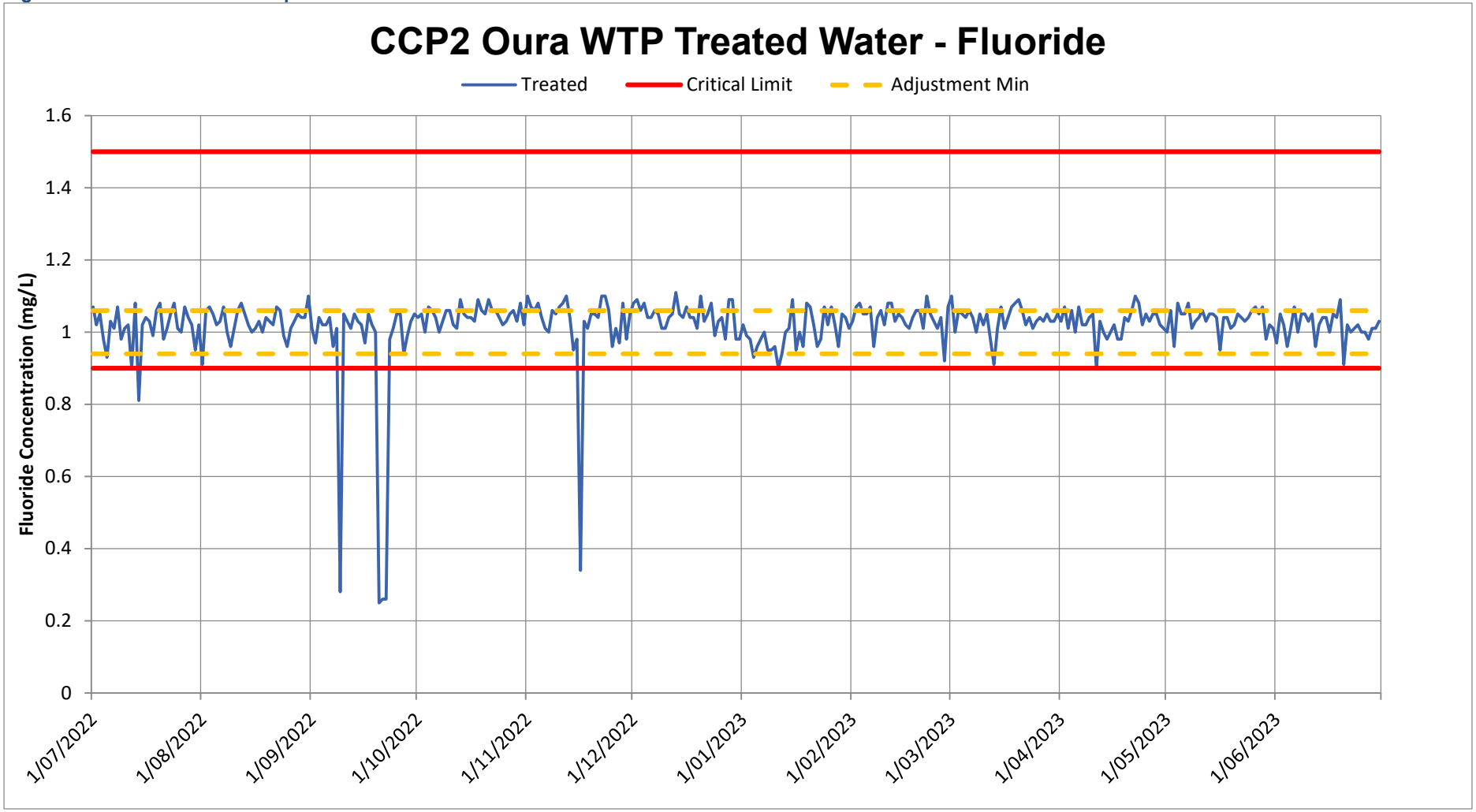


Figure 4 above is a representation of the Finished Water Fluoride in the water leaving the Oura Water Treatment Plant. The red lines are our Critical Control Points (CCP) limits for the concentration of Fluoride in the water and the orange lines are our Operational control points. As is indicated above, there have been 7 exceedances throughout the reporting period. These exceedances have been explained in Table 13 above.

Figure 5: Mt Daylight – finished water free chlorine

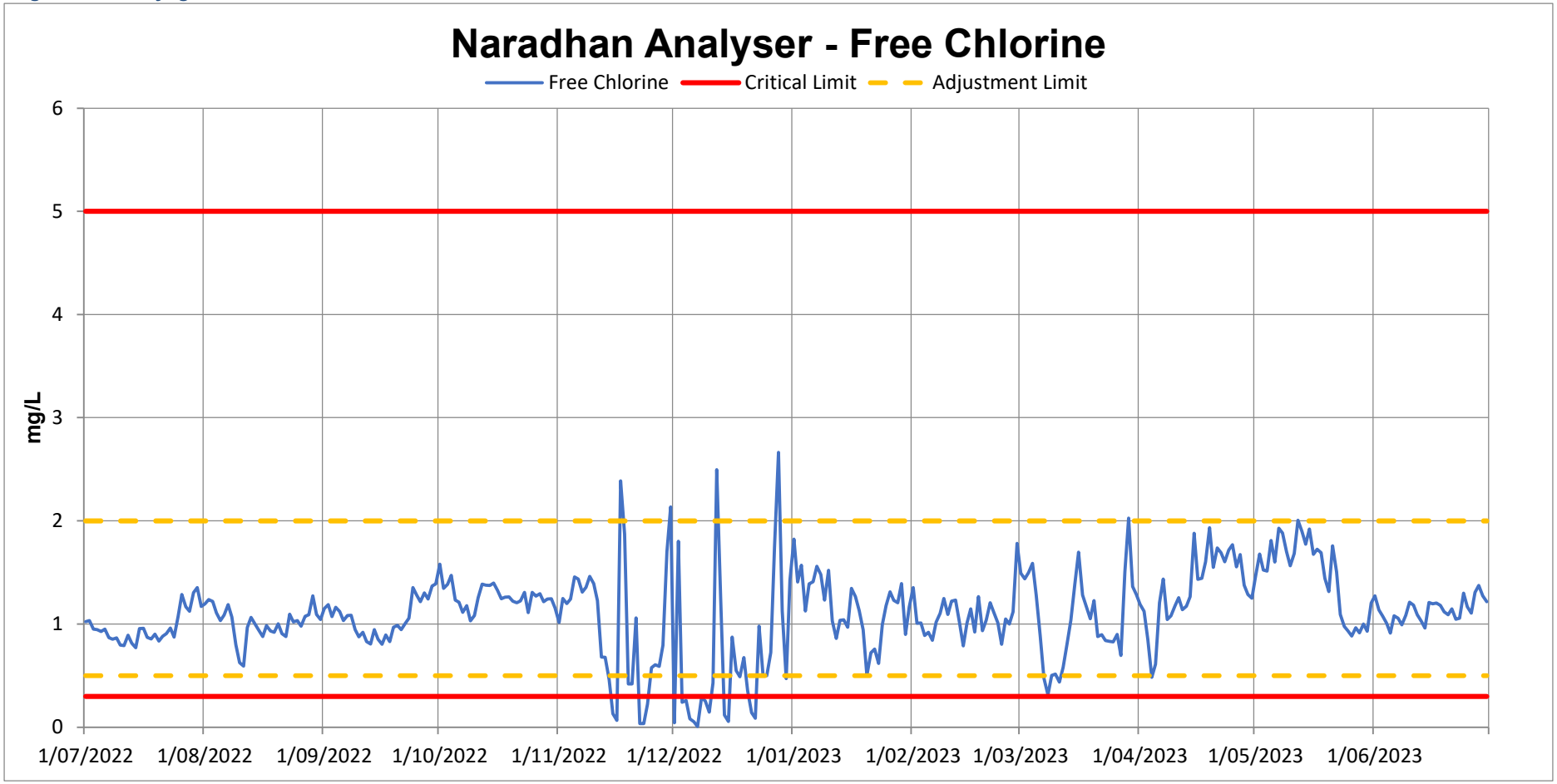


Figure 5 above is representative of the finished water free chlorine for the Mt Daylight system. The red lines are our CCPs and the orange lines are the operational limits. As is indicated above, GWCC is consistently within the CCPs, however due to the flooding event in Carrathool Shire Council in the summer of 2022/23, an extended period of chlorine below the CCP is evident. These exceedances have been explained in Table 14 and under heading Other Reportable CCP Events above.

Water Quality Discussion

Throughout the reporting period GWCC have undertaken numerous water samples for both operational and verification monitoring. These samples are tested at the GWCC laboratory or an external NATA accredited laboratory for operational monitoring or NSW Health's FASS lab for verification or compliance purposes. GWCC also conducted a number of onsite tests for operational purposes which are presented below.

Water samples are tested for Physical, Chemical and Microbial properties in the water.

Throughout the reporting period GWCC have conducted a total of 912 microbial water samples to be either tested by NSW Health or tested 'in-house' by GWCC Water Quality staff.

The drinking water is tested throughout the period by an independent party for chemical elements which may be present in the water. A total of 177 water samples were carried out during the reporting period, and all were tested by NSW Health's FASS laboratory. From the 177 total samples collected and tested, 58 were treated water samples taken in the distribution system and 119 were raw or bore water samples.

GWCC also undertake pesticide sampling of the drinking water across the entire scheme. These samples are tested by a NATA accredited laboratory for the 2022/23 FY a total of 16 samples were tested for the presence of pesticides. All sample results were compliant with parameters set in the ADWGs.

It is also a requirement for GWCC to test for Radiological characteristics in the ground water supplies every 2 years. For the 2022/23 FY, 9 Radiological samples were taken and tested by Australian Nuclear science and Technology Organisation (ANSTO). Results and locations can be seen in Table 20.

Another initiative undertaken by GWCC is the monitoring of chlorine within the distribution system networks across the entire drinking water scheme. These tests are conducted routinely by the distribution staff and a total of 3619 chlorine tests were conducted onsite throughout the year. These tests include both Total and Free chlorine. A running spreadsheet of results was previously updated by office staff once data was received by the distribution staff and is now located in GWCC new database Content Manager (doc 18/1344). Water Outlook (WO) has since been rolled out to the distribution staff to upload the results of the chlorine tests. Since this implementation of WO to staff there has been 10,994 chlorine test results uploaded into the database. See Table 19 below.

Additional works with Atom Consulting regarding the facilitation of service level agreements with our Bulk Councils has been undertaken and we have Draft water quality parameters identified for final agreement. A Draft SLA has been developed by a legal advisor and now issued to both Hilltops and CGRC Councils in 2022. No written response has been received from either Council.

Data Collection

GWCC have conducted numerous monitoring samples throughout the distribution system as well as a number of verification samples that are tested by independent Forensic Analytical Science Services (FASS) laboratories. Below is a summary of Micro samples taken and tested throughout GWCC distribution system as well as tests conducted onsite and at GWCC Water Treatment plants.

Table 16. Micro sampling summary

Tests conducted	Microorganisms Summary Tested by Pathology	Non-compliant samples	Tested In House	Non-compliant samples	(Total)
Jugiong	80	2	192	0	272
Oura	264	0	215	0	479
Mt Arthur	74	0	64	0	138
Mt Daylight	23	0	0	0	23
Total	441	2	471	0	912

New South Wales Health – Micro Monitoring

New South Wales Health Drinking Water Monitoring Program outlines the number and allocation of samples within a Drinking Water System. These numbers are based on population served and the complexity of the system. Currently GWCC have 441 water samples tested by FASS for E.coli and Faecal Coliforms across the entire drinking water scheme. These numbers can be further broken down into water supply systems:

- Jugiong Drinking Water Scheme 78 samples annually for E.coli and Faecal Coliforms
- Oura Drinking Water Scheme 270 samples annually for E.coli and Faecal Coliforms
- Mount Arthur Drinking Water Scheme 64 samples annually for E.coli and Faecal Coliforms
- Mount Daylight Drinking Water Scheme 26 samples annually for E.coli and Faecal Coliforms

GWCC conducted 3 extra tests during the 2022/23 reporting period. Two (2) from the Jugiong scheme as directed by NSW Health as a result of positive E. coli detection.

Comprehensive Chemical Sample Summary

Table 17. Comprehensive chemical sample results - summary

	Tested by FASS (Verification and Operational)	Non-compliant samples	Samples with an indicator not compliant with ADWG e.g. Iron or Manganese or pH	Reason/Notes:
Comprehensive chemical Samples Treated Water	55	See Table 18	6	These are only aesthetic or raw water sample results and not a compliance incident.
Comprehensive Chemical for Raw and/or Bore Data	122			

GWCC conduct both Verification and Operational monitoring of potential chemicals in the drinking water over all of the drinking water scheme. Raw water or untreated water samples are taken from all duty bores from Mt Arthur, Mt Daylight and Oura on a monthly basis. Treated water samples are also taken in the distribution system of all of these schemes. As can be seen from Table 17 above, GWCC has conducted 55 comprehensive chemical samples for our treated water and 122 samples for our raw and/or bore water. A breakdown of how many samples were taken and tested by the FASS lab for each drinking water scheme is presented below:

- **Oura** – 32 raw water samples were taken from the duty bores and 35 Treated water samples taken from the distribution system.
- **Jugiong** – 50 raw water samples taken from the Murrumbidgee River and 11 Treated water samples were taken from the distribution system.
- **Mt Daylight** – 18 Raw water samples were taken from the bores and 5 Treated water samples taken from the distribution system.
- **Mt Arthur** - Raw water samples were taken from the duty bore each month, a total of 22 samples for the reporting period and 4 Treated water samples taken from the distribution system.

Table 18. Breakdown of number of samples with parameters exceeding ADWG values – Treated Water only.

	Indicator Non-Compliant							
Site	**Copper**	**Iron**	**Manganese**	**Colour**	**Turbidity**	**pH**	**Fluoride**	**Lead**
Distribution – Oura Scheme		1 Only aesthetic				2		
Distribution – Jugiong Scheme			1 Only aesthetic					
Distribution – Mt Arthur Scheme*		1 Only aesthetic						
Distribution – Mt Daylight Scheme*	1 Only aesthetic							

Note: Only shows treated water samples taken from the distribution systems. **Non Fluoridated system*

Source water (Ground Water) monitoring has also been increased during the reporting period. All bores are sampled every month and samples sent to FASS for testing. A total of 69 samples were taken during the reporting period from a combination of Oura Bores, Mt Arthur Bores and Mt Daylight bores.

Chlorine Distribution Summary

Table 19. GWCC entire distribution system chlorine management

Chlorine Distribution System Monitoring	in Situ tests for chlorine from spreadsheet and Water Outlook for (2022/23)
Entire Scheme	3619

Every week GWCC distribution staff, conduct Chlorine Analysis of the water distribution system/s. Above, is a summary of how many samples are tested for free and total Chlorine as well as Temperature, Turbidity and pH throughout the entire system/s.

Radiological Sampling

NSW Health Drinking Water Monitoring Program indicates that ground water supplies are to be tested every 2 years for radiological characteristics. Table 20 below shows the results of these tests. All samples are within ADWG guidelines.

Table 20. Results of radiological sampling

Sample description	Sample Date	ANSTO ID	Gross Alpha (Bq/L)	Gross Beta (Bq/L)
Oura Bore 2	2/06/2022	CO887	0.03 ± 0.01	0.03 ± 0.01
Oura Bore 6	2/06/2022	CO888	0.034 ± 0.015	0.03 ± 0.01
Mt Arthur Bore 1	31/05/2022	CO889	<0.03	<0.03
Jugiong River	1/06/2022	CO890	0.09 ± 0.01	0.08 ± 0.01
Oura Bore 3	19/04/2023	CO937	<0.03	<0.03
Oura Bore 4	19/04/2023	CO938	<0.03	<0.03
Mt Arthur Bore 2	19/04/2023	CO939	0.14 ± 0.02	0.05 ± 0.01
Mt Daylight Bore 1	20/04/2023	CO940	0.09 ± 0.02	0.13 ± 0.01
Mt Daylight Bore 2	20/04/2023	CO941	0.09 ± 0.02	0.13 ± 0.01

Water Treatment Plants

GWCC have two main Water Treatment Plants (WTPs) located at Jugiong and Oura. A number of operational water sample results are taken and used on a daily basis to help with the operation of the plants and to determine correct amounts of chlorine and fluoride that need to be injected into the water to make it suitable for consumption. Below is a list of the tests conducted and where within the treatment process they are taken.

Along with the operational monitoring conducted at the WTPs, verification monitoring is also undertaken, specifically for fluoride. A fluoride sample is taken from both WTPs every month and sent to FASS for testing. Results can be seen in the Fluoride Compliance Summary report in appendix C.

Table 21. Jugiong water treatment plant in-house testing

Raw Water	Dosed Water	Settled Water	Finished Water
Fluoride	pH	Turbidity	Turbidity - online
Turbidity - online		Colour	Turbidity - Offline
Turbidity - Offline		pH	Colour
Colour			pH
pH			Alkalinity
Alkalinity			Hardness
Hardness			Temperature
Temperature			Free Chlorine
			Total Chlorine
			Fluoride

Table 22. Oura water treatment plant in-house testing

Raw Water	Treated Water	Oura Collection tank
Temperature	Free Chlorine	Turbidity
Fluoride	Total Chlorine	
pH	Temperature	
	Fluoride	
	pH	

Non-Compliant Data

Operational monitoring indicates there have been some incidences of high pH and low residual chlorine in the extremities of the Jugiong, Oura, Mt Daylight and Mt Arthur drinking water schemes. Results are indicated in Table 23 below.

Table 23. Summary of non-compliant water quality data from operational monitoring.

Date	Location	Parameter	Exceedance	Correction	Preventive action	Notes
Jugiong Scheme						
19/7, 19/7, 26/9, 7/11, 14/11, 15/11, 8/12, 6/2, 29/3, 29/3, 4/4, 12/4, 24/4,	**Young Storage Outlet**	Free Chlorine	0.02, 0.05, 0.07, 0.19, 0.06, 0.02, 0.08, 0.14, 0.08, 0.02, 0.02, 0.02, 0.14	Upstream Dosing	More monitoring	
7/11	**Young Storage Inlet**	Free Chlorine	0.19			
1/3, 29/3	**Harden Town offtake**	Free Chlorine	0.06, 0.04	Manually Dose harden Town res	Extra Monitoring Upstream	
8/12	**Cowangs reservoir Inlet**	Free Chlorine	0.17	Manual Dose	Monitor Cl coming out of plant, run sample water longer	
14/11, 31/1, 1/2, 11/4, 24/4, 24/5	**Cowangs reservoir Outlet**	Free Chlorine	0.06, 0.12, 0.14, 0.03, 0.05, 0.14			
14/9, 18/10, 8/12, 1/2, 26/4, 21/6	**New Horizon Gundagai Rd**	Free Chlorine	0.06, 0.02, 0.02, 0.10, 0.02, 0.12	Manual Dose upstream	Monitor Cl in distribution	
1/2	**GWCC Depot, Cootamundra**	Free Chlorine	0.18			
19/7, 14/9, 18/10, 15/11, 1/2, 8/3, 26/4, 21/6	**Stockinbingal Bowling Club**	Free Chlorine	0.01, 0.14, 0.14, 0.05, 0.18, 0.11, 0.02, 0.11	Manual Dose	Monitor Cl in Distribution System	
20/7, 7/9, 11/10, 14/11, 16/11, 21/11, 1/2, 6/2	**Bauloora Res**	Free Chlorine	0.18, 0.15, 0.13, 0.10, 0.09, 0.12, 0.09, 0.10	Manual Dose	Monitor Cl in Distribution system	
14/9, 8/12, 1/2	**Dirnaseer and Olympic Way Corner**	Free Chlorine	0.17, 0.13, 0.17			

Date	Location	Parameter	Exceedance	Correction	Preventive action	Notes
1/8, 29/8, 24/10, 15/11, 16/11, 1/2, 13/2, 14/3, 4/4, 12/4, 24/4	**Dirnaseer reservoir**	Free Chlorine	0.17, 0.17, 0.13, 0.15, 0.03, 0.02, 0.02, 0.10, 0.02, 0.02, 0.19	Manual Dose	Monitor Cl in Distribution system	
11/1, 20/2	**Dirnaseer reservoir**	Temperature	25.7, 25.1			
1/2, 2/2	**Dirnaseer reservoir**	E. coli	4, 1	Advised NSW Health, drained tank, removed frogs, chlorinated reservoir		
19/7, 14/9, 18/10, 15/11, 8/12, 11/1, 1/2, 28/2, 29/3, 26/4, 21/6	**Town offtake Springdale**	Free Chlorine	0.02, 0.02, 0.02, 0.05, 0.05, 0.02, 0.02, 0.07, 0.02, 0.02, 0.03	Manual dose	Monitor cl in Distribution system	Near the end of the line for the Jugiong system
28/2	**Town offtake Springdale**	Temperature	25.7			
8/12, 29/3	**Town offtake Springdale**	pH	8.83, 8.57			
8/12, 1/2, 8/3	**Wallendbeen Roundabout**	Free Chlorine	0.00, 0.17, 0.16.	Manual Dose Upstream	Monitor Cl in distribution	
18/10, 8/12, 1/2	**Wallendbeen Roundabout**	pH	8.86, 8.7, 8.67			
14/9	**Wallendbeen School**	pH	8.92			
26/9, 7/11, 24/1, 20/2, 4/4, 12/4, 24/4	**Wallendbeen res**	Free Chlorine	0.02, 0.02, 0.02, 0.02, 0.05, 0.04, 0.19			
26/9, 7/11, 16/11, 24/1, 6/2, 13/2, 27/2, 7/3, 27/3, 13/4, 24/4, 5/6	**Brawlin Res**	Free Chlorine	0.17, 0.07, 0.04, 0.02, 0.14, 0.13, 0.02, 0.14, 0.02, 0.02, 0.08, 0.04			
14/11	**Old Temora Road PS**	Free Chlorine	0.15			
29/8, 21/11, 24/4	**Frampton Res**	Free Chlorine	0.13, 0.08, 0.09			

Date	Location	Parameter	Exceedance	Correction	Preventive action	Notes
6/2	**Stockinbingal Res**	Free Chlorine	0.13			
28/6	**Temora East**	Free Chlorine	0.02			
Oura Scheme						
26/9, 4/10, 9/1	**Tara Pump Station Discharge**	Free Chlorine	0.16, 0.19, 0.14			
9/1, 31/1, 21/2, 22/2	**Tara Pump Station Discharge**	Temperature	33.1, 26.2, 26.4, 26.0			
9/8, 18/10, 9/1	**Tara Pump Station Discharge**	pH	8.59, 8.57, 8.80			
31/1, 22/2	**Ariah Park Res**	Temperature	26.3			
9/8	**Ariah Park Res**	pH	8.99			
26/10, 3/11, 9/1	**Beckom Hotel**	Free Chlorine	0.08, 0.02, 0.02			
31/1, 22/2	**Beckom Hotel**	Temperature	26.1, 25.6			
9/8, 7/9, 18/10	**Beckom Hotel**	pH	8.75, 8.78, 9.02			
9/1	**Ardlethan Town Res Outlet**	Free Chlorine	0.17			
31/1	**Ardlethan Town Res Outlet**	Temperature	25.9			
9/8, 7/9, 18/10	**Ardlethan Town Res Outlet**	pH	8.53, 8.54, 8.64			
7/9	**Ardlethan Town Res Outlet**	Turbidity	15.1			Anomaly
9/1, 31/1, 13/2	**Barellan Res**	Free Chlorine	0.10, 0.12, 0.16			
9/1, 31/1, 10/2, 13/2, 21/2, 22/2	**Barellan Res**	Temperature	26.5, 25.5, 25.5, 25.1, 26.9, 26.4			
7/9, 18/10	**Barellan Res**	pH	8.60, 8.68			
21/11, 5/12, 12/12, 4/1, 27/1	**Temora BT inlet**	Free Chlorine	0.15, 0.15, 0.18, 0.17, 0.15			

Date	Location	Parameter	Exceedance	Correction	Preventive action	Notes
8/2	**Temora High School**	Temperature	27.0			
4/4, 2/5	**Beattie St Temora**	Free Cl	0.15, 0.02			
23/1	**Beattie St Temora**	Temperature	27.7			
24/8	**Beattie St Temora**	pH	8.52			
24/1, 8/2	**Temora West School**	Temperature	26.9, 29.0			
24/8, 28/6	**Temora West School**	pH	8.52, 8.61			
24/1, 8/2	**Temora Caravan Park**	Temperature	27.0, 26.0			
14/12, 28/6	**Temora Caravan Park**	pH	8.79, 8.80			
8/2, 6/3	**Marrar Park**	Temperature	28.0, 29.0			
18/7	**Junee Balance tank inlet**	Free Chlorine	0.13			
25/7, 23/1	**Junee High School**	Free Chlorine	0.17, 0.02			
25/7, 14/12, 6/3	**Illabo Hotel**	Free Chlorine	0.17, 0.05, 0.19	Manual Dose	Monitor Distribution	
23/1, 7/2, 6/3	**Illabo Hotel**	Temperature	27.0, 26.0, 26.6			
25/7, 25/8, 19/9	**Illabo Hotel**	pH	8.84, 8.66, 8.59			
14/12	**Eurongilly Res**	pH	8.64			
25/8, 19/9, 26/10, 15/11, 6/3, 3/4, 1/5, 30/5	**Wantabadgery Hall**	Free Cl	0.14, 0.19, 0.11, 0.02, 0.18, 0.18, 0.11, 0.16	Manual Dose	Monitor Distribution	
25/7	**Wantabadgery Hall**	pH	8.56			
9/1, 22/2	**Ariah Park Central School**	Temperature	30.5, 27.2			
9/1	**Palace Hotel Ardlethan**	Free Chlorine	0.02			
9/1, 22/2	**Palace Hotel Ardlethan**	Temperature	30.0, 29.3			

Date	Location	Parameter	Exceedance	Correction	Preventive action	Notes
23/1	**Marrar Public School**	Temperature	27.0			
31/1	**Ariah Park Golf Club**	Temperature	27.4			
7/9, 18/10, 3/11	**Ariah Park Golf Club**	pH	8.84, 8.83, 8.68			
2/2, 23/2, 22/3	**Ardlethan (Bygoo St)**	Temperature	27, 28.6, 28			
12/1	**Barmedman Town reservoir**	Temperature	25.3			
4/1, 12/1, 25/1, 24/1, 31/1, 4/2, 15/2, 21/2, 9/3, 17/3	**Barmedman Park**	Temperature	25.1, 26.2, 25.5, 26, 28.1, 26, 25.1, 26.3, 25.6, 25.4			Hot Summer
26/11,	**Barellan Low Level**	Free Cl	0.16			
7/3	**Barellan Club**	Temperature	25.9			
9/9, 3/11, 1/12, 20/4	**Ariah Park Golf Club**	pH	8.79, 8.57, 8.72, 9.05			
1/12, 2/2, 23/2	**Ariah Park Golf Club**	Temperature	25.3, 26, 27.8			
8/10, 23/2	**Ariah Park Golf Club**	Turbidity	2.4, 1.2			
18/10, 31/1	**Bygoo Street, Ardlethan**	Free Chlorine	0.17, 0.14			
9/8, 7/9, 18/10	**Bygoo Street, Ardlethan**	pH	8.87, 8.89, 8.94			
31/1	**Bygoo Street, Ardlethan**	Temperature	27.0			
25/8, 15/11, 8/3,	**Memorial Park, Bethungra**	Free Chlorine	0.16, 0.16, 0.19			
25/7	**Memorial Park, Bethungra**	pH	8.51			
5/7, 4/8, 30/8	**Barmedman Park**	Temperature	26.4, 27.2, 27.2, 25.1, 26.1, 26.3			
24/1, 1/2, 7/2, 9/2, 20/2, 13/3	**Barmedman Park**	pH	8.94, 8.74, 8.66			

Date	Location	Parameter	Exceedance	Correction	Preventive action	Notes
5/7, 4/8, 30/8	**Wyalong Pump Station**	pH	8.97, 8.75, 8.73			
24/1, 15/3	**Wyalong Pump Station**	Temperature	26.0, 26.0			
15/2, 15/2, 18/2, 21/2, 5/3, 9/3, 14/3	**West Wyalong Terminal Storage**	Temperature	26.6, 27, 26.4, 25.9, 26.2, 25.7, 26			
20/7	**Wyalong School**	Free Chlorine	0.16			
5/7, 4/8, 30/8	**Wyalong School**	pH	8.95, 9.73, 9.67			
24/1	**Wyalong School**	Temperature	25.4			
5/7, 4/8, 30/8, 24/1	**Perseverance St, West Wyalong**	pH	9.07, 8.83, 8.83, 8.51			
24/1, 15/3	**Perseverance St, West Wyalong**	Temperature	29.3, 28.0			
9/5	**West Wyalong Public School**	Free Chlorine	0.03			
5/7, 4/8, 30/8	**West Wyalong Public School**	pH	9.04, 8.83, 8.73			
24/1, 9/2, 15/3	**West Wyalong Public School**	Temperature	25.8, 25.3, 27.0			
5/7, 4/8, 30/8	**Wyalong Terminal Reservoir**	pH	8.97, 8.75, 8.69			
24/1, 30/1, 11/2, 20/2, 24/2, 15/3, 17/3, 22/3, 28/3	**Wyalong Terminal Reservoir**	Temperature	25.1, 26.6, 25.9, 26.3, 26.7, 27.0, 26.8, 25.9, 25.2			
5/7, 4/8, 30/8, 9/5	**Calleen reservoir Outlet**	pH	9.34, 9.05, 8.92, 8.54			
30/1	**Calleen reservoir Outlet**	Temperature	25.7			

Date	Location	Parameter	Exceedance	Correction	Preventive action	Notes
5/7, 4/8, 30/8, 9/2, 15/3, 9/5	**Ungarie town res**	pH	9.44, 9.26, 9.04, 8.61, 8.86, 8.64			Ungarie is the end of a long distribution system
16/1, 20/1, 24/1, 30/1, 6/3	**Ungarie town res**	Temperature	26.5, 26.8, 25.7, 25.3, 25.9			
4/8	**Bing Waller Park, Ungarie**	Free Chlorine	0.16			
5/7, 4/8, 30/8, 24/1, 15/3	**Bing Waller Park, Ungarie**	pH	9.5, 9.22, 9.18, 8.73, 8.76		Mains Flushing/ Cleaning, pH correction	End of a long system
7/12, 8/12, 12/12, 17/12, 19/12, 23/12, 16/1, 20/1, 24/1, 30/1, 11/2, 20/2, 28/2, 6/3, 15/3, 17/3, 20/3, 28/3	**Bing Waller Park, Ungarie**	Temperature	29.8, 25.5, 26.9, 26.1, 26.3, 25.7, 31.9, 32.9, 30.8, 27.8, 28.1, 30.2, 30.3, 31.0, 28.0, 28.0, 28.2, 25.2			
12/4	**Central School, Ungarie**	Free Chlorine	0.02			
12/4, 9/5	**Central School, Ungarie**	pH	8.59, 8.79			
8/7, 29/9, 7/10, 14/11, 16/1, 20/1, 24/1, 27/1, 6/2, 8/2, 10/2, 21/2, 27/2, 6/3, 31/3, 17/4, 21/4, 2/5, 5/5, 26/5, 9/6	**Temora East res**	Free Cl	0.11, 0.19, 0.15, 0.17, 0.13, 0.16, 0.02, 0.05, 0.16, 0.10, 0.18, 0.06, 0.09, 0.08, 0.10, 0.03, 0.14, 0.06, 0.16, 0.06, 0.15, 0.10, 0.09			Water can be from either Oura or Jugiong or both (end of Jugiong scheme)
8/2	**Temora East res**	Temperature	26.0			
12/12	**Bectric Res**	Free Chlorine	0.14			
4/10, 2/12	**Ardlethan Booster Pump**	Free Chlorine	0.18, 0.17			

Date	Location	Parameter	Exceedance	Correction	Preventive action	Notes
28/11, 13/2, 17/4, 24/4	**Barellan Low Level Res**	Free Chlorine	0.15, 0.13, 0.16, 0.13			
13/2, 21/2	**Barellan Low Level Res**	Temperature	25.5, 26.5			
19/12, 23/12, 29/12, 20/2, 24/2, 4/4	**Ampol, Wyalong**	Temperature	26.8, 27.1, 27.1, 30.0, 28.7, 25.1			
9/2	**Wyalong TAFE**	Temperature	25.1			
12/12, 19/12, 23/12, 29/12, 30/1, 11/2, 20/2, 24/2, 13/3, 17/3, 22/3, 28/3	**Wyalong Park**	Temperature	26.9, 27.7, 26.1, 29.0, 32.3, 30.1, 32.1, 31.8, 30.5, 30.0, 28.0, 28.5			
19/12, 23/12, 29/12, 9/1, 13/2, 20/2, 24/2, 13/3, 22/3, 28/3	**Wyalong Depot**	Temperature	25.8, 27.0, 30.3, 27.2, 26.6, 29.2, 28.8, 26.0, 25.5, 26.2			
20/2, 24/2	**Wyalong Balance Tank**	Temperature	26.2, 26.7			
Mt Arthur Scheme						
14/12	**Matong School**	Free Chlorine	0.02	Manual Dose	Monitor	
8/8, 14/11	**Matong School**	pH	9.57, 8.8			
9/1, 1/2, 8/3, 20/3	**Matong School**	Temperature	27.4, 26.4, 26.4, 26			
9/1	**Coolamon (Allawah Lodge)**	Temperature	25.7			
9/1, 1/2, 20/3	**Coolamon Central School**	Temperature	27.3, 27.0, 26.5			
8/8, 9/1, 13/6	**“Tolmie” Wagga rd Coolamon**	Free Chlorine	0.16, 0.13, 0.16			

Date	Location	Parameter	Exceedance	Correction	Preventive action	Notes
8/8	**"Tolmie" Wagga rd Coolamon**	pH	6.4			
20/3	**"Tolmie" Wagga rd Coolamon**	Temperature	27.0			
1/2	**Ganmain Pre School**	Temperature	25.5			
9/1, 8/3	**Ganmain Public School**	Temperature	26.1, 25.3			
8/8, 17/8, 12/9, 14/11, 14/12, 9/1, 1/2, 8/3, 20/3, 15/3, 13/6	**Grong Grong Park**	Free Chlorine	0.17, 0.11, 0.19, 0.09, 0.06, 0.02, 0.14, 0.02, 0.13, 0.15, 0.09			
9/1, 1/2, 8/3, 20/3	**Grong Grong Park**	Temperature	29.3, 26.6, 26.1, 28			
9/1	**Ganmain Low Level Res**	Free Chlorine	0.02			
9/1, 22/2	**Ganmain Low Level Res**	Temperature	29.3, 27.2			
7/9, 12/9, 8/11	**Matong Low Level Res**	Free Chlorine	0.18, 0.19, 0.14			
4/7, 1/8, 5/8, 19/9	**Grong Grong (town res)**	Free Chlorine	0.05, 0.09, 0.03, 0.11	Manual Dose	Monitor	
Mt Daylight Scheme						
23/11, 19/12, 29/12	**Hannan Res**	Free Chlorine	0.02, 0.18, 0.11			
5/1, 16/1, 18/1, 20/1, 30/1, 7/2, 20/2, 28/2, 14/2, 6/3, 10/3, 17/3, 20/3, 20/3, 28/3	**Hannan Res**	Temperature	26.6, 28.7, 29.0, 29.6, 26.7, 25.6, 27.2, 27.0, 28.2, 28.5, 26.2, 27.0, 28.3, 27.9, 25.2			
21/11, 23/11, 19/12	**Naradhan Concrete Res**	Free Chlorine	0.18, 0.02, 0.18			
5/1, 5/1, 16/1, 18/1, 20/1, 23/1, 30/1, 7/2, 14/2, 20/2, 28/2, 6/3, 10/3,	**Naradhan Concrete Res**	Temperature	25.5, 25.6, 27.3, 28.8, 27.8, 26.5, 26.9, 25.9, 28.1, 27.6, 27.9, 27.1,			

Date	Location	Parameter	Exceedance	Correction	Preventive action	Notes
17/3, 20/3, 20/3, 28/3			25.6, 25.9, 27.8, 27.3, 25.1			
3/11, 4/12, 6/12, 29/12, 5/1, 5/1, 14/2, 20/3, 12/4	**North Weethalle Res**	Free Chlorine	0.17, 0.10, 0.12, 0.10, 0.09, 0.19, 0.11, 0.13, 0.09			
16/1, 18/1, 20/1, 23/1, 30/1, 6/2, 10/2, 14/2, 20/2, 28/2, 6/3, 10/3, 17/3, 20/3, 20/3	**North Weethalle Res**	Temperature	25.4, 27.0, 28.1, 27.6, 26.6, 26.2, 27.1, 26.9, 25.9, 27.1, 26.6, 27.2, 26.9, 26.1, 26.3, 26.5, 25.9			
6/7, 14/10, 24/10, 4/11, 14/11, 18/11, 21/11, 29/11, 4/12, 5/12, 6/12, 8/12, 16/12, 16/1, 20/1, 14/2 20/2, 28/2, 6/3, 10/3, 20/3, 4/4, 12/4, 21/4	**Russell trading Weethalle**	Free Chlorine	0.19, 0.12, 0.19, 0.15, 0.18, 0.10, 0.12, 0.19, 0.15, 0.16, 0.15, 0.05, 0.19, 0.05, 0.09, 0.18, 0.12, 0.03, 0.10, 0.18, 0.08, 0.13, 0.18, 0.02, 0.10			
4/12, 5/12, 12/12, 16/12, 19/12, 23/12, 5/1, 16/1, 18/1, 20/1, 30/1, 9/2, 10/2, 14/2, 20/2, 28/2, 6/3, 10/3, 17/3, 20/3, 20/3	**Russell trading Weethalle**	Temperature	26.5, 27.5, 26.1, 25.6, 25.8, 27.9, 28.7, 32.5, 33.2, 31.2, 32.2, 27.1, 29.2, 30.3, 30.8, 31.4, 31.0, 28.1, 28.0, 29.4, 28.1			
16/1	**Narriah Res**	Free Chlorine	0.09			
16/1, 18/1, 20/1, 23/1, 30/1, 7/2, 10/2, 14/2, 20/2, 28/2, 6/3	**Narriah Res**	Temperature	25.3, 27.1, 26.8, 25.6, 25.9, 25.7, 25.7, 25.3, 25.3, 25.8, 25.5			
11/7, 4/11, 11/11, 18/11, 21/11, 23/11, 4/12, 5/12, 6/12, 29/12, 16/1, 23/1,	**Tallimba Park**	Free Chlorine	0.16, 0.19, 0.17, 0.10, 0.10, 0.02, 0.16, 0.19, 0.06, 0.10, 0.12, 0.10,			

Date	Location	Parameter	Exceedance	Correction	Preventive action	Notes
23/1, 14/2, 28/2, 24/4			0.02, 0.18, 0.04, 0.12			
23/12, 29/12, 16/1, 23/1, 23/1, 30/1, 6/2, 10/2, 14/2, 20/2, 28/2, 6/3, 10/3, 17/3, 20/3	**Tallimba Park**	Temperature	25.2, 26.0, 28.3, 26.9, 25.5, 27.0, 27.9, 28.5, 29.8, 27.5, 25.9, 28.0, 27.6, 26.3, 26.9			
3/11, 18/1, 12/4	**Tallimba School**	Free Chlorine	0.02, 0.05, 0.10			
18/1	**Tallimba School**	Temperature	28.9			
14/12	**Tallimba Inn**	Free Chlorine	0.17			
28/3	**Tallimba Inn**	Temperature	25.6			
1/7, 29/11, 5/12, 8/12, 28/2, 6/3, 10/3	**Nobbies Res**	Free Chlorine	0.15, 0.18, 0.12, 0.09, 0.10, 0.08, 0.10			
29/12, 5/1, 16/1, 20/1, 30/1, 20/2, 28/2, 6/3, 10/3, 20/3, 28/3, 21/4	**Nobbies Res**	Temperature	25.2, 25.7, 28.2, 25.8, 26.5, 27.7, 27.0, 26.9, 26.4, 25.9, 25.1, 31.7			
4/11, 29/12, 5/1	**Weethalle Res**	Free Cl	0.18, 0.11, 0.19			
16/1, 20/1, 23/1, 30/1, 6/2, 10/2, 20/2, 28/2, 6/3, 10/3, 17/3, 20/3	**Weethalle Res**	Temperature	27.3, 27.4, 26.9, 27.0, 26.8, 26.3, 27.1, 26.8, 26.9, 26.0, 26.3, 26.2			
6/12	**Naradhan Steel res**	Free Chlorine	0.02			
6/12, 5/1, 16/1, 20/1, 30/1, 7/2, 20/2, 28/2, 6/3, 10/3, 17/3, 20/3, 28/3	**Naradhan Steel res**	Temperature	25.9, 25.5, 27.5, 27.4, 27.0, 26.0, 27.6, 27.4, 27.0, 25.6, 26.8, 27.3, 25.3			
5/6	**Ungarie Rural Reservoir**	Free Chlorine	0.11			
16/1, 20/1, 30/1, 6/3, 20/3	**Ungarie Rural Reservoir**	Temperature	26.9, 27.2, 26.3, 25.8, 25.9			

Date	Location	Parameter	Exceedance	Correction	Preventive action	Notes
21/11, 29/11, 16/12, 20/12, 7/2	**Naradhan Park**	Free Chlorine	0.19, 0.19, 0.08, 0.14, 0.10			
29/11, 5/12, 8/12, 12/12, 20/12, 23/12, 16/1, 20/1, 30/1, 7/2, 20/2, 28/2, 10/3, 17/3, 20/3, 4/4	**Naradhan Park**	Temperature	26.0, 26.9, 25.5, 25.1, 25.7, 26.5, 31.9, 32.2, 31.5, 29.6, 39.1, 27.4, 28.9, 29.9, 30.3, 25.4			
5/12, 30/1, 17/3, 28/3	**Mt Daylight Pump Station**	Temperature	25.8, 26.0, 25.7, 25.9			
29/11, 12/12	**Naradhan Pump Station**	Free Chlorine	0.18, 0.18			
16/1, 23/1, 30/1, 20/2, 28/2, 6/3, 10/3, 17/3, 20/3	**Naradhan Pump Station**	Temperature	26.9, 26.9, 29.0, 26.8, 26.0, 27.0, 25.7, 26.6, 27.8			

Customer Complaints

Table 24. Customer complaints registered in the 2022/23 reporting period.

Month	Total Complaints	Discoloured Water	Burst Main	Taste/Odour Related	No Supply/Low Pressure	Leaking Meter	Messy or unsafe jobsite	Unable to Isolate meter	Other
Jul-22	20	20							
Aug-22	35	35							
Sep-22	7	6		1					
Oct-22	8	8							
Nov-22	21	20							1
Dec-22	38	38							
Jan-23	19	19							
Feb-23	28	28							
Mar-23	15	14		1					
Apr-23	30	29							1
May-23	13	13							
Jun-23	21	21							

There were a total of 255 complaints made during the reporting period 2022/23. The majority of complaints that were made pertained to dirty or discoloured water totalling 251; this is a decrease of 84 compared to 339 complaints recorded in 2021/22. These complaints allowed staff to determine that the townships of Coolamon, Junee and Temora require attention. To mitigate against complaints, GWCC invests in cleaning reservoirs and flushing dead ends regularly. A study into discoloured water events (2020) found iron and manganese to be the primary cause of complaints in the Coolamon township whereby investigating into the economic feasibility of installing a treatment plant will next be explored; however short term solutions are also needed.

In previous years, GWCC had procured the services of No-Des, a contractor that has the ability to clear water mains with no loss of water to the environment. These contractors cleaned approximately 65 km of water mains in the Coolamon and nearby townships in 2019. Whilst undertaking this flushing/cleaning, turbidity's throughout the towns were recorded as high as 171 NTU, with an average of approximately 25 NTU. Comparing against historical records of the number of complaints, this method had drastically reduced the number of customer complaints received from these areas.

GWCC engaged the services of No-Des again during 2022, whereby the town of Junee and Coolamon were completed. This saw a dramatic decrease in the number of complaints received from Junee residents as a result. GWCC is looking to regularly implement these services by procuring a No-Des truck and cleaning pipes more often across more of Council's drinking water schemes. Numerous investigations have been undertaken by GWCC to eliminate these discoloured water incidents; however, only full treatment process or regular/constant proactive management of the retic system is viable. The procurement of a No-Des unit will provide a much more economically feasible outcome for customers if it can be negotiated.

Additional reactive solutions have been implemented by GWCC, such as the implementation of automated flushing systems within the Coolamon reticulation system. GWCC initially installed a unit on the notorious dead end of Kingdom Drive in February 2019, GWCC had not received any

complaints from customers serviced on this pipeline since its installation. As such, the flushing system installed is assisting with handling of customer complaints. GWCC has since installed two additional flushing units in the Coolamon retic with positive results.

Water Quality Incidents

Table 25. Summary of incidents and emergencies, recommendations and preventative actions

Details of Incident/Emergency	Investigation Recommendations	Preventive Action Undertaken
Two incidents of E. coli were detected in February 2023 at Dirnaseer reservoirs. Frogs were found breeding in the reservoirs, causing the E. coli. NSW Health were contacted upon the first reading of E. coli.	NSW Health recommended to retest in the first instance and then drop the reservoir if the second test is positive. Upon the second positive test, it was recommended by NSW Health to empty the reservoirs and clean them out which allowed Council staff to determine frogs as the cause of the E. coli.	Fill in the gaps between the roof sheeting ridges and the reservoir wall to prevent frogs entering in future.

Staff Development and Training

Incident and Emergency Response Training

GWCC have implemented and completed Incident and Emergency response training. This training has been undertaken by relevant staff and stakeholders. GWCC Management had previously issued a request to NSW Health for funding for scenario training which occurred in late 2020 with our Bulk Councils. As a result of these workshops and training, incident response protocols were developed and have since been maintained by GWCC.

NOTE: currently internal training is undertaken by Water Quality staff at the Jugiong Water Treatment plant for emergency response management as part of the Pollution Incident Response Management Plan requirements (PIRMP).

Table 26 below indicates all of the training that GWCC staff have undertaken during the reporting period of 2020/21.

Table 26. Full list of staff training for the 2022/23 reporting period.

Name	Course	Completion date
Mike Read	A-Z of DA's LEP's and DCP's	18/08/2022
Sammy Jung	A-Z of DA's LEP's and DCP's	18/08/2022
Christine Roberts	Applying Values	10/11/2022
Mitchell Farlow	Asbestos Awareness	24/10/2022
Mitchell Farlow	AutoCAD Essentials PLUS	18/04/2023
Shane Baldry	Breathing Apparatus	19/10/2022
Daniel Flack	CPR	16/07/2022
Andrew Derrick	CPR	16/11/2022
Annie Coleman	CPR	16/11/2022
Bradley Moye	CPR	16/11/2022
Brendon Ford	CPR	16/11/2022

Joshua Hale	CPR	16/11/2022
Lewis Allen	CPR	16/11/2022
Liam Pattison	CPR	16/11/2022
Mark Carroll	CPR	16/11/2022
Matthew Cooper	CPR	16/11/2022
Ian Basham	CPR	16/11/2022
James Butler	CPR	16/07/2022
Chris Breen	CPR	16/07/2022
Shane Barrett	CPR	16/07/2022
Rob Drummond	CPR	16/07/2022
Nicol Kelly	CPR	16/07/2022
Michael Lewis	CPR	16/07/2022
Robin Davis	CPR	16/07/2022
Jack Fuller	CPR	16/07/2022
Chris Fealy	CPR	16/07/2022
Sean Tiernan	CPR	19/07/2022
Liam Welch	CPR	19/07/2022
Barry Shepherd	CPR	19/07/2022
Rodney Ryan	CPR	19/07/2022
Chris Scott	CPR	19/07/2022
Blake Hingerty	CPR	19/07/2022
Shane Hartshorn	CPR	19/07/2022
Adam Ryall	CPR	19/07/2022
Luke Townsend	CPR	19/07/2022
Shane Baldry	Effective Consultative Committees	28/02/2023
Ian Basham	Effective Consultative Committees	28/02/2023
James Butler	Effective Consultative Committees	28/02/2023
Aaron Drenovski	Effective Consultative Committees	28/02/2023
Mitchell Farlow	Effective Consultative Committees	28/02/2023
Laurie Flack	Effective Consultative Committees	28/02/2023
Brendon Ford	Effective Consultative Committees	28/02/2023
Jack Fuller	Effective Consultative Committees	28/02/2023
Sammy Jung	Effective Consultative Committees	28/02/2023
Kathryn Lowe	Effective Consultative Committees	28/02/2023
Nigel Marion	Effective Consultative Committees	28/02/2023
Mike Read	Effective Consultative Committees	28/02/2023
Leslie Scott	Effective Consultative Committees	28/02/2023
Sean Tiernan	Effective Consultative Committees	28/02/2023
Annie Coleman	Electrotechnology Test & Tag	1/08/2022
Blake Hingerty	Electrotechnology Test & Tag	1/08/2022
Sonya Kovacevic	Electrotechnology Test & Tag	1/08/2022
Shane Baldry	Electrotechnology Test & Tag	1/08/2022

Rodney Ryan	Electrotechnology Test & Tag	1/08/2022
Ray McCarthy	Electrotechnology Test & Tag	1/08/2022
Robin Davis	Electrotechnology Test & Tag	1/08/2022
Nigel Marion	Electrotechnology Test & Tag	1/08/2022
Leslie Scott	Electrotechnology Test & Tag	1/08/2022
Liam Moston	Electrotechnology Test & Tag	1/08/2022
Kathryn Lowe	Electrotechnology Test & Tag	1/08/2022
Kylie Crouch	Electrotechnology Test & Tag	1/08/2022
Jeremy Coleman	Electrotechnology Test & Tag	1/08/2022
Dean Wiggins	Electrotechnology Test & Tag	1/08/2022
Bailey Lowes	Electrotechnology Test & Tag	1/08/2022
Sean Tiernan	Finance for Non-Finance Managers	7/07/2022
Annie Coleman	Finance for Non-Finance Managers	7/07/2022
Chris Breen	Finance for Non-Finance Managers	7/07/2022
Geoffrey Veneris	Finance for Non-Finance Managers	7/07/2022
Ian Basham	Finance for Non-Finance Managers	7/07/2022
Jack Fuller	Finance for Non-Finance Managers	7/07/2022
Kylie Crouch	Finance for Non-Finance Managers	7/07/2022
Luke Townsend	Finance for Non-Finance Managers	7/07/2022
Mike Read	Finance for Non-Finance Managers	7/07/2022
Mitchell Farlow	Finance for Non-Finance Managers	7/07/2022
Nicol Kelly	Finance for Non-Finance Managers	7/07/2022
Rahul Patil	Finance for Non-Finance Managers	7/07/2022
Ali Wood	Finance for Non-Finance Managers	7/07/2022
Nigel Marion	Finance for Non-Finance Managers	7/07/2022
Shane Baldry	Finance for Non-Finance Managers	7/07/2022
Tony Corby	Finance for Non-Finance Managers	7/07/2022
Jack Fuller	First Aid	19/07/2022
Rob Drummond	First Aid	19/07/2022
Chris Breen	First Aid	16/07/2022
Robin Davis	First Aid	16/07/2022
Shane Barrett	First Aid	16/07/2022
Shane Baldry	First Aid	16/07/2022
Nicol Kelly	First Aid	16/07/2022
Daniel Flack	First Aid	16/07/2022
Chris Fealy	First Aid	16/07/2022
Michael Lewis	First Aid	16/07/2022
Adam Ryall	First Aid	19/07/2022
Sean Tiernan	First Aid	19/07/2022
Mike Read	First Aid	19/07/2022
Rodney Ryan	First Aid	19/07/2022
Chris Scott	First Aid	19/07/2022

Luke Townsend	First Aid	19/07/2022
Blake Hingerty	First Aid	19/07/2022
Shane Hartshorn	First Aid	19/07/2022
James Butler	First Aid, CPR and Basic Emergency Life Support	19/07/2022
Nicol Kelly	First Aid, CPR and Basic Emergency Life Support	19/07/2022
Brady Gilchrist	First Aid, CPR and Basic Emergency Life Support	19/07/2022
Shane Barrett	First Aid, CPR and Basic Emergency Life Support	19/07/2022
Chris Breen	First Aid, CPR and Basic Emergency Life Support	19/07/2022
Sonya Kovacevic	First Aid, CPR and Basic Emergency Life Support	19/07/2022
Shane Baldry	First Aid, CPR and Basic Emergency Life Support	19/07/2022
Nigel Marion	First Aid, CPR and Basic Emergency Life Support	19/07/2022
Michael Lewis	First Aid, CPR and Basic Emergency Life Support	19/07/2022
Liam Welch	First Aid, CPR and Basic Emergency Life Support	19/07/2022
Rodney Ryan	First Aid, CPR and Basic Emergency Life Support	19/07/2022
Jack Fuller	First Aid, CPR and Basic Emergency Life Support	19/07/2022
Daniel Flack	First Aid, CPR and Basic Emergency Life Support	19/07/2022
Chris Fealy	First Aid, CPR and Basic Emergency Life Support	19/07/2022
Chris Scott	First Aid, CPR and Basic Emergency Life Support	19/07/2022
Robin Davis	First Aid, CPR and Basic Emergency Life Support	19/07/2022
Luke Townsend	First Aid, CPR and Basic Emergency Life Support	19/07/2022
Blake Hingerty	First Aid, CPR and Basic Emergency Life Support	19/07/2022
Mike Read	First Aid, CPR and Basic Emergency Life Support	19/07/2022
Shane Hartshorn	First Aid, CPR and Basic Emergency Life Support	19/07/2022
Adam Ryall	First Aid, CPR and Basic Emergency Life Support	19/07/2022
Barry Shepherd	First Aid, CPR and Basic Emergency Life Support	19/07/2022
Sean Tiernan	First Aid, CPR and Basic Emergency Life Support	19/07/2022
Stephen Ledgard	Fraud & Corruption Awareness	23/03/2023
Robin Davis	Fraud & Corruption Awareness	23/03/2023
Brendon Ford	Fraud & Corruption Awareness	23/03/2023
Laurie Flack	Fraud & Corruption Awareness	23/03/2023
Lewis Allen	Fraud & Corruption Awareness	23/03/2023
Bradley Moye	Fraud & Corruption Awareness	23/03/2023
Larissa Ward	Fraud & Corruption Awareness	23/03/2023
James Carr	Fraud & Corruption Awareness	23/03/2023
Dilrosh Jayawardene	Fraud & Corruption Awareness	23/03/2023
James Butler	Fraud & Corruption Awareness	23/03/2023
Libby Kite	Fraud & Corruption Awareness	23/03/2023
Jack Fuller	Fraud & Corruption Awareness	23/03/2023
Bailey Lowes	Fraud & Corruption Awareness	23/03/2023
Sonya Kovacevic	Fraud & Corruption Awareness	23/03/2023
Mitchell Farlow	Fraud & Corruption Awareness	23/03/2023
Kylie Crouch	Fraud & Corruption Awareness	23/03/2023

Myrka Robichaud	Fraud & Corruption Awareness	23/03/2023
Michael Diggins	Fraud & Corruption Awareness	23/03/2023
Mark Carroll	Fraud & Corruption Awareness	23/03/2023
Chris Scott	Fraud & Corruption Awareness	23/03/2023
Shane Hartshorn	Fraud & Corruption Awareness	23/03/2023
David Chandler	Fraud & Corruption Awareness	23/03/2023
Joshua Hale	Fraud & Corruption Awareness	23/03/2023
Isaac Reardon	Fraud & Corruption Awareness	23/03/2023
Liam Moston	Fraud & Corruption Awareness	23/03/2023
Chris Fealy	Fraud & Corruption Awareness	23/03/2023
Rob Drummond	Fraud & Corruption Awareness	23/03/2023
Matthew Cooper	Fraud & Corruption Awareness	23/03/2023
Andrew Derrick	Fraud & Corruption Awareness	23/03/2023
Eleni McCabe	Fraud & Corruption Awareness	23/03/2023
Breah Coleman	Fraud & Corruption Awareness	23/03/2023
Brady Gilchrist	Fraud & Corruption Awareness	23/03/2023
Kathryn Lowe	Fraud & Corruption Awareness	23/03/2023
Andrew Haley	Fraud & Corruption Awareness	23/03/2023
Geoffrey Veneris	Fraud & Corruption Comprehensive	22/03/2023
Aaron Drenovski	Fraud & Corruption Comprehensive	22/03/2023
Genevieve Taylor	Fraud & Corruption Comprehensive	22/03/2023
Tony Corby	Fraud & Corruption Comprehensive	22/03/2023
Sean Tiernan	Fraud & Corruption Comprehensive	22/03/2023
Ian Basham	Fraud & Corruption Comprehensive	22/03/2023
Daniel Flack	Fraud & Corruption Comprehensive	22/03/2023
Tony Goodyer	Fraud & Corruption Comprehensive	22/03/2023
Simone Fouracre	Fraud & Corruption Comprehensive	22/03/2023
Chris Breen	Fraud & Corruption Comprehensive	22/03/2023
Michael Lewis	Fraud & Corruption Comprehensive	22/03/2023
Mike Read	Fraud & Corruption Comprehensive	22/03/2023
Rahul Patil	Fraud & Corruption Comprehensive	22/03/2023
John Chapman	Fraud & Corruption Comprehensive	22/03/2023
Shane Baldry	Fraud & Corruption Comprehensive	22/03/2023
Nigel Marion	Fraud & Corruption Comprehensive	22/03/2023
Matthew Bett	Fraud & Corruption Comprehensive	22/03/2023
Lynette Breust	Fraud & Corruption Comprehensive	22/03/2023
Christine Roberts	Fraud & Corruption Comprehensive	22/03/2023
David Chandler	Implement Traffic Control Plans	12/10/2022
Liam Pattison	Implement Traffic Control Plans	12/10/2022
Shane Hartshorn	Implement Traffic Control Plans	12/10/2022
Dilrosh Jayawardene	Low Voltage Rescue and Resuscitation (LVR/CPR)	12/10/2022
James Butler	Low Voltage Rescue and Resuscitation (LVR/CPR)	12/10/2022

Jeremy Coleman	Low Voltage Rescue and Resuscitation (LVR/CPR)	12/10/2022
Leslie Scott	Low Voltage Rescue and Resuscitation (LVR/CPR)	12/10/2022
Liam Moston	Low Voltage Rescue and Resuscitation (LVR/CPR)	12/10/2022
Ray McCarthy	Low Voltage Rescue and Resuscitation (LVR/CPR)	12/10/2022
Rodney Ryan	Low Voltage Rescue and Resuscitation (LVR/CPR)	12/10/2022
Shane Baldry	Low Voltage Rescue and Resuscitation (LVR/CPR)	12/10/2022
Shane Baldry	Mental Health First Aid	22/02/2023
Chris Breen	Mental Health First Aid	22/02/2023
Dilrosh Jayawardene	Mental Health First Aid	22/02/2023
Nigel Marion	Mental Health First Aid	22/02/2023
Mike Read	Mental Health First Aid	22/02/2023
Geoffrey Veneris	Mental Health First Aid	22/02/2023
Brendon Ford	Mental Health First Aid	22/02/2023
Nicol Kelly	Mental Health First Aid	22/02/2023
Jack Fuller	Mental Health First Aid	22/02/2023
Blake Hingerty	Mental Health First Aid	22/02/2023
Blake Hingerty	Project Management Fundamentals	31/08/2022
Sonya Kovacevic	Project Management Fundamentals	31/08/2022
Jack Fuller	Project Management Fundamentals	31/08/2022
Nigel Marion	Project Management Fundamentals	31/08/2022
Andrew Haley	Project Management Fundamentals	31/08/2022
Liam Pattison	Project Management Fundamentals	31/08/2022
Ray McCarthy	Project Management Fundamentals	31/08/2022
Chris Breen	Project Management Fundamentals	31/08/2022
Leslie Scott	Project Management Fundamentals	31/08/2022
Liam Moston	Project Management Fundamentals	31/08/2022
Dilrosh Jayawardene	Project Management Fundamentals	31/08/2022
Kathryn Lowe	Project Management Fundamentals	31/08/2022
Nicol Kelly	Project Management Fundamentals	31/08/2022
Bradley Moye	Project Management Fundamentals	31/08/2022
Chris Scott	Project Management Fundamentals	31/08/2022
Sonya Kovacevic	QGIS Essentials	6/09/2022
Nigel Marion	QGIS Essentials	6/09/2022
Mike Read	QGIS Essentials	6/09/2022
Sammy Jung	QGIS Essentials	6/09/2022
Myrka Robichaud	QGIS Essentials	6/09/2022
Adam Ryall	Safe Work near Power Lines	27/09/2022
Andrew Derrick	Safe Work near Power Lines	27/09/2022
Blake Hingerty	Safe Work near Power Lines	27/09/2022
Bradley Moye	Safe Work near Power Lines	27/09/2022
Daniel Flack	Safe Work near Power Lines	27/09/2022
David Chandler	Safe Work near Power Lines	27/09/2022

Dean Wiggins	Safe Work near Power Lines	27/09/2022
Dilrosh Jayawardene	Safe Work near Power Lines	27/09/2022
Ian Basham	Safe Work near Power Lines	27/09/2022
Jack Fuller	Safe Work near Power Lines	27/09/2022
James Butler	Safe Work near Power Lines	27/09/2022
Jeremy Coleman	Safe Work near Power Lines	27/09/2022
Leslie Scott	Safe Work near Power Lines	27/09/2022
Liam Moston	Safe Work near Power Lines	27/09/2022
Liam Pattison	Safe Work near Power Lines	27/09/2022
Matthew Cooper	Safe Work near Power Lines	27/09/2022
Ray McCarthy	Safe Work near Power Lines	27/09/2022
Rob Drummond	Safe Work near Power Lines	27/09/2022
Sean Tiernan	Safe Work near Power Lines	27/09/2022
Shane Baldry	Safe Work near Power Lines	27/09/2022
Shane Hartshorn	Safe Work near Power Lines	27/09/2022
Shane Baldry	Safe working in Confined Spaces	6/10/2022
Adam Ryall	Safe working in Confined Spaces	7/09/2022
Andrew Derrick	Safe working in Confined Spaces	7/09/2022
Barry Shepherd	Safe working in Confined Spaces	7/09/2022
Blake Hingerty	Safe working in Confined Spaces	7/09/2022
Bradley Moye	Safe working in Confined Spaces	7/09/2022
Brendon Ford	Safe working in Confined Spaces	7/09/2022
Chris Breen	Safe working in Confined Spaces	7/09/2022
Chris Fealy	Safe working in Confined Spaces	7/09/2022
David Chandler	Safe working in Confined Spaces	7/09/2022
Dean Wiggins	Safe working in Confined Spaces	7/09/2022
Dilrosh Jayawardene	Safe working in Confined Spaces	7/09/2022
Ian Basham	Safe working in Confined Spaces	7/09/2022
Jack Fuller	Safe working in Confined Spaces	7/09/2022
James Butler	Safe working in Confined Spaces	7/09/2022
James Carr	Safe working in Confined Spaces	7/09/2022
Leslie Scott	Safe working in Confined Spaces	7/09/2022
Liam Moston	Safe working in Confined Spaces	7/09/2022
Liam Welch	Safe working in Confined Spaces	7/09/2022
Mark Carroll	Safe working in Confined Spaces	7/09/2022
Matthew Cooper	Safe working in Confined Spaces	7/09/2022
Mike Read	Safe working in Confined Spaces	7/09/2022
Myrka Robichaud	Safe working in Confined Spaces	7/09/2022
Nicol Kelly	Safe working in Confined Spaces	7/09/2022
Ray McCarthy	Safe working in Confined Spaces	7/09/2022
Sean Tiernan	Safe working in Confined Spaces	7/09/2022
Liam Pattison	Traffic Controller	12/10/2022

Mark Carroll	Traffic Controller	12/10/2022
Shane Hartshorn	Traffic Controller	12/10/2022
David Chandler	Traffic Controller	12/10/2022

Continuous Improvement Plan

Table 27 below is a summary of all items in the Continuous Improvement plan that have been completed or actioned during the 2022/23 reporting period.

Table 27. Continuous improvement plan activities that have progressed, been completed, or been added during the period 2022/23

Action no.	Item	Progress	Date for completion	Who is responsible
29	*GWCC to consider installing online chlorine residual analyser at outlet of settling tanks to ensure 30 minutes contact time (Mt Arthur system)*	*magflow and analysers installed however not connected to clearscada system – Mt Arthur SCADA/Telemetry network to commence upgrade in 2022/23 financial year. Connection of water quality instrumentation to be completed after this. In progress*	*June 2024*	*Manager Production & Services*
76	*Bulk Service Level Agreements (SLA)*	*Draft SLA completed and currently under review. Change in staff at Bulk councils has made it difficult to resolve outstanding items for agreement – In progress. Draft SLA's have been provided to each Bulk Council. No response has been given.*	*June 2024*	*Manager Production and Services*

Review of DWMS Implementation

Adoption of the Drinking Water Management System occurred in February 2018 and the implementation has been reviewed annually since. In addition to our regular annual reviews, GWCC engaged their Internal Auditor, National Audits Group to undertake a review of Councils DWMS and its associated governance and reporting requirements. Results of this Audit are provided in Appendix D below.

Table 28. Summary of internal reviews

Date	Reviewer	Scope	Findings	Actions
3/10/2019	*Geoff Veneris and Chris Breen*	*Drinking Water Policy*	*Fully Compliant – Council reviewed and endorsed the water policy on 23/08/19.*	*No Action required*
FY 2019/20	*Geoff Veneris and Chris Breen*	*Verification Monitoring*	*Council has undertaken all required verification monitoring*	*Continual compliance with NSW Health*
FY 2020/21	*Geoff Veneris and Chris Breen*	*Operational Monitoring*	*GWCC has conducted extensive Operational Monitoring of all Water Source schemes (see Water Quality Section for breakdown of monitoring)*	*Continued Monitoring of all water source scheme Review of current sampling runs are needed*

Date	Reviewer	Scope	Findings	Actions
FY 2021/22	*Geoff Veneris and Chris Breen*	*Operational Monitoring*	*GWCC has conducted extensive Operational Monitoring of all Water Source schemes (see Water Quality Section for breakdown of monitoring)*	*Continued Monitoring of all water source scheme Review of current sampling runs are needed*
FY 2022/23	*Geoff Veneris, Chris Breen and Mitchell Farlow*	*Operational Monitoring*	*GWCC has conducted extensive Operational Monitoring of all Water Source schemes (see Water Quality Section for breakdown of monitoring)*	*Continued Monitoring of all water source scheme Review of current sampling runs are needed*

Table 29. Summary of external reviews.

Date	Reviewer	Scope	Findings	Actions
June 2019	*National Audits Group*	*To review the effectiveness of Council's water quality systems and monitoring procedures and to assess compliance with the ADWG*	*Table 39*	*Complete*

Reservoir inspections

GWCC conducted regular reservoir inspections throughout the reporting period. They have a schedule for weekly 'drive by' inspections, as well as a more detailed inspection regime that is carried out on a quarterly basis. Any issues found with the weekly or quarterly inspections are entered into a spreadsheet/database (CM9 doc number, 20/4023) and the appropriate section is notified of the works that will need to be carried out.

Reservoir inspections are given a priority ranking between 1 and 5, a ranking of 1 being the worst and needing immediate attention, a ranking of 5 being of lowest criticality. (At this point an electronic database has not been kept for all inspections). GWCC is currently working to implement the reservoir inspections in WaterOutlook so that all information can be gathered electronically and acted on accordingly.

Reservoir Inspections were also conducted by Aqualift (Councils contracted divers for cleaning and inspection) during the reporting period. A full report of their findings is located in Appendix. C, below is a summary of their report.

Table 30. Summary of reservoir inspections and outcomes

Date	Reservoirs inspected	Findings	Corrective actions
31/10/2022	Barellan HL Reservoir	-There is leakage present along the mid wall strengthening beam area. It is recommended to use an EWP to tighten all the bolts to see if this slows down the leakage issues - The mesh panel under the main entry cover is beginning to corrode and there is no padlock present to secure the hatch closed	- Bolts to be tightened

		- The platform area is too small for effective maintenance procedures. The guard rails should have surrounded the complete roof area - With only a small roof area present, the safety rails should have extended all the way around the tank	
		- The walls have been recoated and many repairs have been carried out. There are numerous cracks developing along some of the joins which are leaking intermittently - There are fine cracks present in the coating and many blisters are also developing	- None at present
30/10/2022	Coolamon North HL	- There is a common inlet outlet @ 6 oclock and another at 3 oclock. Both of these require directional nozzles to be fitted when the tank is recoated, to prevent the floor sediments from being disturbed	- Platform and guardrails need to be installed
30/10/2022	Coolamon North LL	- There is a rescue hatch present at 12 oclock that opens up in two sections. There is an adjacent unsealed section where the old ladder stiles used to extend through	- None at present
30/10/2022	Coolamon South HL	- The SS ladder is too short and it will not be effective if the water level drops down when a diver is inside the tank. It need to be extended by another 5 metres to make the tank safe	- None at present
		- The epoxy type sealant on the wall joints is either cracking or is peeling off in many areas	- Resealing of joints to be arranged
28/10/2022	Jugiong Clear Water Treatment Plant	- The galvanised ladder and platform has corrosion present.	- To be replaced with a Nextep FRP vertical ladder 9300mm long
29/10/2022	Junee BT 1	- The entry hatch requires a raised edge and an over lapping cover to seal more effectively - There are numerous holes and open drainage areas on the platform that need sealing - The hatch requires a raised edge and an over lapping cover to seal more effectively - The cable hole in the roof is unsealed	- Entry hatch to be replaced with raised edge - Unsealed holes to be siliconed

29/10/2022	Junee BT 3	- There is slight external weepage present in two wall base areas @ 10 and 2 oclock	- None at present

Appendix A – Water quality data

Water Quality Graphs

Jugiong Water Treatment Plan

Jugiong Water Treatment Plant data has been represented in the following graphs and commentary. The following data has been taken from the new Water outlook Database that GWCC is currently building with an external party, Safegroup.

Data relevant to Critical Control and Operational Control is reported as follows:

Chlorine is the main Critical Control Point of the Jugiong WTP used to eliminate chlorine sensitive pathogens, Disinfection.

- The chlorine target leaving the WTP is 1.8mg/L with amber alerts sent if chlorine drops below 1.2mg/L or goes over 2mg/L.
- The alert becomes critical with DWMS protocols implemented when chlorine levels drop below 0.8mg/L in summer and 0.5mg/L in winter. Figure 5 below represents the finished water chlorine at the Jugiong WTP, both Free and Total. As can be seen, GWCC has only exceeded its lower critical limit (<0.5mg/L, winter, <0.8mg/L summer) or its upper critical limit (>5.0mg/L) for Free Chlorine 1 time throughout the reporting period.
- A free/residual chlorine of 0.65mg/L was the lowest recorded result on the 19/02/2023. The highest total chlorine recorded was on the 5/6/2021 with a value of 3.61mg/L.
- The average Free Chlorine for the reporting year was 1.67mg/L and average Total chlorine reading was 2.10mg/L.

Figure 5. Jugiong chlorine levels for the 2022/23 reporting period

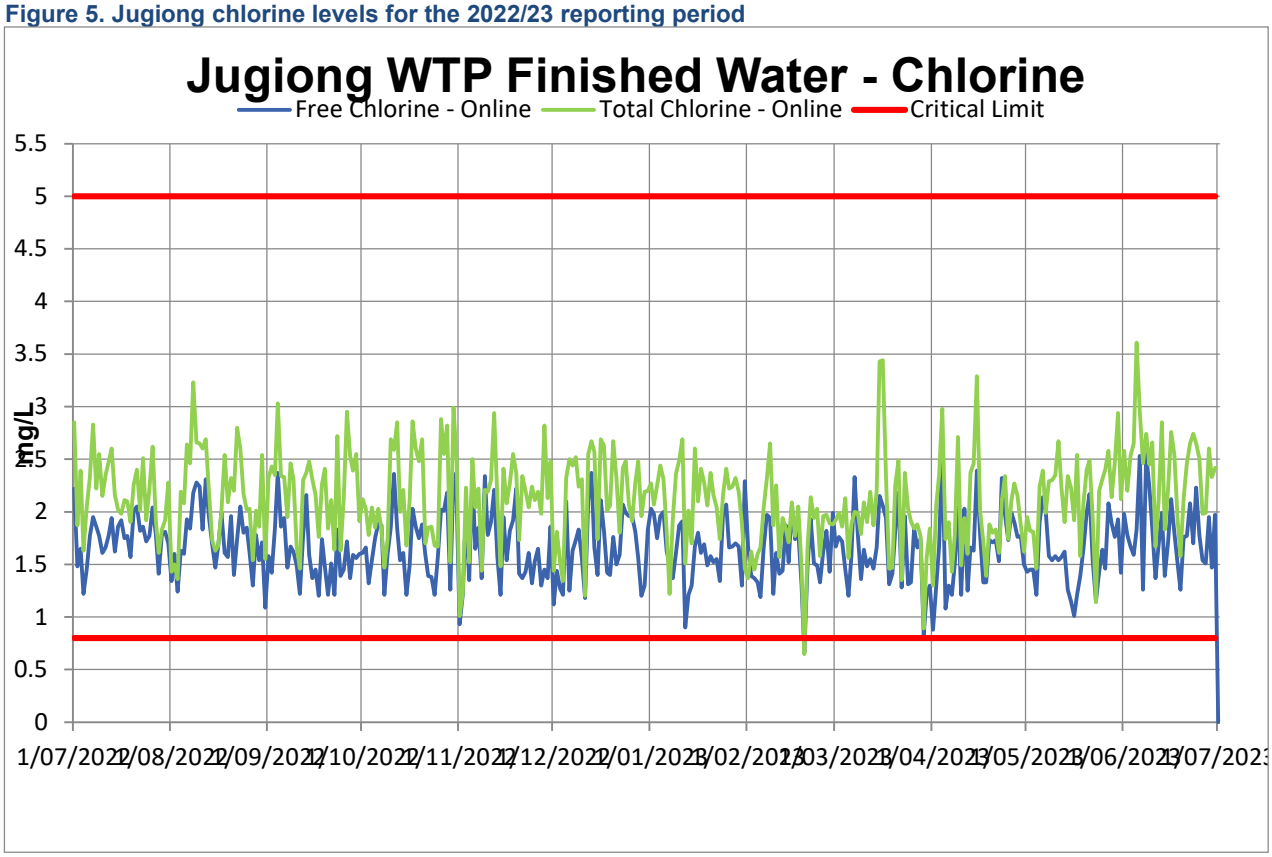


Figure 6 represents the finished water fluoride (Blue line) and Raw Water Fluoride (Green Line) for the Jugiong water treatment plant. Fluoride levels both Raw and Finished has remained consistent throughout the reporting period with a minimum value of 0.09 mg/L (Raw Water concentration) and a maximum value of 1.21 mg/L (Finished water Concentration). The Finished water Fluoride at the Jugiong Water Treatment Plant has exceeded its minimum value of 0.95mg/L on several occasions throughout the reporting period. These exceedances were due to equipment failure or breakdown.

Figure 6. Jugiong fluoride levels for the 2022/23 reporting period

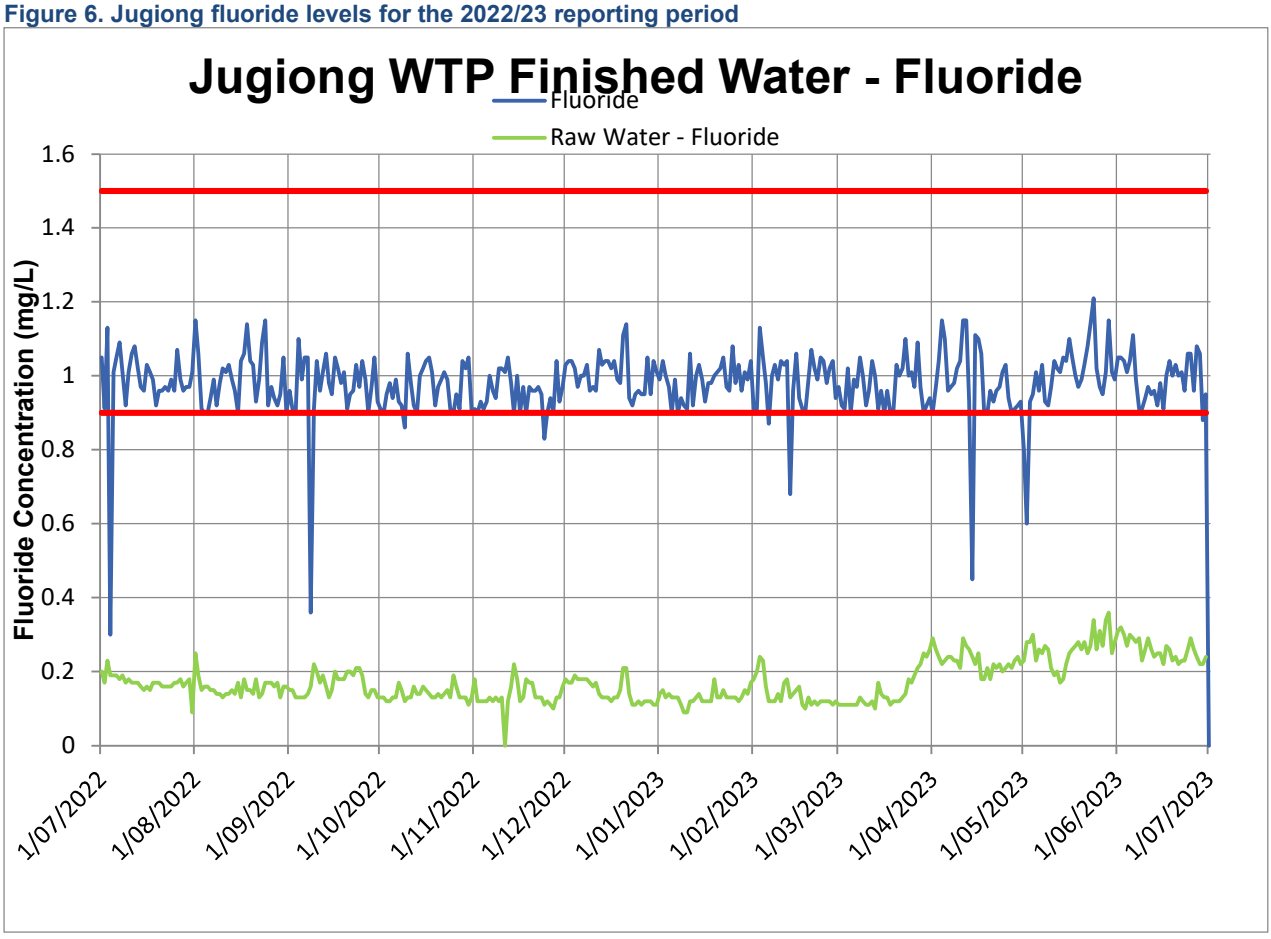


Figure 7. Jugiong raw water turbidity for the 2022/23 reporting period

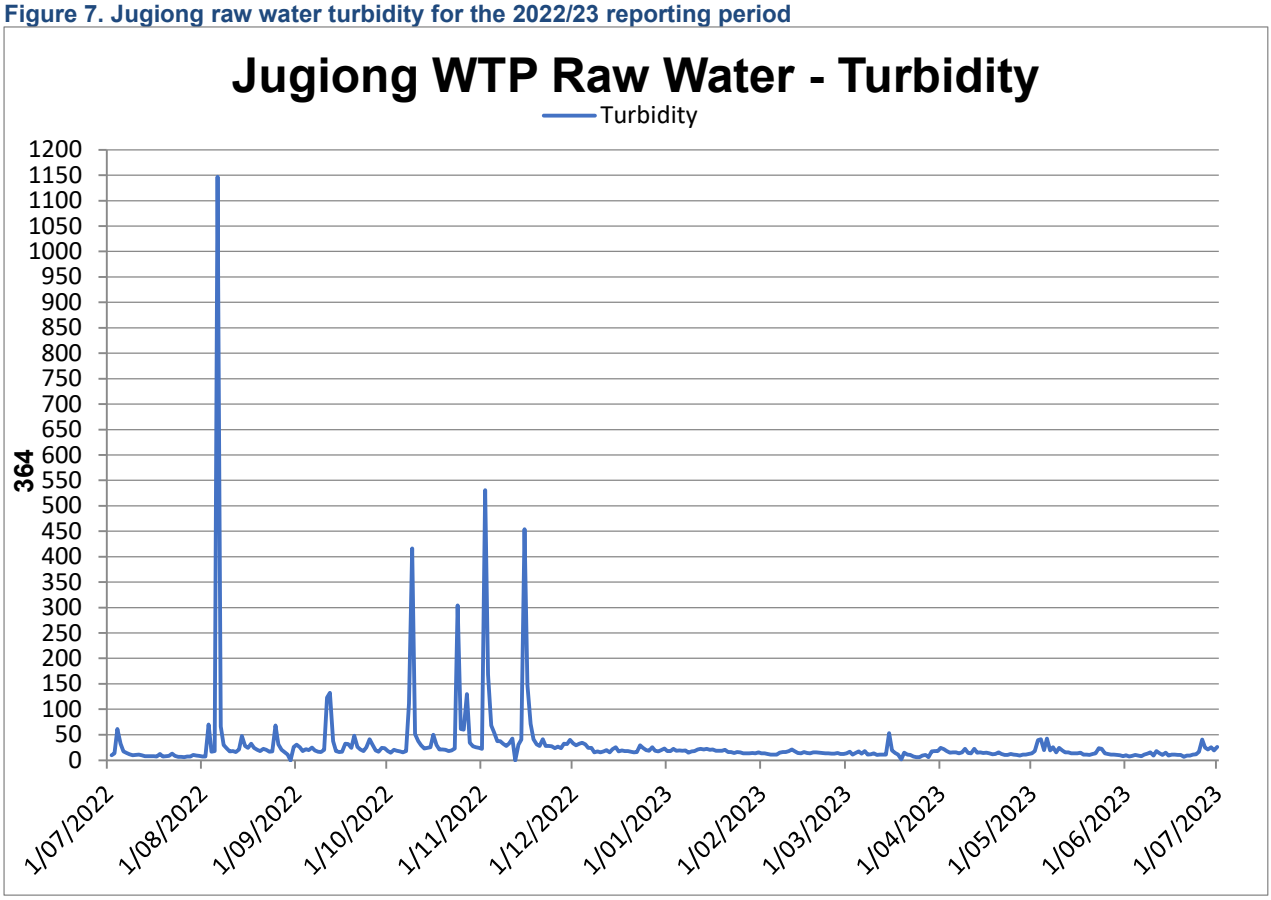


Figure 8. Jugiong finished water turbidity for the 2022/23 reporting period

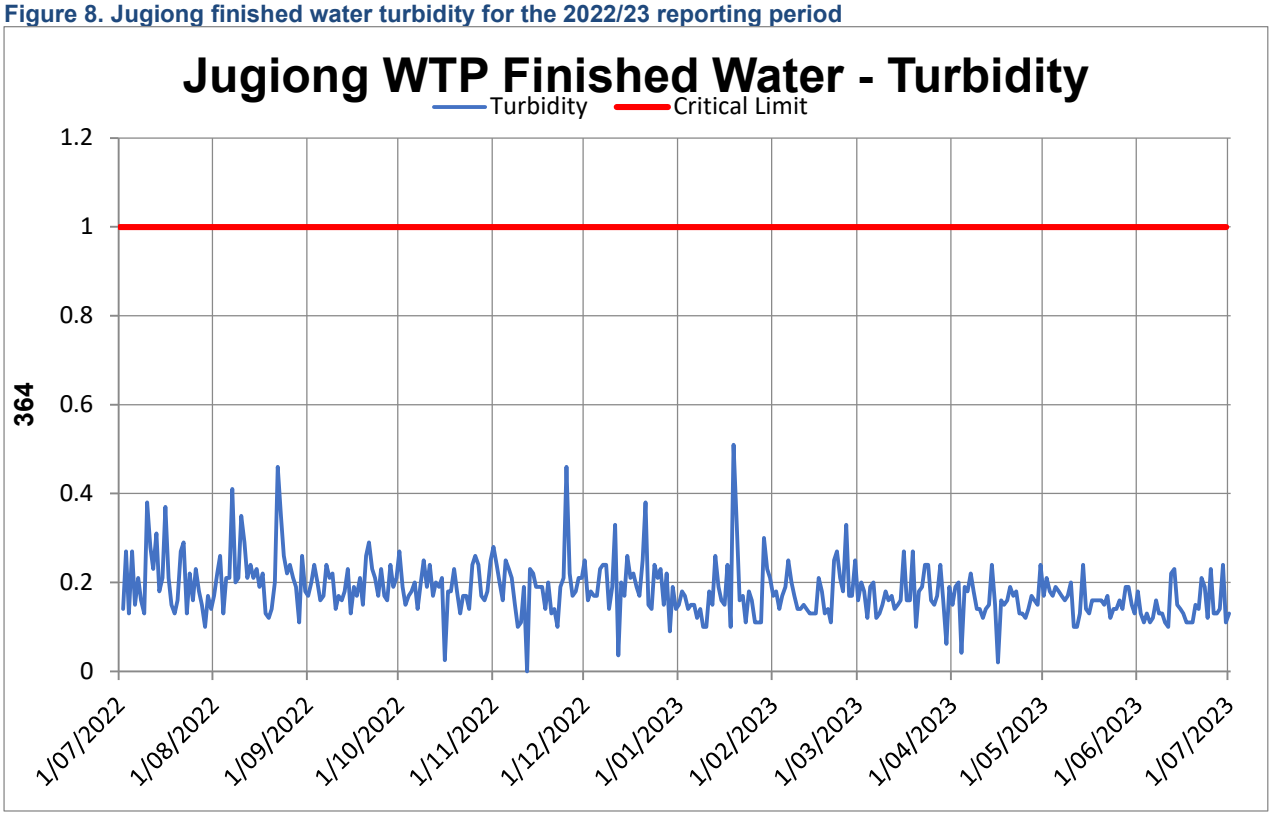
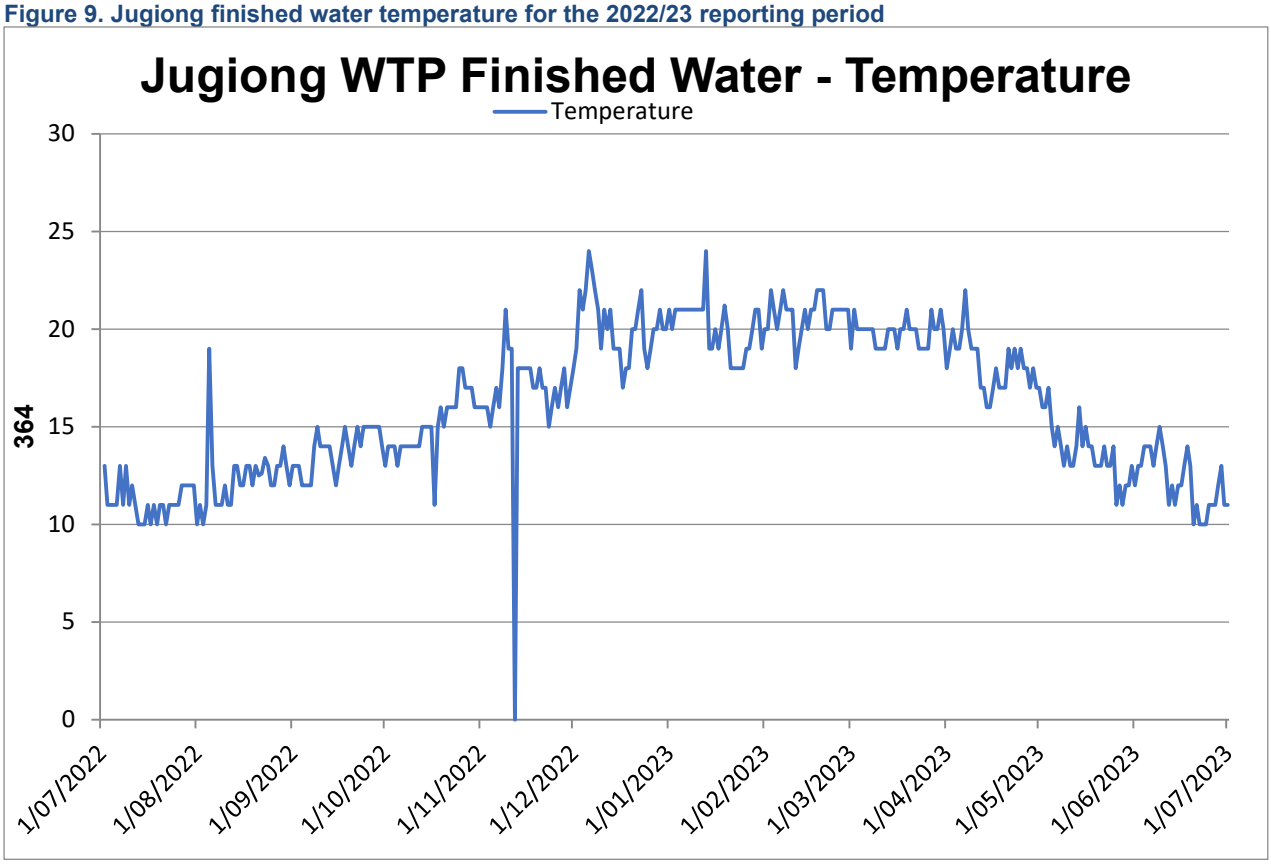


Figure 9. Jugiong finished water temperature for the 2022/23 reporting period



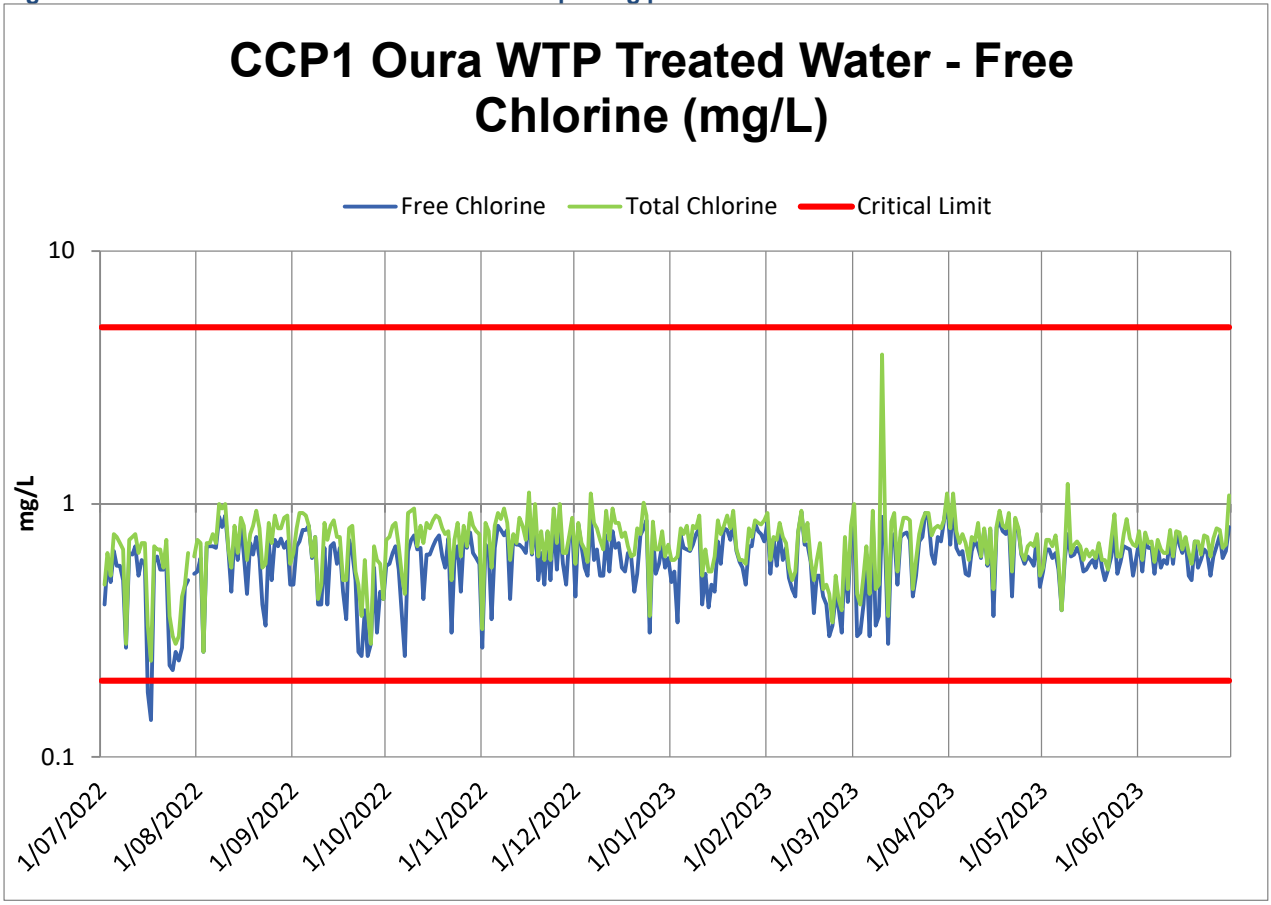
Oura Treatment Plant

Since the implementation of Water Outlook at the Oura WTP some valuable data has been produced. This data is represented in the following graphs produced for the WTP's CCP's.

Chlorine is used at the Oura WTP for disinfection and assistance with oxidising of iron, pre-aeration, of the ground water extracted from bores in Gumly Borefield. It is used to eliminate chlorine sensitive pathogens to achieve required C.t. for disinfection. The chlorine target for GWCC exiting the Oura WTP is 0.5 mg/L. An amber alert is issued through WaterOutlook when chlorine levels drop below 0.3 mg/L and when they rise above 1.0 mg/L. A critical alarm is issued when chlorine levels drop below 0.2 mg/L and rise above 5mg/L.

Fluoride is also added to the water at the Oura WTP. There is natural Fluoride detected in the water, therefore more is added to meet the NSW Health target range of 0.95mg/L to 1.05mg/L. this information is represented in the graphs below.

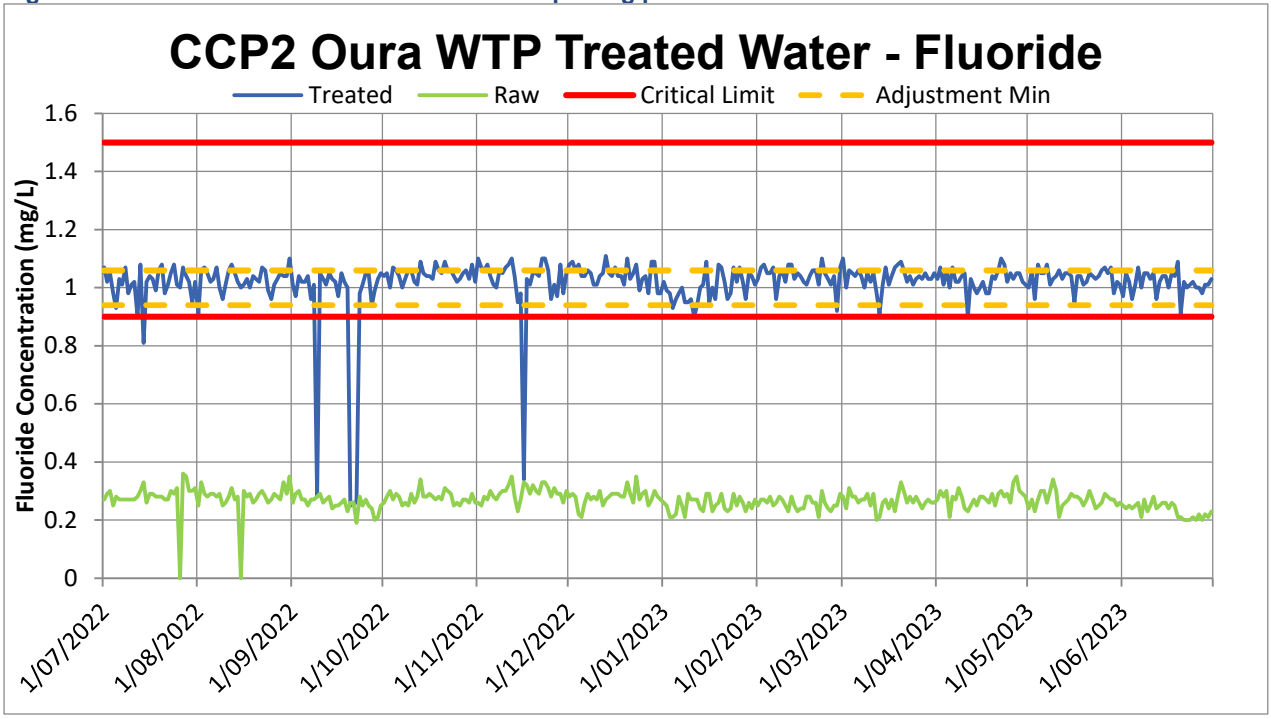
Figure 10. Oura chlorine levels for the 2022/23 reporting period



As can be seen in Figure 10, which uses a logarithmic scale on the vertical axis, the injection of chlorine into the Oura bore water has been extremely consistent throughout the reporting period. Averaging approx. 0.61mg/L (FCl) and 0.72mg/L (TCl) for the 12 months this is slightly higher than our target of 0.5mg/L but well within our CCP range of 0.2mg/L and 5mg/L.

As discussed within the exceedance section of this report, there were a number of chlorine dosing exceedances detected by the online analyser in the 2022/23 financial year; however, these were verified to be a result of instrumentation errors and high inorganics rather than insufficient dosing.

Figure 11. Oura fluoride levels for the 2022/23 reporting period



As can be seen in Figure 11, the raw fluoride content from the Oura Bores is very consistent remaining between 0.2mg/L and 0.4mg/L for the reporting period 2022/23. Raw water fluoride averaged 0.27mg/L for the 2022/23 period.

The treated water fluoride was fairly inconsistent over the reporting period recording 6 exceedances. **All exceedances may be attributed to equipment failure.**

Figure 12. Oura collection tank turbidity levels for the 2022/23 reporting period

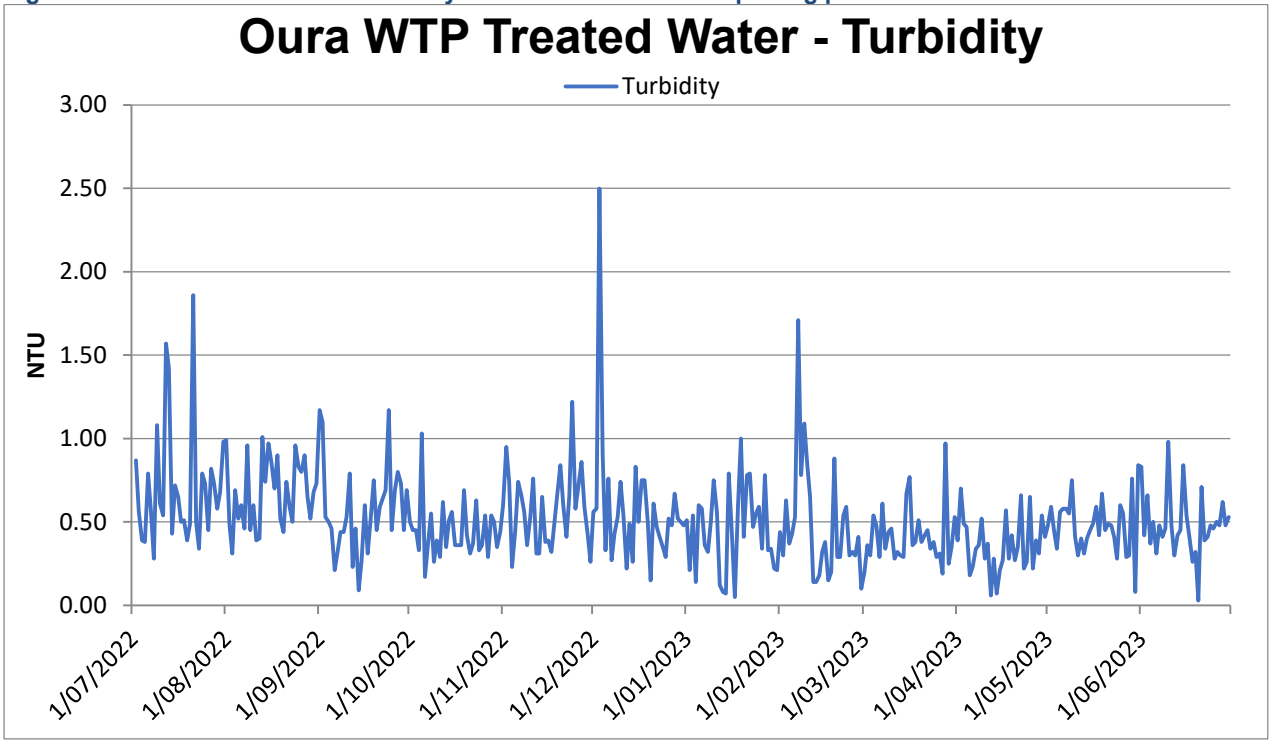


Figure 12 shows the turbidity at the Oura collection tank. Australian Drinking Water Guidelines (ADWG) indicates that turbidity should be <5 NTU (Nephelometric Turbidity Units). As can be seen, there have been no exceedances of this limit for the 2022/23 reporting period.

Figure 13. Oura treated water temperature for the 2022/23 reporting period

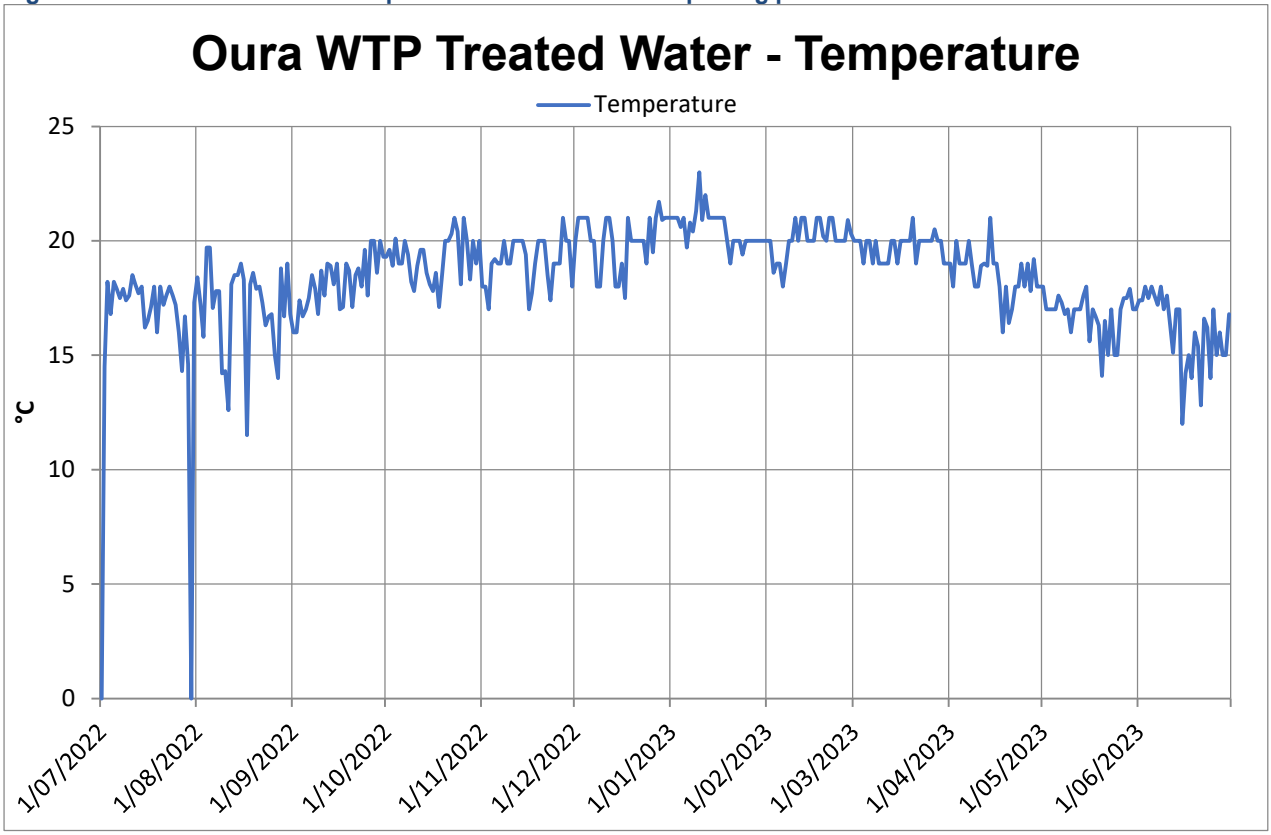


Figure 13 shows the relationship between the temperatures of the treated water with time over the reporting period. As you would surmise, it follows a seasonal trend in that the treated water is warmer in summer and colder in winter despite being extracted from groundwater sources.

Water Quality Data Summary

Table 31. Raw water measured parameters pertaining to water quality in the 2022/23 reporting period - Jugiong

Parameter	Minimum	Average	Maximum	Lower Critical Limit	Upper Critical Limit	No. Samples
Fluoride	0.09	0.17	0.36			364
Turbidity - Online	1.08	11.87	166.56			365
Turbidity Offline	0.18	28.96	1147			364
Colour	15	120.4	1000			364
pH	7.04	7.77	8.26			364
Alkalinity	0	93.3	180			364
Hardness	0	104.9	260			364
Temperature	2	16.3	24			364

Table 32. Raw water measured parameters pertaining to water quality in the 2022/23 reporting period - Oura

Parameter	Minimum	Average	Maximum	Lower Critical Limit	Upper Critical Limit	No. Samples
Fluoride	0.19	0.27	0.36		1.5	365
pH	6.3	6.93	8.03			362
Temperature	11.5	18.53	23			363
Turbidity	0.03	0.52	2.5			365

Table 33. Treated water measured parameters pertaining to water quality in the 2022/23 reporting period - Jugiong

Parameter	Minimum	Average	Maximum	Lower Critical Limit	Upper Critical Limit	No. Samples
Turbidity SCADA	0.01	0.042	0.162		1	365
Turbidity – Offline	0.02	0.18	0.51		1	364
Colour	0	3.8	33			364
pH	7	7.46	8			364
Temperature	10	16.2	24			364
Alkalinity	50	91.9	180			364
Hardness	0	107.3	240			364
Free Chlorine – Online	0.67	1.67	2.64			365
Total chlorine – Online	0.65	2.1	3.61			365
Fluoride	0.3	0.98	1.21			365

Table 34. Treated water measured parameters pertaining to water quality in the 2022/23 reporting period - Oura

Parameter	Minimum	Average	Maximum	Lower critical limit	Upper critical limit	No. samples
Fluoride	0.25	1.02	1.11	0.9	1.5	365
pH	6.66	7.61	8.01			362
Free Chlorine	0.14	0.61	1.03	0.2	5	363
Total Chlorine	0.24	0.72	3.9			363
Temperature	11.5	18.53	23			363

Reticulation Water Quality Reporting

Table 35. Water quality parameters in Jugiong reticulation - Chemistry

Characteristic	Guideline Value	Min	Mean	Max	Sample Count	% meeting guideline values
Aluminium	0.2000	0.06	0.0250	0.03	1	100.00
Antimony	0.0030	0.00005	0.0001	0.00005	1	100.00
Arsenic	0.0100	0.0005	0.0005	0.0005	1	100.00
Barium	2.0000	0.0232	0.0210	0.0241	1	100.00
Boron	4.0000	0.0088	0.0081	0.0081	1	100.00
Cadmium	0.0020	0.00005	0.0001	0.00005	1	100.00
Calcium	10000.0000	10.6	14.4000	17.1	1	100.00
Chloride	250.0000	17	26.5000	32	1	100.00
Chromium	0.0500	0.0005	0.0005	0.0005	1	100.00
Copper	2.0000	0.001	0.0030	0.003	1	100.00
Fluoride	1.5000	0.98	0.9750	1.08	1	100.00
Iodine	0.5000	0.01	0.0100	0.01	1	100.00
Iron	0.3000	0.005	0.0050	0.005	1	100.00
Lead	0.0100	0.0001	0.0001	0.0001	1	100.00
Magnesium	10000.0000	6.21	8.2450	9.55	1	100.00
Manganese	0.5000	0.0139	0.0239	0.0322	1	100.00
Mercury	0.0010	0.0004	0.0004	0.0004	1	100.00
Molybdenum	0.0500	0.0001	0.0002	0.0002	1	100.00
Nickel	0.0200	0.0006	0.0006	0.0006	1	100.00
Nitrate	50.0000	2	1.0000	1	1	100.00
Nitrite	3.0000	0.05	0.0500	0.05	1	100.00
pH	6.5 - 8.5	7.6	7.7500	7.8	1	100.00
Selenium	0.0100	0.0035	0.0035	0.0035	1	100.00
Silver	0.1000	0.0001	0.0001	0.0001	1	100.00
Sodium	180.0000	34	34.5000	39	1	100.00
Sulfate	500.0000	56	45.0000	45	1	100.00
Total Dissolved Solids (TDS)	10000.0000	114	153.5000	168	1	100.00
Total Hardness as CaCO3	10000.0000	52	69.9000	82	1	100.00
True Colour	15.0000	0.5	6.5000	11	1	100.00
Turbidity	5.0000	0.9	0.0750	0.1	1	100.00
Uranium	0.0170	0.0002	0.0001	0.0001	1	100.00
Zinc	3.0000	0.01	0.0100	0.01	1	100.00

Table 36. Water quality parameters in Oura reticulation - Chemistry

Characteristic	Guideline Value	Min	Mean	Max	Sample Count	% meeting guideline values
Aluminium	0.2000	0.005	0.0054	0.01	12	100.00
Antimony	0.0030	0.00005	0.0001	0.00005	12	100.00
Arsenic	0.0100	0.001	0.0010	0.001	12	100.00
Barium	2.0000	0.0101	0.0206	0.0247	12	100.00
Boron	4.0000	0.0166	0.0201	0.0247	12	100.00
Cadmium	0.0020	0.00005	0.0001	0.00005	12	100.00
Calcium	10000.0000	12.9	17.4917	20.7	12	100.00
Chloride	250.0000	16	49.5833	71	12	100.00
Chromium	0.0500	0.0005	0.0007	0.001	12	100.00
Copper	2.0000	0.001	0.0069	0.039	12	100.00
Fluoride	1.5000	0.96	1.0875	1.26	12	100.00
Fluoride (WU result)	1.5000	0.93	1.0283	1.08	12	100.00
Fluoride Ratio	0.8 - 1.2	0.85	0.9492	1.04	12	100.00
Iodine	0.5000	0.02	0.0317	0.04	12	100.00
Iron	0.3000	0.01	0.0725	0.25	12	100.00
Lead	0.0100	0.0001	0.0003	0.0008	12	100.00
Magnesium	10000.0000	10.75	14.4042	16.78	12	100.00
Manganese	0.5000	0.0068	0.0380	0.0904	12	100.00
Mercury	0.0010	0.0004	0.0004	0.0004	12	100.00
Molybdenum	0.0500	0.00005	0.0001	0.0002	12	100.00
Nickel	0.0200	0.0002	0.0005	0.0011	12	100.00
Nitrate	50.0000	1	4.6667	39	12	100.00
Nitrite	3.0000	0.05	0.0500	0.05	12	100.00
pH	6.5 - 8.5	7.6	7.8167	8.1	12	100.00
Selenium	0.0100	0.0035	0.0035	0.0035	12	100.00
Silver	0.1000	0.0001	0.0001	0.0001	12	100.00
Sodium	180.0000	21	37.3333	49	12	100.00
Sulfate	500.0000	4	16.0833	33	12	100.00
Total Dissolved Solids (TDS)	10000.0000	97	167.0000	217	12	100.00
Total Hardness as CaCO3	10000.0000	76.5	103.0000	120.3	12	100.00
True Colour	15.0000	0.5	1.0833	3	12	100.00
Turbidity	5.0000	0.2	0.6500	2	12	100.00
Uranium	0.0170	0.0002	0.0005	0.0007	12	100.00
Zinc	3.0000	0.01	0.0117	0.02	12	100.00

Table 37. Water quality parameters in Mt Arthur reticulation - Chemistry

Characteristic	Guideline Value	Min	Mean	Max	Sample Count	% meeting guideline values
Aluminium	0.2000	0.005	0.0050	0.005	2	100.00
Antimony	0.0030	0.00005	0.0001	0.00005	2	100.00
Arsenic	0.0100	0.0005	0.0005	0.0005	2	100.00
Barium	2.0000	0.0121	0.0134	0.0147	2	100.00
Boron	4.0000	0.0404	0.0414	0.0424	2	100.00
Cadmium	0.0020	0.00005	0.0001	0.00005	2	100.00
Calcium	10000.0000	11.5	11.8500	12.2	2	100.00
Chloride	250.0000	56	61.5000	67	2	100.00
Chromium	0.0500	0.0005	0.0005	0.0005	2	100.00
Copper	2.0000	0.048	0.0535	0.059	2	100.00
Fluoride	1.5000	0.44	0.4550	0.47	2	100.00
Iodine	0.5000	0.04	0.0450	0.05	2	100.00
Iron	0.3000	0.09	0.1750	0.26	2	50.00
Lead	0.0100	0.0002	0.0002	0.0002	2	100.00
Magnesium	10000.0000	8.57	9.5050	10.44	2	100.00
Manganese	0.5000	0.0095	0.0235	0.0375	2	100.00
Mercury	0.0010	0.0004	0.0004	0.0004	2	100.00
Molybdenum	0.0500	0.0002	0.0002	0.0002	2	100.00
Nickel	0.0200	0.0002	0.0002	0.0002	2	100.00
Nitrate	50.0000	0.5	0.5000	0.5	2	100.00
Nitrite	3.0000	0.05	0.0500	0.05	2	100.00
pH	6.5 - 8.5	7.5	7.7500	8	2	100.00
Selenium	0.0100	0.0035	0.0035	0.0035	2	100.00
Silver	0.1000	0.0001	0.0001	0.0001	2	100.00
Sodium	180.0000	48	51.0000	54	2	100.00
Sulfate	500.0000	10	11.0000	12	2	100.00
Total Dissolved Solids (TDS)	10000.0000	161	166.5000	172	2	100.00
Total Hardness as CaCO3	10000.0000	64	68.7500	73.5	2	100.00
True Colour	15.0000	0.5	1.2500	2	2	100.00
Turbidity	5.0000	0.05	0.0750	0.1	2	100.00
Uranium	0.0170	0.00005	0.0001	0.00005	2	100.00
Zinc	3.0000	0.01	0.0100	0.01	2	100.00

Table 38. Water quality parameters in the Mt Daylight reticulation- Chemistry

Characteristic	Guideline Value	Min	Mean	Max	Sample Count	% meeting guideline values
Aluminium	0.2000	0.005	0.0050	0.005	2	100.00
Antimony	0.0030	0.00005	0.0001	0.00005	2	100.00
Arsenic	0.0100	0.002	0.0020	0.002	2	100.00
Barium	2.0000	0.0708	0.0742	0.0776	2	100.00
Boron	4.0000	0.037	0.0401	0.0431	2	100.00
Cadmium	0.0020	0.00005	0.0001	0.00005	2	100.00
Calcium	10000.0000	23.6	24.5000	25.4	2	100.00
Chloride	250.0000	101	104.0000	107	2	100.00
Chromium	0.0500	0.0005	0.0005	0.0005	2	100.00
Copper	2.0000	0.003	0.0035	0.004	2	100.00
Fluoride	1.5000	0.55	0.5550	0.56	2	100.00
Iodine	0.5000	0.14	0.1450	0.15	2	100.00
Iron	0.3000	0.005	0.0050	0.005	2	100.00
Lead	0.0100	0.0001	0.0002	0.0002	2	100.00
Magnesium	10000.0000	22.34	22.4350	22.53	2	100.00
Manganese	0.5000	0.0034	0.0037	0.0039	2	100.00
Mercury	0.0010	0.0004	0.0004	0.0004	2	100.00
Molybdenum	0.0500	0.0023	0.0024	0.0024	2	100.00
Nickel	0.0200	0.0005	0.0006	0.0007	2	100.00
Nitrate	50.0000	0.5	0.5000	0.5	2	100.00
Nitrite	3.0000	0.05	0.0500	0.05	2	100.00
pH	6.5 - 8.5	7.4	7.4500	7.5	2	100.00
Selenium	0.0100	0.0035	0.0035	0.0035	2	100.00
Silver	0.1000	0.0001	0.0001	0.0001	2	100.00
Sodium	180.0000	88	90.0000	92	2	100.00
Sulfate	500.0000	39	39.0000	39	2	100.00
Total Dissolved Solids (TDS)	10000.0000	322	337.5000	353	2	100.00
Total Hardness as CaCO3	10000.0000	150.9	153.5500	156.2	2	100.00
True Colour	15.0000	0.5	0.5000	0.5	2	100.00
Turbidity	5.0000	0.05	0.0750	0.1	2	100.00
Uranium	0.0170	0.0025	0.0029	0.0032	2	100.00
Zinc	3.0000	0.01	0.0100	0.01	2	100.00

Table 39. Microbiological results - Jugiong

Characteristic	Guideline Value	Units	Mean	Median	Standard Deviation	Min	Max	Sample Count	Exception Count	95th Percentile	5th Percentile	% meeting guideline values
E. coli	0.0000	mpn/100 mL	0.0625	0.0000	0.4596	0	4	80	2	0	0	97.50
Free Chlorine	0.2 - 5	mg/L	0.4058	0.2250	0.5221	0.02	2.9	80	38	1.5	0.02	52.50
pH	6.5 - 8.5		7.8968	7.8000	0.4648	7.09	9.17	80	10	8.83	7.31	87.50
Temperature	30.0000	C	17.2325	17.7000	4.8970	6	25.7	80	0	24.6	10	100.00
Total Chlorine	5.0000	mg/L	0.6343	0.4800	0.6132	0.02	2.9	79	0	2.02	0.05	100.00
Total Coliforms	0.0000	mpn/100 mL	4.2750	0.0000	25.0478	0	201	80	8	10	0	90.00
Turbidity	5.0000	NTU	0.6979	0.4800	0.6613	0.15	3.96	78	0	2	0.25	100.00

Table 40. Microbiological results - Oura

Characteristic	Guideline Value	Units	Mean	Median	Standard Deviation	Min	Max	Sample Count	Exception Count	95th Percentile	5th Percentile	% meeting guideline values
E. coli	0.0000	mpn/100 mL	0.0000	0.0000	0.0000	0	0	264	0	0	0	100.00
Free Chlorine	0.2 - 5	mg/L	0.4361	0.4000	0.2326	0.02	1.53	264	29	0.81	0.14	89.02
pH	6.5 - 8.5		8.2315	8.2300	0.4235	7.13	9.64	264	66	8.94	7.59	75.00
Temperature	30.0000	C	19.1375	18.7000	5.0564	10.1	33.1	264	3	27.4	11.8	98.86
Total Chlorine	5.0000	mg/L	0.5441	0.5200	0.2419	0.04	1.6	264	0	0.97	0.22	100.00
Total Coliforms	0.0000	mpn/100 mL	0.0114	0.0000	0.1846	0	3	264	1	0	0	99.62
Turbidity	5.0000	NTU	0.7293	0.5500	0.6062	0.11	5.65	263	1	1.6	0.23	99.62

Table 41. Microbiological results – Mt Arthur

Characteristic	Guideline Value	Units	Mean	Median	Standard Deviation	Min	Max	Sample Count	Exception Count	95th Percentile	5th Percentile	% meeting guideline values
E. coli	0.0000	mpn/100 mL	0.0000	0.0000	0.0000	0	0	74	0	0	0	100.00
Free Chlorine	0.2 - 5	mg/L	0.4668	0.4200	0.2952	0.02	1.71	74	13	1.03	0.05	82.43
pH	6.5 - 8.5		7.4691	7.4300	0.4227	6.95	9.57	74	3	8.09	6.98	95.95
Temperature	30.0000	C	19.5811	20.1000	5.4263	9.6	29.3	74	0	28	11.3	100.00
Total Chlorine	5.0000	mg/L	0.5759	0.5400	0.3745	0.04	2.18	74	0	1.24	0.1	100.00
Total Coliforms	0.0000	mpn/100 mL	0.2703	0.0000	1.7225	0	14	74	3	0	0	95.95
Turbidity	5.0000	NTU	0.7200	0.5450	0.4508	0.25	2.56	74	0	1.61	0.26	100.00

Table 42. Microbiological results – Mt Daylight - Micros

Characteristic	Guideline Value	Units	Mean	Median	Standard Deviation	Min	Max	Sample Count	Exception Count	95th Percentile	5th Percentile	% meeting guideline values
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	0.2604	0.2600	0.2011	0.02	0.81	23	9	0.56	0.02	60.87
pH	6.5 - 8.5		7.3148	7.2600	0.2486	6.95	7.7	23	0	7.7	6.98	100.00
Temperature	30.0000	C	19.0870	17.3000	6.7068	11.6	33.2	23	2	31.4	11.8	91.30
Total Chlorine	5.0000	mg/L	0.3835	0.3900	0.1988	0.06	0.92	23	0	0.65	0.08	100.00
Total Coliforms	0.0000	mpn/100 mL	0.0000	0.0000	0.0000	0	0	23	0	0	0	100.00
Turbidity	5.0000	NTU	0.5514	0.5000	0.3545	0.12	1.6	21	0	1	0.2	100.00

Appendix B - Continuous Improvement Plan

GWCCC DWMS Action and Improvement Plan

Table 43. GWCC DWMS Action and Improvement Plan

No.	Action	Type	Status	Date completed / closed	Comments	Priority	Responsibility	Action reference
1	GWCC to consider installing an online free chlorine analyser at Oura disinfection point (after 30 min contact time).	Capital works	Complete	1/07/2020	25/11/2016 - 9 analysers purchased. As Oura is not disinfecting for primary kill, the analyser should be located as close as practical to the disinfection point. 15/10/2019 - Blueeye analyser installed; however has been found to be unreliable. Analyser has not be implemented for control however is registering trends. A new Burket system will now be installed as a replacement. 1/9/2021 Burket analyser has been installed and opreating since early 2020.	Very High	Manger Production and Services	GWCC DWMS Technical Note 2 Risk Assessment and Critical Control Point Workshop (HydroScience, 2015)

2	GWCC to consider training staff in backflow prevention	Training	Complete	Sep-16				GWCC DWMS Technical Note 2 Risk Assessment and Critical Control Point Workshop (HydroScience, 2015)
3	GWCC to consider conducting internal training on chlorine residual testing	Training	Complete	2017				GWCC DWMS Technical Note 2 Risk Assessment and Critical Control Point Workshop (HydroScience, 2015)
4	GWCC to conduct internal training (or refresher training) on correct sampling techniques	Training	Complete	2017	25/11/2016 - Register needs to be updated to capture internal training completed 15/10/2019 - All Water Qual staff have been inducted into proper sampling techniques; however a role out of all staff across the organisation whom may require sampling as part of their role will need to be undertaken. 25/8/2020 All new distribution staff inducted internally however, a register is yet to be developed. 1/9/21 all compliance sampling is conducted by Water Quality Staff	Low		GWCC DWMS Technical Note 2 Risk Assessment and Critical Control Point Workshop (HydroScience, 2015)

					now who are trained and specialised. The only testing that occurs from distribution staff is now just chlorine operational samples. Water Quality Staff continue developmet and all maintain their cert 3 in water treatment plant operations.			
5	GWCC to consider conducting a community education program on backflow prevention	Community engagement	Closed	25-Nov	25/11/2016 - Action closed due to changed process. Refer to action 33 (implement backflow prevention program)			GWCC DWMS Technical Note 2 Risk Assessment and Critical Control Point Workshop (HydroScience, 2015)
6	GWCC to conduct bacto sampling after storm event if visual check of bores show	Monitoring	Closed	25-Nov	25/11/2016 - Action closed due to changed process. Refer to action 33 (implement backflow prevention program)			GWCC DWMS Technical Note 2 Risk Assessment and Critical Control Point Workshop (HydroScience, 2015)

	signs of being compromised							
7	GWCC to install an online turbidity meter in Murrumbidgee River to predict water quality decline	Capital works	Closed	Nov-16	25/11/2016 - Turbidity meter purchased. However this action is no longer required. Controls for WTP are established at the plant through the upgrade to ClearScada control system. Raw water turbiditity is already measured and shuts the plant down if variation >20% occurs. Contact with WaterNSW will also provide any release changes that may impact on river turbidity.			GWCC DWMS Technical Note 2 Risk Assessment and Critical Control Point Workshop (HydroScience, 2015)
8	GWCC to roll out system of different levels of key access to increase security	Operations and maintenance	Complete	2016	25/11/2016 - Keys purchased 25/8/2020, majority of all sites now completed with only remote site remaining			GWCC DWMS Technical Note 2 Risk Assessment and Critical Control Point Workshop (HydroScience, 2015)
9	GWCC to consider performing preventative maintenance on solenoid valves	Operations and maintenance	Closed	Nov	25/11/2016 - Considered as part of maintenance			GWCC DWMS Technical Note 2 Risk Assessment and Critical Control Point Workshop (HydroScience, 2015)

	leading into fluoride batching tank							
10	GWCC to check data entry to ensure no errors and record all incidents and causes of high readings (e.g. data entry error, human error, etc.)	Monitoring	Closed	2017	the implementation of a new water quality database (Wateroutlook) has allowed for the centralisation of all test results and automated reporting for any non-conformances.			GWCC DWMS Technical Note 2 Risk Assessment and Critical Control Point Workshop (HydroScience, 2015)
11	GWCC to consider purchasing electronic chlorine analyser to eliminate manganese interference with chlorine residual testing as per DPI Water recommendation (e.g. chloro-sense kits)	Capital works	Closed	2014	25/11/2016 - One at Jugiong and one at Oura			GWCC DWMS Technical Note 2 Risk Assessment and Critical Control Point Workshop (HydroScience, 2015)

12	GWCC to consider increasing monitoring of chlorine residual throughout system during power outages	Monitoring	Closed	25-Nov	25/11/2016 - Covered within incident management. 9 chlorine analysers to be installed 15/10/2019 - multiple sites now online via scada with battery backup operations.			GWCC DWMS Technical Note 2 Risk Assessment and Critical Control Point Workshop (HydroScience, 2015)
13	GWCC to consider installing online chlorine analysers at Oura PS	Capital works	Closed	2020	25/11/2016 - analyser purchased. Currently being installed and connected to SCADA 2017. 15/10/2019 - Analyser installed in lab. Reliability of the Blueeye unit is not good and a new unit will be installed in 2019. System is currently operating however no controls have been engaged from the anlyser due to reliability f the unit. Trends are however being obtained. 1/9/2021 wokrs were complete and commissioned in early 2020			GWCC DWMS Technical Note 2 Risk Assessment and Critical Control Point Workshop (HydroScience, 2015)

14	GWCC to develop a register for water carters	Procedures and documentation	Closed	2019	2017 - Letters issued to all known water carters within supply area. No repsonses received from water caters regarding potable water services. Process will be controlled greater via the installation of automated filling stations which will be delivered as an ongoing capital delivery project. 15/10/2019 - Filling stations installed at Temora, Bardmedman and West Wyalong. No commercial water carters for potable services have been registered.			GWCC DWMS Technical Note 2 Risk Assessment and Critical Control Point Workshop (HydroScience, 2015)
15	GWCC to develop and maintain a register of RPZs within distribution system	Procedures and documentation	Closed		To be completed as part of *Action33 Implement backflow prevention program*			GWCC DWMS Technical Note 2 Risk Assessment and Critical Control Point Workshop (HydroScience, 2015)

16	GWCC to consider and investigate and install the most suitable BFPD on the connection between Oura and Hylands Bridge (e.g. RPZ, break tank with air gap, etc.)	Capital works	Complete		2017 risk assesment and report developed on the non-pot system and its potential for cross contamination. Further projects to progress to investigation stage in 2018. 15/10/2019 - Works still outstanding 25/8/2020 Works still outstanding 1/11/22 A stop valve and non-return valve has been put in place to reduce any risk of backflow.	High	Manager Engineering	GWCC DWMS Technical Note 2 Risk Assessment and Critical Control Point Workshop (HydroScience, 2015)
17	GWCC to ensure all hatches on reservoirs comply with AS/NZS	Operations and maintenance	Rolled into other action		To be completed as part of *Action 36 To complete and submit circular 18*			GWCC DWMS Technical Note 2 Risk Assessment and Critical Control Point Workshop (HydroScience, 2015)
18	GWCC to implement a formal water quality monitoring regime at Mt Arthur to monitor pH, turbidity, free, and total chlorine	Monitoring	Rolled into other action		To be completed as part of *Action 37 Complete formal review of monitoring plan, against ADWG, NSW Health*			GWCC DWMS Technical Note 2 Risk Assessment and Critical Control Point Workshop (HydroScience, 2015)

19	GWCC to implement a formal water quality monitoring regime at Mt Daylight to monitor pH, turbidity, free, and total chlorine	Monitoring	Rolled into other action		To be completed as part of *Action 37 Complete formal review of monitoring plan, against ADWG, NSW Health*			GWCC DWMS Technical Note 2 Risk Assessment and Critical Control Point Workshop (HydroScience, 2015)
20	GWCC to install a backflow prevention device between the GWCC reservoir and the reservoir managed by Carathool Shire Council to protect water quality in the Mt Daylight drinking water supply	Capital works	Closed	2020	25/11/2016 - Part of broader discussion on governance with Carathool Shire Council 25/8/2020 there is an airgap between water in reservoir and inlet therefore restricting any backflow			GWCC DWMS Technical Note 2 Risk Assessment and Critical Control Point Workshop (HydroScience, 2015)
21	GWCC to consider purging reservoir as part of emergency response if	Operations and maintenance	Closed	2016	25/11/2016 - Considered as part of emergency procedures			GWCC DWMS Technical Note 2 Risk Assessment and Critical Control Point Workshop (HydroScience, 2015)

	contamination is suspected							
22	GWCC to consider alarming all reservoir hatch doors in case of sabotage or vandalism. Mt Daylight reservoir is a priority, which is the most remote	Operations and maintenance	Closed	2016	25/11/2016 - Been considered, but currently not practical. Managed with weekly and quarterly inspections.			GWCC DWMS Technical Note 2 Risk Assessment and Critical Control Point Workshop (HydroScience, 2015)
23	GWCC to complete live chlorine monitoring system for reticulation system (in progress)	Capital works	Complete	2019	25/11/2016 - analyser purchased 15/10/2019 - analysers will be installed on demarcation boundaries for Bulk customers retics. No considerations for online retic monitoring is being considered at this stage as water quality team are building data to inform future decisions such as apporpriate locailities that warrant online monitoring. 25/8/2020 as per previous note on 15/10/2019 1/9/2021 as	Low	Manager Production & Services	GWCC DWMS Technical Note 2 Risk Assessment and Critical Control Point Workshop (HydroScience, 2015)

					per previous advice and note that staff undertake significant amount of additional operational testing for the retic systems.			
24	GWCC to consider developing SOP for fluoride hopper cleaning	Procedures and documentation	Complete	2020	15/10/2019 - External training consultant required to facilitate, training and development of an SOP for Trades. This will occur upon completion of the new Code of Practice. 25/8/2020 SOP has been drafted and induction to be provided for all trades and WTP operators 1/9/2021 new induction procedure was completed and implemented in 2020	Very High	Manager Production & Services	GWCC DWMS Technical Note 2 Risk Assessment and Critical Control Point Workshop (HydroScience, 2015)
25	GWCC to consider	Procedures and	Closed	30/06/2019	15/10/2019 - consideration of			GWCC DWMS Technical Note 2 Risk Assessment and Critical

	developing SOPs for chlorine testing to include manganese interference with reagent	documentation			developing SOP's has been determined as not required.			Control Point Workshop (HydroScience, 2015)
26	GWCC to develop SOPs for operational and supporting activities, such as plant operation, mains break repair, mains flushing, etc.	Procedures and documentation	Complete	2020	15/10/2019 - SOPS for WTP's and Water Quality division have been completed. Distribution SOP's now required in line with relevant training 25/8/2020 distribution staff to develop SOPS for their activities e.g. mains breaks 1/9/2021 GWCC have now established a WHS committee and officers, continual improvement processes are in place and managed as part of this process. This includes all WHS documentation and SOP needs for the organisation	Medium	Manager Operations	GWCC DWMS Technical Note 2 Risk Assessment and Critical Control Point Workshop (HydroScience, 2015)
27	GWCC to include drinking water quality management in	Procedures and documentation	Complete	2018	First report and submitted in October 2018.			GWCC DWMS Technical Note 2 Risk Assessment and Critical Control Point Workshop (HydroScience, 2015)

	the annual report, as recommended in Element 10 of the ADWG							
28	Educate community member that owns the private bore in close proximity to Oura Borefield to ensure they are aware that the bore accesses the drinking water aquifer	Community engagement	Complete	30/06/2020	25/11/2016 - Refer to new action 38	High	Manager Engineering	GWCC DWMS Technical Note 2 Risk Assessment and Critical Control Point Workshop (HydroScience, 2015)

29	GWCC to consider installing online chlorine residual analyser at outlet of settling tanks to ensure 30 minutes contact time (Mt Arthur system)	Capital works	In progress		25/11/2016 - Analyser purchased. Unit has been installed at Ganmain; however just waiting on connection for discharge water to sewer before comissioning occurs. 15/10/2019 - Analysers and Maglows to be installed in the Mt Arthur System to provide more data for potential treatment requirements. Investigations to Occur from January 2020 as part of MIPPS student placement. 25/8/2020 MIPPS student investigation project complete June 2020, further investigations in treatment options to occur 1/9/2021 magflow and analysers installed however not connected to clearscada system. 1/11/22 Mt Arthur SCADA/Telemtry network to commence upgrade in 2022/23 financial year.	Low	Manager Production & Services	GWCC DWMS Technical Note 2 Risk Assessment and Critical Control Point Workshop (HydroScience, 2015)

					Connection of water quality instrumentation to be completed after this. Completion of Mt Arthur SCADA upgrade and Microwave link Telemtry system, is expecd to be completed by June 2024 within the current financial year. Consideration of analysers will occur after this. 21/11/2023			
30	GWCC to consider changing location of online chlorine analyser in the Mt Daylight system to ensure free chlorine measurement after 30 min contact time. Both the chlorine dosing and the chlorine analyser are	Capital works	Closed	30/06/2020	Consider as part of analyser installation. 15/10/2019 - Analyser installed at Naradhan Res's providing residual levels 15km down stream of dosing point. Anlayser needs to include controls to inhibit Daylight pumps if residuals or CL2 dosing stops.	Medium	Manager Production & Services	GWCC DWMS Technical Note 2 Risk Assessment and Critical Control Point Workshop (HydroScience, 2015)

	located at the reservoir inlet							
31	Determine the level of water quality training required for new staff and add to induction program	Training	Complete		15/10/2019 - Consideration of training will need to be developed in accordance with each individuals role. However in terms of induction and competancy based requirements for all field staff, this needs to be developed. 25/8/2020 all new starter within WQ and distribution teams have been provided relevent inductions where required however formal register yet to be developed. 1/9/2021 water quality staff now managing all compliance requirements of the DWMS. Their training is being developed in line with the National	Medium	Human Resource Coordinator	Added as part of action and improvement plan review (25 November 2016)

					Training Package 2020. we are working with the NSW Water Directorate and TWRRP Team for access to new training providors which has delayed our continual development requirements.Staff undertake a review of their Staff Development Plans every 6 months,			
32	Develop and implement competency checklist/schedule on sampling methodology	Training	Closed	30/06/2020	15/10/2019 - Will be considered as part of an induction and training program for water quality testing. Internally competency sign off required 25/8/2020 has been considered and will form part of induction process and register 1/9/2021 All compliance	Low	Manager Production & Services	Added as part of action and improvement plan review (25 November 2016)

					sampling conducted by Quality staff now whom hold a minimum of cert 3 in water treatment operations.			
33	Implement backflow prevention program, including developing register of RPZs	Capital works	Closed	30/06/2020	25/11/2016 - Budget approved, project underway. 15/10/2019 - Program has commenced and is nearing its completion for all rural high risk connections.25/8/2020 RPZD register of high risk connections has been completed	Very High	Manager Engineering	Added as part of action and improvement plan review (25 November 2016)
34	Develop a microbiological sampling SOP when bore head integrity has been potentially compromised (maintenance, flooding, vandalism)	Procedures and documentation	Closed	30/06/2019	15/10/2019 - in line with action item 6 above. Emergancy Response SOP's have been developed. Routine raw water testing now undertaken.			Added as part of action and improvement plan review (25 November 2016)

35	Investigate options for electronic card systems on standpipes to record water carter access	Capital works	Closed	30/06/2019	Temora and West Wyalong have been determined as priority locations for installation during the 18/19 financial year. 15/10/2019 - West Wyalong, Temora and Barmedman now installed and operational.			Added as part of action and improvement plan review (25 November 2016)
36	To complete and submit circular 18	Operations and maintenance	Complete		The development of routine inspections and standard operating procedures have been completed in 2017. Work on the development of a centralised database that can issue out work orders and retain asset corrective action data is now being developed through Wateroutlook. 15/10/2019 - formal submission Circular 18 has not recieved any feedback from 2017. Consideration of new submission to be made. 25/8/2020 No change still no feedback from DPIE	High	Manager Engineering	Added as part of action and improvement plan review (25 November 2016)

37	Complete formal review of monitoring plan, against ADWG, NSW Health	Monitoring	Complete	2017	Works completed with independent review completed by Atom consulting in 2017. 15/10/2019 - Annual DWMS review is undertaken in October of every year and reported to NSW Health upon completion.			Added as part of action and improvement plan review (25 November 2016)
38	Investigate bore 5 private ownership and licensing, in liaison with DPI Water. Considering water quality contamination risks from bore	Investigative studies	Closed	30/06/2019	15/10/2019 - contact with Land Holder and DOI Water to occur 25/8/2020 no indication of active bore, GWCC to continue to monitor raw water of existing borefield	High	Manager Engineering	Added as part of action and improvement plan review (25 November 2016)
39	Ensure bore 1 wellhead security e.g. secure gaps in casement	Capital works	Closed	2019	contact with land holder to gain access and investigate bore closure to occur in 2018 15/10/2019 - 100% confirmation is not possible. Continued monitoring of our borefield raw water will identify any issues if such shall arise.			Added as part of action and improvement plan review (25 November 2016)

40	Review operational monitoring data	Monitoring	Complete	ongoing	Independent monitoring report completed by Atom Consulting with internal review also undertaken for development of better operational data gathering for population of Wateroutlook system.			Added as part of action and improvement plan review (25 November 2016)
41	Formulate a Drinking Water Quality Policy	Procedures and documentation	Closed	2018	Formulate a drinking Water Policy, to be completed before August council meeting. 15/10/2019 - now complete		Manger Production and Services	Added as part of review/development of DWMS
42	Ensure Drinking Water Quality policy is communicated and understood by staff	Training	Closed	2018	Once policy has been adopted by council it is to communicated and understood by staff 15/10/2019 - all policies are submitted to the Consultative Committee for review and made available online for all staff.		Manger Production and Services	Added as part of review/development of DWMS
43	construct Flow diagrams of water supply system from catchment to consumer	Procedures and documentation	Complete	2017	flow diagrams were updated to be placed into DWMS			

44	Assemble pertinent information and document key characteristics of the water supply system	Procedures and documentation	Complete	2017	Information was generated for production of DWMS		Manger Production and Services	
45	Assemble a team with appropriate knowledge and expertise	Procedures and documentation	Closed	2019	Asset management asset required. 15/10/2019 - Water Quality team now established with more room to grow trainees in future years. Engineering team has gone from 3 to 5 staff with an independant manager.		Manger Production and Services	
46	Identify existing preventive measures from catchment to consumer for each significant hazard or hazardous event and estimate the residual risk	Investigative studies	Complete	ongoing	Ongoing risk reviews and actions are undetaken upon incident reporting/lessons learnt scenarios. As the organisations asset and operational maturity increases so to will the levels of assesment and outcomes. 1/9/2021 GWCC staff monitori and maintain its raw water systems vi amonthly monitoring	Low		

					lab results. In addition to that we are altered by any chnages to Murrumbidgee discharges from Waternsw.			
47	Evaluate alternative or additional preventive measures where improvement is required		Closed	ongoing	25/8/2020 as per item 46 above			
48	Document all procedures and compile into an operations manual	Procedures and documentation	Closed	2019	SOPs have been generated and reviewed, they will need to be finalised. SWMS are currently being developed 15/10/2019 - All SOP's for WTP operations have now been complete. All documents have been made available on WaterOutlook. An operations manual is		Manger Production and Services	

					not deemed required at this stage.			
49	Identify procedures required for processes and activities from catchment to consumer	Procedures and documentation	Complete	2020	See point 48 above. 15/10/2019 - This needs to be investigated and developed into a management plan for each supply scheme. 1/9/2021 this is documented and managed as aprt of our DWMS and asscoiated annual reviews.	Medium	Manger Production and Services	
50	Ensure monitoring data is representative and reliable	Monitoring	Complete	ongoing	Ongoing data auditing every 12 months will help confirm data is representative of water supplies. 15/10/2019 - Wateroutlook provides monthly data reports for review by the water quality team. All data is reviewed annually for consideration of any new improvements		Manger Production and Services	

					required for data and operational consistancy.			
51	Determine the characteristics to be monitored in the distribution system and in water as supplied to the customer	Monitoring	Complete	2017	monitoring is carried out as per NSW Health drinking water Monitoring Program and operational requirments of GWCC.			
52	Establish and document a sampling plan for each characteristic, including the location and frequency of sampling	Monitoring	Complete	2017	Monitoring program to be audited every 12 months to ensure data is representative of the drinking water system			

53	Establish a consumer complaint and response program, including appropriate training of employee	Community engagement	Complete	2017	A register of customer complaints and outcomes and feedback to be developed. 15/10/2019 - CRM processes and indicators to be developed over the next 12 months with data recording and reporting mechanisms to be developed as well. This is an outstanding item in both Internal audit and NPR Audit. 25/8/2020 Draft operating proceedure for complaints handling completed 1/9/2020 process is now business as usual with utilisation of councils customer service complaints system utilised to log and report on issues	Medium	Manger Production and Services	
54	Define communication protocols with the involvement of relevent agencies and prepare a contact list of	Procedures and documentation	Closed	2018	A register of conacts has been completed and Emergency Response Management Plan will need to be reviewed to add the list. 15/10/2019 - works			

	key people, agencies and businesses				now complete and reviewed annually.			
55	develop a public and media communuications strategy	Community engagement	Complete	2019	See Ryan for update. 15/10/2019 - complete			
56	Develop mechanisms and communication procedures to increase employees awareness of and participation in drinking water quality management	Procedures and documentation	Complete	2020	Suggested by GM to have all staff trained in Cert II Water Operations. 15/10/2019 - induction based training should be undertaken by operational staff. Discussions with HR Coordinator to occur to develop long term plan. 1/9/2021 GWCC issue relevant update emails, SOP's and guidelines to all staff when chnages occur. Additional training inlcuding scenario training is undertaken as well. Sceanrio training was conducted with Bulk Councils involved in late 2020.	High	Manger Production and Services	

57	Develop a comprehensive strategy for community consultation	Community engagement	Closed	2019	Have communications officer develop comms strategy. 15/10/2019 - Complete			
58	Assess requirements for effective community involvement	Community engagement	Complete	2019	15/10/2019 - As per Local Government Act, IP&R Framework and the Best Practice requirments for Water & Sewer.			
59	Use information to improve management of the Water Supply system	Investigative studies	Implemented	ongoing	Information will help GWCC to evolve with the requirements of its customers	Low	Manger Production and Services	
60	establish programs to increase understanding of the water supply system	Community engagement	Complete	ongoing	Programs may include education of water quality, treatment processes, distribution works, new capital works etc. 1/9/2021 GWCC continue to develop hydraulic models, P&ID, and validation systems for Councils networks. Council have also developed and undertaken an education program called "Depth Days" which provides tours of	Medium	Manger Production and Services	

					Jugiong WTP and gives an overview of catchment to tap process for students and/or community groups if requested.			
61	Validate processes and procedures to ensure that they are effective at controlling hazards	Procedures and documentation	Implemented		Ongoing assesment current procedures will help produce and highlight the need for new or additional processes or information			
62	Revalidate processes periodically or when variations in conditions occur	Procedures and documentation	Implemented		See Action and Improvement Plan Action item 61 above			
63	Validate the selection and design of new equipment and infrastructure to ensure continuing reliability	Investigative studies	Implemented	2017	Ongoing			

64	Periodically review documentation and revise as nessesary	Procedures and documentation	Implemented	2017	Ongoing document will be review and updated as per the document review dates			
65	develop a document control system to ensure current versions are in use	Procedures and documentation	Complete		Systematic approach with all review documents and their resepective review dates to be determined and a suitable timeline developed to make sure all docs are updated as required 25/8/2020 all systems built into Water Outlook	High	Manger Production and Services	
66	Establish a records management system and ensure that employees are trained to fill out records	Procedures and documentation	Implemented	2018	Wateroutlook is deing developed by Safe group with a number of avenues of data collection to be made availble once fully rolled out. 15/10/2019 - Additional CRM system is avaialble for registering all documents, emails and correspondance		Manger Production and Services	

67	Document information pertinent to all aspects of drinking water quality mangement	Procedures and documentation	Implemented		This will evolve as GWCC move forward, relevant information e.g. reservoir inspection sheets to be enetered into a database for reporting and so that any works can be followed up on and actioned if not complete	Very High	Manger Production and Services	
68	produce an annual report to be made available to customers, regulatory authorities and stakeholders	Procedures and documentation	Implemented		DWMS Report may be made available once Water Quality Technical Officer has completed in July/August. 15/10/2019 - The annual report will be completed, submitted and made available to all relevant authorities in October of every year.	High	Manger Production and Services	
69	establish procedures for effective internal and external reporting	Procedures and documentation	Closed	2017	The DWMS annual report to NSW Health will but completed for the first time by GWCC and the annual performance report will also be undertaken by GWCC staff as usual on an annual basis			

70	Document and report results	Monitoring	Complete	2017	This will an evolving and ongoing			
71	Collect and evaluate longterm data to assess performance and identify problems	Monitoring	Complete	2017	This will an evolving and ongoing			
72	Document and communicate audit results	Monitoring	Complete	2017	Audit results are always documented and communicated so that any issues can be attended to or so that good results are communnicated for good reason			
73	Establish processes for internal and external audits	Procedures and documentation	Complete	2019	15/10/2019 - Internal Audit undertaken this year and shoulld be completed every 3 years. Consideration of external audits should be undertaken at least every 5 years.			
74	Evaluate the need for change	Investigative studies	Closed	ongoing				
75	Senior Executive review of the effectiveness of the management system	Investigative studies	Complete		15/10/2019 - Manex to review the Annual report and provide advice on any required changes. 25/8/2020			

					MANEX and council review annual report			
76	Bulk User Service Level Agreement	Procedures and documentation	In Progress	Ongoing	a) Formal Service level agreement be developed and implemented for councils bulk water users; and b) This action be included into action and improvement plan within DWMS 25/8/2020 Funding has been awarded for the facilitation and development of WQ SLA between GWCC-Hilltops and GWCC and Coota Gundagai 1/9/2021 Water Qual component has been completed and a draft is currently being developed by Lindsay Taylor Lawyers. 1/11/22 draft SLA completed and currently under review. Change in staff at bulk councils has made it difficult to resolve outstanding items for agreement.	Medium	Manager production and Services	Part B has been added to action and improvements plan (Oct 2019); PART A is in progress, Staff have submitted a request to Public Health for the engagement of an external facilitator to undertake the development of a new Service Level Agreement between GWCC and its Bulk Customers. Project to commence upon approval from Public Health for funding of the Consultant.

					Draft SLA's have been provided to each Bulk Council. No response has been given. 21/11/2023			
77	Complaints Mangement System	Procedures and documentation	Implemented	Ongoing	Investigate options for a complaints handling system that integrates with Council's Asset Management and GIS Systems, and meets the requirements of the framework for the management of drinking water and Council's performance. 1/9/2021 GWCC provides a number of systems, however an	Medium	Manager production and Services	Management is unaware if a fully integrated complaints management system exists that could be implemented within GWCC cost effectively. However, Management will seek to improve its current capture of complaints through a more secure reporting system. This could be undertaken through tools such as Civica or WaterOutlook

					integrated approcah for systems is currently not available that would adequtly do what we would like.			
78	Emergency response traiing	Training	Complete	ongoing	Incident and emergency response traiing to be developed and refererred to in DWMS and undertaken by relevent employees and stakeholders. (To be Included in DWMS) 25/8/2020 - Health have funded the facilitation of Emergency response training including bulk councils to occur 2020/21 1/9/2020 GWCC and Hilltops and CGRC all participated within a scenario training workshop held late 2020 at Jugiong WTP. Council also has developed Incident Protocols for water	Medium	Manager production and Services	Managemet have issued a request for this scenario training to be funded and facilitated through Public Health. If funding and facilitated by Health GWCC will seek to undertake the training as soon as practicably possible. It should be noted that internal training is undertaken annualy for emergancy reponse maement at the Jugiong Water Treatment Plant as part of Council's Pollution Incident Response Management Plan. (HAS been included into DWMS under Traing)

					quality incidents that are to be used for management.			
79	Backflow Prevention	Procedures and documentation	Complete	2019	a) The Backflow Prevention Policy be referred to within the Drinking Water Management System; (COMPLETE under sectionRural Backflow Prevention Program) and b) Backflow device register be updated as required in accordance with the Backflow Prevention Policy (PP06). (Kevin will need to familiarise himself with this)	Medium	Manager production and Services	Staff will include Backflow Prevention commentary within the DWMS Annual Report which is set to be completed and submitted to Council by December 2019.

80	Water Quality reporting	Procedures and documentation	Complete	2019	Consideration be given to making water quality information publicly available. For example, through the formal reporting to Council meetings, and/or making the DWMS Annual Reporting information available on Council's website.	Low	Manager Production and Services	Staff will submit the Annual DWMS Report to Council for acknowledgment between October and December every year. (Report will be submitted to December Council meeting and subsequently displayed on the public website for the public to see
81	Drinking Water Management System review	Procedures and documentation	Closed	30/06/2020	a) Following the annual review, the Drinking Water Management System be updated to reflect any changes that have been made; and b) Evidence of any review be retained such as meeting minutes, investigative studies, and reports to Council's Senior Management Team and/or Board Members.	low	Manager production and Services	As above
82	Evaluation and audit	Procedures and documentation	Complete	2019	a) Consult with the Local Public Health Unit to clarify their expectations regarding independent audit requirements; and b) Detail the scope and frequency of the	Low	Manager production and Services	Management are constantly engaged with Public Health and have formally requested a recommendation for a fixed auditing period. No fixed period has been provided, with feedback stating that a requirement for an independant and external audit

					independent audit of the Drinking Water Management System (DWMS) in the DWMS.			will be required when Health direct GWCC to do so.

Appendix C - Full Reservoir Inspection Report 2022/23

Reservoir Critical Maintenance Priorities Report

30/07/2023

Date:	31/10/2022	**Client Name:**	Goldenfields Water
WS #:	006	**Reservoir Name:**	Barellan HL 006
Asset No:	103631903	**Location:**	Barellan Depot Barellan
Job No:	027753	**Project Number:**	0
Cleaning Due:	25/6/2025	**Inspection Due:**	31/10/2026

External

Area	Priority	Status	Comments
Walls	2	A	There is leakage present along the mid wall strengthening beam area. It is recommended to use an EWP to tighten all the bolts to see if this slows down the leakage issues
Entry Hatch	2	A	The mesh panel under the main entry cover is beginning to corrode and there is no padlock present to secure the hatch closed
Roof Platforms	2	A	The platform area is too small for effective maintenance procedures. The guard rails should have surrounded the complete roof area
Handrails	2	A	With only a small roof area present, the safety rails should have extended all the way around the tank

Internal

Area	Priority	Status	Comments
Walls	2	A	The walls have been recoated and many repairs have been carried out. There are numerous cracks developing along some of the joins which are leaking intermittently
Floor	2	A	There are fine cracks present in the coating and many blisters are also developing

Comments

External Comment:
The safety cable system fitted inside the caged ladders makes climbing difficult and does not improve the overall safety on the tank. There is leakage present along the mid wall strengthening beam area. It is recommended to use an EWP to tighten all the bolts to see if this slows down the leakage issues.

Internal Comment:
The walls and floor have been recoated and many repairs have been carried out. There are fine cracks present in the wall and floor coating and many blisters are also developing.

Reservoir Critical Maintenance Priorities Report

30/07/2023

Date:	30/10/2022	**Client Name:**	Goldenfields Water
WS #:	031	**Reservoir Name:**	Coolamon North HL 031
Asset No:	031	**Location:**	Ardlethan Rd Coolamon
Job No:	028067	**Project Number:**	0
Cleaning Due:	15/5/2023	**Inspection Due:**	30/10/2026

External

Area	Priority	Status	Comments

Internal

Area	Priority	Status	Comments
Inlet	2	F	There is a common inlet outlet @ 6 oclock and another at 3 oclock. Both of these require directional nozzles to be fitted when the tank is recoated, to prevent the floor sediments from being disturbed

Comments

External Comment:
The roof and platform areas have been renovated and the other external areas appear to be in good condition.

Internal Comment:
The internal areas have been re-coated, but not inspected below the water line area to date.

Reservoir Critical Maintenance Priorities Report

30/07/2023

Date:	30/10/2022	**Client Name:**	Goldenfields Water
WS #:	032	**Reservoir Name:**	Coolamon North LL 032
Asset No:	032	**Location:**	Ardlethan Rd Coolamon

Job No:	028066	**Project Number:**	0
Cleaning Due:	30/10/2024	**Inspection Due:**	30/10/2024

External

Area	Priority	Status	Comments
Roof Hatches	2	A	There is a rescue hatch present at 12 oclock that opens up in two sections. There is an adjacent unsealed section where the old ladder stiles used to extend through

Internal

Area	Priority	Status	Comments

Comments

External Comment:
There is a rescue hatch present at 12 oclock that opens up in two sections. There is an adjacent unsealed section where the old ladder stiles used to extend through.

Internal Comment:
The two main rafters have significant surface corrosion present, as the original coating has peeled off. They are still structurally sound however.

Reservoir Critical Maintenance Priorities Report

30/07/2023

Date:	30/10/2022	**Client Name:**	Goldenfields Water
WS #:	033	**Reservoir Name:**	Coolamon South HL 033
Asset No:	0	**Location:**	off Dyces Rd Coolamon
Job No:	028065	**Project Number:**	0
Cleaning Due:	30/10/2023	**Inspection Due:**	30/10/2023

External

Area	Priority	Status	Comments

Internal

Area	Priority	Status	Comments
Ladder Internal	2	A	The SS ladder is too short and it will not be effective if the water leveldrops down when a diver is inside

	the tank. It need to be extended by another 5 metres to make the tank safe

Comments

External Comment:
The external areas appear to be in good condition.

Internal Comment:
The epoxy type sealant on the wall joints is either cracking or is peeling off in many areas.The SS ladder is too short and it will not be effective if the water level drops down when a diver is inside the tank. It needs to be extended by another 5 metres to make the tank safe.

Reservoir Critical Maintenance Priorities Report

30/07/2023

Date:	28/10/2022	**Client Name:**	Goldenfields Water
WS #:	056	**Reservoir Name:**	Jugiong CWT 056
Asset No:	056	**Location:**	Jugiong WTP
Job No:	028062	**Project Number:**	0
Cleaning Due:	28/10/2026	**Inspection Due:**	28/10/2026

External

Area	Priority	Status	Comments

Internal

Area	Priority	Status	Comments
Ladder Internal	2	F	The galvanised ladder and platform has corrosion present. It should be replaced with a Nextep FRP vertical ladder 9300mm long

Comments

External Comment:
The security enclosure for the ladder is showing signs of surface corrosion.

Internal Comment:
There is one minor section of concrete spalling present, due to shallow steel cover. The galvanised ladder and platform has corrosion present - it should be replaced with a Nextep FRP vertical ladder 9300mm long.

Reservoir Critical Maintenance Priorities Report

30/07/2023

Date:	29/10/2022	**Client Name:**	Goldenfields Water
WS #:	059	**Reservoir Name:**	Junee BT No1 059
Asset No:	059	**Location:**	off Albert St Junee
Job No:	028063	**Project Number:**	0
Cleaning Due:	29/10/2024	**Inspection Due:**	29/10/2024

External

Area	Priority	Status	Comments
Entry Hatch	1	A	The entry hatch requires a raised edge and an over lapping cover to seal more effectively
Roof Platforms	1	A	There are numerous holes and open drainage areas on the platform that need sealing
Roof Hatches	1	A	The hatch requires a raised edge and an over lapping cover to seal more effectively
Level Indicator	2	A	The cable hole in the roof is unsealed

Internal

Area	Priority	Status	Comments

Comments

External Comment:
The platform and hatch areas require renovating to seal the tank effectively from contamination ingress.

Internal Comment:
The internal walls have had many leak repairs carried out in the past and the sealant is now blistering in a lot of areas.

Reservoir Critical Maintenance Priorities Report

30/07/2023

Date:	29/10/2022	**Client Name:**	Goldenfields Water
WS #:	0	**Reservoir Name:**	Junee BT No3 116
Asset No:	0	**Location:**	off Albert St Junee

Job No:	028064	**Project Number:**	0
Cleaning Due:	29/10/2024	**Inspection Due:**	29/10/2024

External

Area	Priority	Status	Comments

Internal

Area	Priority	Status	Comments

Comments

External Comment:
There is slight external weepage present in two wall base areas @ 10 and 2 oclock. There is a foam material on the external and internal wall base area and possibly a water stop system inbetween. In both cases there is a crack running from beneath the wall which may be causing the problem.

Internal Comment:
The internal areas appear to be OK.

Appendix D - External Auditor Report Summary

Table 44. External auditor report summary

Number	Issue	Risk Rating	Recommendation	Management Response	Responsible Person	Action Date
1	Bulk User Service Level Agreements	Medium	a) Formal service level agreements be developed and implemented for Council's bulk water users; and b) This action be included in the Action and Improvement Plan within the Drinking Water Management System	Staff have submitted a request to Public Health for the engagement of an external facilitator to undertake the development of a new Service Level Agreement between GWCC and its Bulk Customers. Project to commence upon approval from Public Health for funding of the Consultant.	Manager Production & Services	Aug-20
2	Complaints Management	Medium	Investigate options for a complaints handling system that integrates with Council's Asset Management and GIS Systems, and meets the requirements of the framework for the management of drinking water and Council's performance.	Management is unaware if a fully integrated complaints management system exists that could be implemented within GWCC cost effectively. However, Management will seek to improve its current capture of complaints through a more secure reporting system. This could be undertaken through tools such as Civica or WaterOutlook	Manager Corporate Services	Jun-21

Number	Issue	Risk Rating	Recommendation	Management Response	Responsible Person	Action Date
3	Emergency Response Training	Medium	Incident and emergency response plan training be developed and referred to in the Drinking Water Management System and undertaken by relevant employees and external stakeholders.	Management have issued a request for this scenario training to be funded and facilitated through Public Health. If funding and facilitated by Health GWCC will seek to undertake the training as soon as practicably possible. It should be noted that internal training is undertaken annually for emergency response management at the Jugiong Water Treatment Plant as part of Council's Pollution Incident Response Management Plan.	Manager Production & Services	Dec-20
4	Backflow Prevention	Medium	a) The Backflow Prevention Policy be referred to within the Drinking Water Management System; and b) Backflow device register be updated as required in accordance with the Backflow Prevention Policy (PP06).	Staff will include Backflow Prevention commentary within the DWMS Annual Report which is set to be completed and submitted to Council by December 2019.	Manager Production & Services	Ongoing

Number	Issue	Risk Rating	Recommendation	Management Response	Responsible Person	Action Date
5	Water Quality Reporting	Low	Consideration be given to making water quality information publicly available. For example, through the formal reporting to Council meetings, and/or making the DWMS Annual Reporting information available on Council's website.	Staff will submit the Annual DWMS Report to Council for acknowledgment between October and December every year.	Manager Production & Services	Ongoing
6	Drinking Water Management System Review	Low	a) Following the annual review, the Drinking Water Management System be updated to reflect any changes that have been made; and b) Evidence of any review be retained such as meeting minutes, investigative studies, and reports to Council's Senior Management Team and/or Board Members.	As per item 5 above. Staff will submit the Annual report to Council between the October and December period. The report will highlight any issues, modifications and achievements gained throughout the year.	Manager Production & Services	Ongoing

Number	Issue	Risk Rating	Recommendation	Management Response	Responsible Person	Action Date
7	Evaluation and Audit	Low	a) Consult with the Local Public Health Unit to clarify their expectations regarding independent audit requirements; and b) Detail the scope and frequency of the independent audit of the Drinking Water Management System (DWMS) in the DWMS.	Management are constantly engaged with Public Health and have formally requested a recommendation for a fixed auditing period. No fixed period has been provided, with feedback stating that a requirement for an independent and external audit will be required when Health direct GWCC to do so.	Manager Production & Services	Complete