Drinking Water Management System

Annual Report 2020/21

Goldenfields Water County Council

Date: October 2021

Version: 3.3

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Document Control

Date	Change made	Person
August 2020	Updated Annual Report to include relevant 2019/20 data and information	Chris Breen/Geoff Veneris
October 2019	Updated Annual Report Data	Chris Breen/Geoff Veneris
October 2020	Updated Annual report with relevant data	Chris Breen/Geoff Veneris
September 2021	Updated Annual report with relevant data for 2020/21 reporting period	Chris Breen/Geoff Veneris

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 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 2019/20 financial year with the corresponding CCP number. Please note there were no exceedances for Mt Arthur or Mt Daylight.

Jugiong	CCP1	CCP2	CCP3	CCP4	CCP5	CCP6
Number of CCP exceedances	0	0	1	5	0	0

Oura	CCP1	CCP2	CCP3	CCP4	CCP5	CCP6
Number of CCP exceedances	2	9	0	0	0	0

Water Quality

Verification monitoring has been undertaken over the entire GWCC scheme during the reporting period. All data is compliant with the Australian drinking Water Guidelines and limits set by public Health (NSW Health).

Operational monitoring has also been conducted over the entire scheme with some non-compliances reported. These non-compliances have been summarised in Table 9 under Critical Limit Exceedances. The non-compliances have been mainly for low residual chlorines in the furthest extremities in each of the water source systems. For a more detailed analysis of the issues regarding maintaining chlorine residuals within the extremities of our supply schemes, please refer to *Goldenfields Water County Council – Chlorination Issues – Background Report – Atom Consulting 2019.*

Continuous Improvement Plan

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

	Completed or closed	In progress	Not Started	Implemented/Ongoing	Items added
Number of actions	67	3	0	9	2

*Note that the 3 items that haven't been counted above have been rolled into another action item. The full Continuous Improvement Plan can be seen in Appendix B.

DWMS Reviews

The 2017/18 DWMS was the first to be undertaken by GWCC to ensure that there was oversight and that we conform to the requirements described within Circular 18. The 2017/18 report was conducted using the data available at the time. The dataset has now grown extensively and GWCC are able to provide a very clear oversight of the performance of its operations.

This DWMS report, has utilised the entire 2020/21 data for the Jugiong, Oura, Mt Arthur and Mt Daylight potable water supply systems. This data was made available from the implementation of WaterOutlook and ClearSCADA. Data is also 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 any additional recommendations for improvement.

A key finding was that more transparency of data be reported and adopted by the Board. A full list of audit findings can be found in Appendix D. Additional update notes have been provided in Appendix D in Green for the 2020/21 reporting year. This DWMS Annual Report is provided to the Board for consideration between the October and December Council meetings.

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

Reservoir Inspections

As part of the Circular 18 requirements for *'Barrier 2 - Ensure distribution system integrity to prevent contamination',* GWCC undertakes an extensive monitoring and maintenance program of its water supply assets. A total of 126 reservoirs, 8 surge tanks and 2 Brake Pressure tanks are visually inspected weekly.

A more comprehensive inspection on the above is conducted on a quarterly basis by GWCC staff where the findings of the inspections are summarised in the section headed '***Reservoir Inspections'***. A more comprehensive reservoir inspection is completed and reported on by Aqualift contractors and has been downloaded from the ASAM website. This is the database that Aqualift provide when undertaking GWCC reservoir cleaning and maintenance via diving works. The report for reservoirs inspected during the 2020/21 FY is available in Appendix C of this report.

Report Purpose

The purpose of the report is to inform and keep up to date New South Wales Department of Health (NSW Health) and DPIE 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 46,000 people spread over an area in excess of 22,500 sq. km, between the Lachlan & Murrumbidgee Rivers in the Southwest of NSW.

GWCC's water supply system consists of five separate water schemes. That being, 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 for supply of their Northern Wagga area between Oura and Brucedale.

At the end of the 2020/21 reporting period, there were 11365 retail water connections across Goldenfields entire drinking water supply schemes. This is an increase of 47 new connections since the previous reporting year. It should be noted that the bulk connections are identified as single connections only.

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 to 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.

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.

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 40 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

The Jugiong drinking Water scheme has 672 connections. The system also supplies GWCCs bulk customers, Hilltops and Coota-Gundagai. Jugiong GWCC retail Connections are broken down as follows:

- 20mm = 521
- 25mm = 142
- 32mm = 3
- 40mm = 3

- 50mm = 3

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

In addition to the above GWCC supply bulk water to businesses that are billed on a monthly cycle:

- Australian Meat properties has 1 X 50mm and 1 X 80mm connections
- Narasell has 1 X 80mm connection
- Hilltops Council have 2 X 150mm, 1 X 50mm and 1 X 80mm connections
- Coota/Gundagai Council have 1 X 100mm and 1 X 200mm connections

Upgrades 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:

• Jugiong WPS 2 High Voltage Motor 1 Overhaul	$21,444.33
• Rosehill Pump 1 Overhaul Pump and Motor	$4,562.33
• Jugiong Old Plant Demolition	$670,550.64
• Jugiong High Voltage renewal prelim works	$61,185.63
• Rosehill Pump Station – Rosehill to Young renewal investigation	$78,856.89
• Jugiong CWPS2 Pump No 2 maintenance	$57,898.77
• Demondrille Pump No 1 Rebuild	$19,993.12
• Jugiong Compressor renewal	$13,765.74
• Jugiong Strategic Asset Planning (30-year horizon review)	$104,468.76
• Jugiong PLC Upgrade	$308,175.25

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 non-potable water supply scheme at Hylands Bridge.

Source Water

Water is sourced from the Oura Borefield, which is located at Gumly Gumly Island to the north of the Murrumbidgee River. Goldenfields Water is licensed to draw from four groundwater bores: Bore 2, Bore 3, Bore 4 and Bore 6. Bores are housed within bore huts elevated above the 1:100 riverine flood level.

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 DPIE (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 either line shaft or submersible bore pumps. 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 is used as a second rather than lead pump. The bore was removed and cleaned by an external contractor in early 2021 with a substantial amount of sand removed.
- All Bores have elevated levels of Iron and Manganese and fluctuate corresponding with wet years and flooding incidents.
- 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 201 km of trunk mains and 1,055 km 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 8659 connections, this scheme also supplies bulk water to Riverina Water County Council. The Oura connections are broken down as follows:

- 20mm = 7714 connections
- 25mm = 732 connections

- 32mm = 83 connections
- 40mm = 60 connections
- 50mm = 57 connections
- 80mm = 8 connections
- 100mm = 5 connections

Included in this data are 19 standpipe connections: 8 x 32mm, 5 x 40mm, 2 x 50mm and 4 x 80mm.

In addition to the above GWCC supply bulk water to businesses that are billed on a monthly cycle:

- Pace farm has a 50mm and an 80mm connection
- GEO (Junee Jail) has a 150mm and 80mm connection
- Jindalee (Abattoirs) has a 100mm connection
- MLK Properties Temora has a 50mm connection
- Easterbrook has a 20mm connection
- Scriven has an 80mm connection
- Junee Shire Council has 4 x 40mm connections

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:

• Oura Pump 1 Overhaul Pump and Motor	$ 35,083.45
• Ariah Park Pump Station Design	$ 13,270.34
• Oura Bore 4 Renewal	$ 42,889.89
• Oura Pump 2 Rebuild	$ 52,309.33
• Oura Bore 3 Elec SB Renewal	$ 8,357.59
• Oura Bore 6 Elec SB Renewal	$ 166,888.24
• Oura Bore 6 Renewal	$ 56,579.20
• Temora WPS SB Upgrade	$ 656.29
• Oura HV Elec Upgrade	$ 2,198,932.57
• Oura High Voltage Preliminary work	$ 1,663.63
• Oura Strategic Plan	$ 11,233.03

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 (Bore 1 & Bore 2) 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 1552 connections, the Mount Arthur connections are broken down as follows:

- 20mm = 1446 connections
- 25mm = 59 connections
- 32mm = 34 connections
- 40mm = 6 connections
- 50mm = 7 connections

Included in this data are 4 standpipe connections: 2 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, with a summary of those works are provided below:

• Mt Arthur Bore Renewal	$ 15,600.00
• Ganmain Pump 4 Renewal	$ 7,171.44
• Ganmain Pump 3	$ 9,456.76
• Ganmain Pump Station - Pump 5 & 6 Replacement	$ 36,736.98

Mt Arthur Water Scheme – Periodic inspection

The Mt Arthur Drinking Water Scheme was recently inspected by the Department of Planning, Industry and Environment (DPIEs) Senior Inspector Pat Freeman in June 2021. This inspection was in accordance with statutory requirements of the Local government Act 1993. At the time of inspection (15th June 2021) 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 the table below.

Table 1. Water quality results from Mt Arthur inspection on 15th June 2021.

Reticulation	pH	Colour	Turbidity (NTU)	Free Chlorine (mg/L)	Total Chlorine (mg/L)
Coolamon	7.2	3.9	0.31	0.58	0.6
Ganmain	7.59	1.5	0.16	0.39	0.5
Matong	8.38	3.2	0.28	0.36	0.36
Grong Grong	7.72	3.1	0.2	0.22	0.34

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

Mt Daylight System

The Mt Daylight drinking water system, 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 (Hydroscience). 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 (Bore 1 & Bore 2) 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 268 connections, these connections are broken down as follows:

- 20mm = 145 connections
- 25mm = 119 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.

Upgrades to the System/System Improvements

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

- North Weethalle WPS Electrical and Pump Upgrade $ 222,537.01
- Weethalle WPS Electrical and Pump Upgrade $ 182,488.91

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).

The work to reduce this risk via the install of RPZD's on all rural connections was undertaken by contactors on behalf of Goldenfields Water. Backflow devices were installed before the water meter and Goldenfields Water is responsible for the lifetime maintenance of the backflow device.

GWCC adopted the Backflow Prevention policy (PP06) in August 2016 and works began in May 2017. To date a total of 1347 RPZD have been installed within the GWCC area. GWCC have also now installed 70 RPZDs for Hilltops Council during the 2020/21 FY making it a total of 1417 installs. There are currently approximately 120 installs outstanding or no certificate has been found and/or completed for their install. These outstanding connections are due to issues of pressure and supply. If an RPZD was to be installed, the customer would no longer have access of supply, as the RPZD reduces pressures by 7m/h.

An action item for GWCC is to report to the Board options for reducing backflow risk whilst maintaining water supply to these customers.

DWMS Document Control

The Drinking Water Management System for GWCC was issued to NSW Health and DPI Water in March 2017 and adopted and approved by Council in early 2018. Only minor modifications have been undertaken to the DWMS with nothing relevant to report to the NSW Health for updating.

Document	Version	Updates	Submitted to NSW Health and date submitted?
Drinking Water Management System	2.0	Continuous Improvement Plan Appendix B	Yes, March 2017
Drinking Water Management System		Continuous Improvement Plan Appendix B	Yes, October 2019
Drinking Water Management System		Reservoir Inspection Report	Yes, October 2020
Drinking Water Management System		Continuous Improvement Plan Appendix B	Yes, October 2020
Drinking Water Management System		Continuous Improvement Plan Appendix B, Reservoir Inspection Report	Yes, September 2021

Critical Control Points

No Changes have been made to the CCP's during the 2020/21 reporting period.

Table 2. 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% variation above or below 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

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	

Critical Limit Exceedance

A breakdown of what each CCP represents can be seen in Table 2 above. Summary of Critical Control points. 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 3 Critical Limit Exceedances.

Table 3. Critical limit exceedances - Jugiong

Date	CCP 1	CCP 2	CCP 3	CCP 4	CCP 5	CCP 6	OCP 1	Water Quality Issue	Reason	Immediate Correction	Preventive Action
24/07/20				0.75					Low reading due to running hopper for cleaning		
24/12/20				0.74					Reading low due to fluoride electrical fault	Rectify/reset fault	
8/4/21				0.51					Fluoride feeder blocked	Unblock feeder	
24/4/21			0.51						Analyser reading incorrectly. Grab sample validated conforming result of 1.43mg/l of CL2 residual	Clean analyser	
8/5/21				0.75					PRV Issue causing dosing pumps to fault	Rectify PRV issue	Preventative maintenance on PRV
9/5/21				0.85					PRV Issue causing dosing pumps to fault	Rectify PRV issue	

Table 4. Critical limit exceedances - Oura

Date	CCP1	CCP2	CCP3	CCP4	Water Quality Issue	Reason	Immediate Correction	Preventative Action
27/7/20		0.26				Fluoride electrical fault		
14/11/20	0.04					Issues with Bore 6 water quality after clean and replacement. It appears chlorine was being stripped via either iron and	Changed bores, manual dosing of clear water storage and downstream Junee reservoirs. No non-	ClearSCADA upgrade of controls with pre- and post-dosing system to occur under future upgrade project.

						manganese or gases at the time. Total CL2 was 0.52mg/l	conforming water was distributed to the reticulated system.	
8/12/20		0.28				Low solution fault	Swapped dosing pumps	Continual Pump maintenance
14/12/20		0.28				Low solution fault	Swapped dosing pumps	Continual Pump maintenance
19/12/20	0.19					Chlorine dosing pump fail	Reset dosing pump. Testing of clear water storage and Junee balance tanks to ensure compliance of water before entering reticulated system.	ClearSCADA upgrade of controls with pre- and post-dosing system to occur under future upgrade project.
27/12/20		0.26				Low solution tank fault	Reset fault	
1/1/21		0.25				Low solution tank Fault	Reset electrical fault	
2/1/21		0.24				Low solution tank Fault	Reset electrical fault	
3/1/21		0.26				Low solution tank Fault	Reset electrical fault	
20/3/21		0.23				Low solution tank Fault	Reset electrical fault	
30/3/21		0.29				Low solution tank Fault	Reset electrical fault	

Table 5. Critical Limit Exceedances for Mt Arthur

Date	CCP1	CCP2	Water Quality Issue	Reason	Immediate Correction	Preventative Action

There were no critical Limit Exceedances for the Mt Daylight scheme during the 2020/21 reporting period.

Table 6. Critical Limit Exceedances for Mt Daylight

Date	CCP1	CCP2	Water Quality Issue	Reason	Immediate Correction	Preventative Action

There were no critical Limit Exceedances for the Mt Daylight scheme during the 2020/21 reporting period.

Critical Control Point Graphs

Figure 1. Jugiong water treatment plant - free chlorine. (Online and offline)

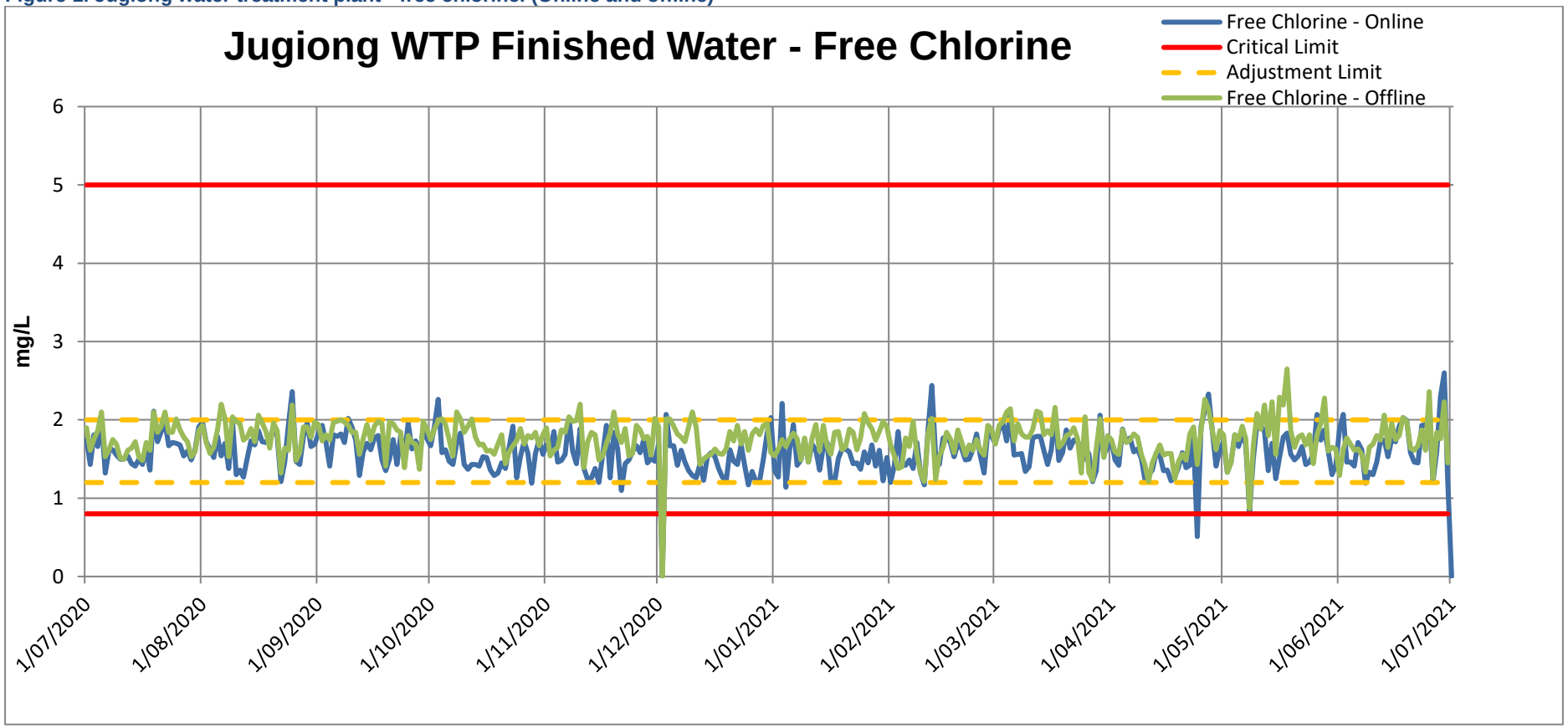

Figure 1 above is a representation of Free Chlorine in the water leaving the Jugiong Water Treatment Plant. The red lines are our Critical Control Points (CCP) for the concentration of chlorine in the water and the orange lines are our Operational control points. As is indicated above, GWCC is consistently within the CCP throughout the year except for 2 exceedances. These exceedances are explained in Table 3 above, Critical Limit exceedances. Note: no pumping occurred on 2/12/2020 due to a power outage. This would equate for the lower limit exceedance on the 2nd of December 2020. The green line represents the offline testing that is undertaken manually by the Water treatment plant operators. These tests are conducted for quality assurance and to make sure the online chlorine analyser is working correctly and within calibration limits.

Figure 2. Jugiong water treatment plant - finished fluoride.

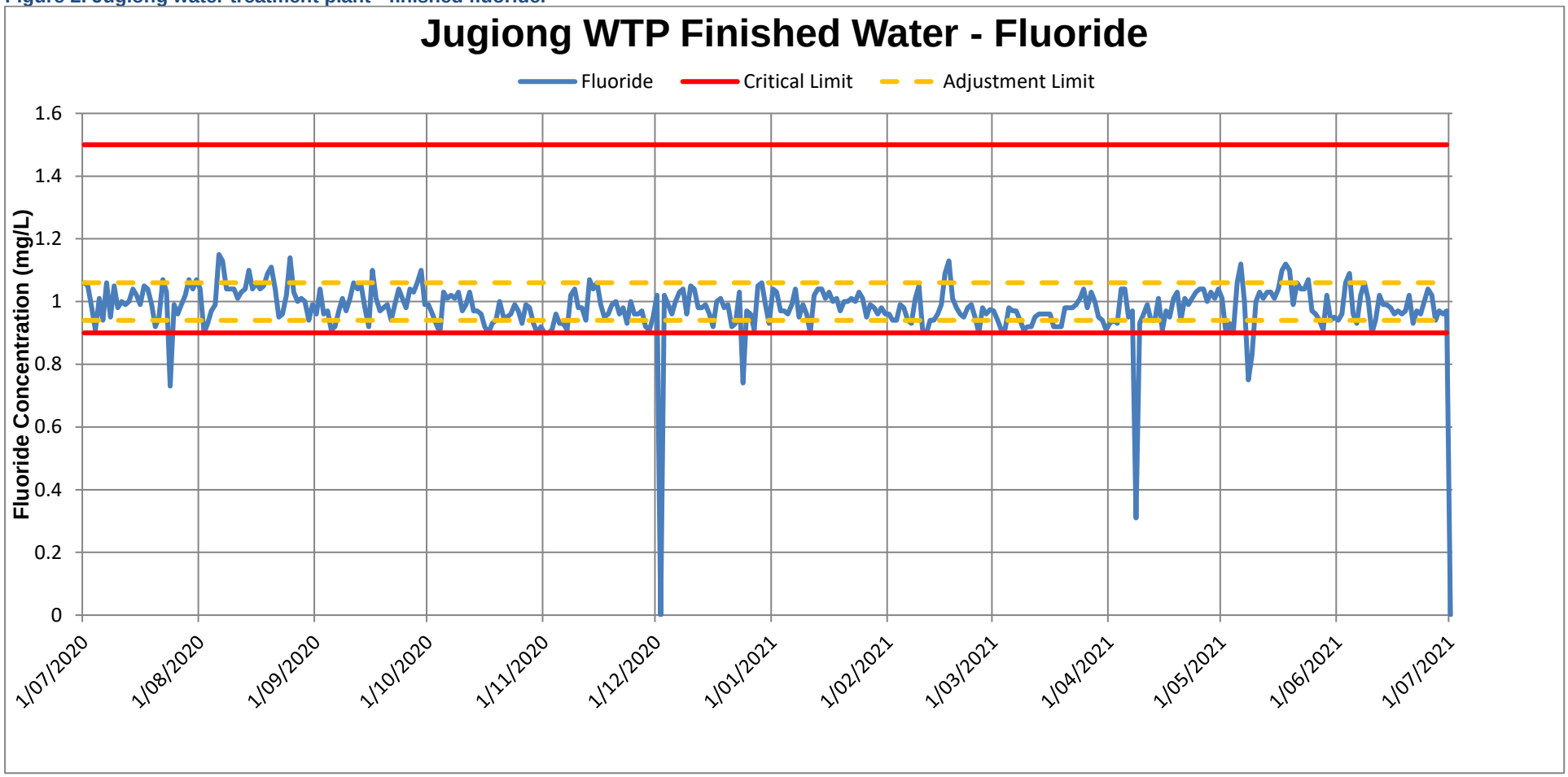

Figure 2 is a representation of the Finished Water Fluoride in the water leaving the Jugiong Water Treatment Plant. The red lines are our Critical Control Points (CCP) limits for the concentration of Fluoride in the water and the orange lines are our Operational control points. As is indicated above, GWCC is generally within the CCP throughout the year with the exception of 5 exceedances as indicated above. These exceedances are explained in Table 3 above, Critical Limit exceedances.

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

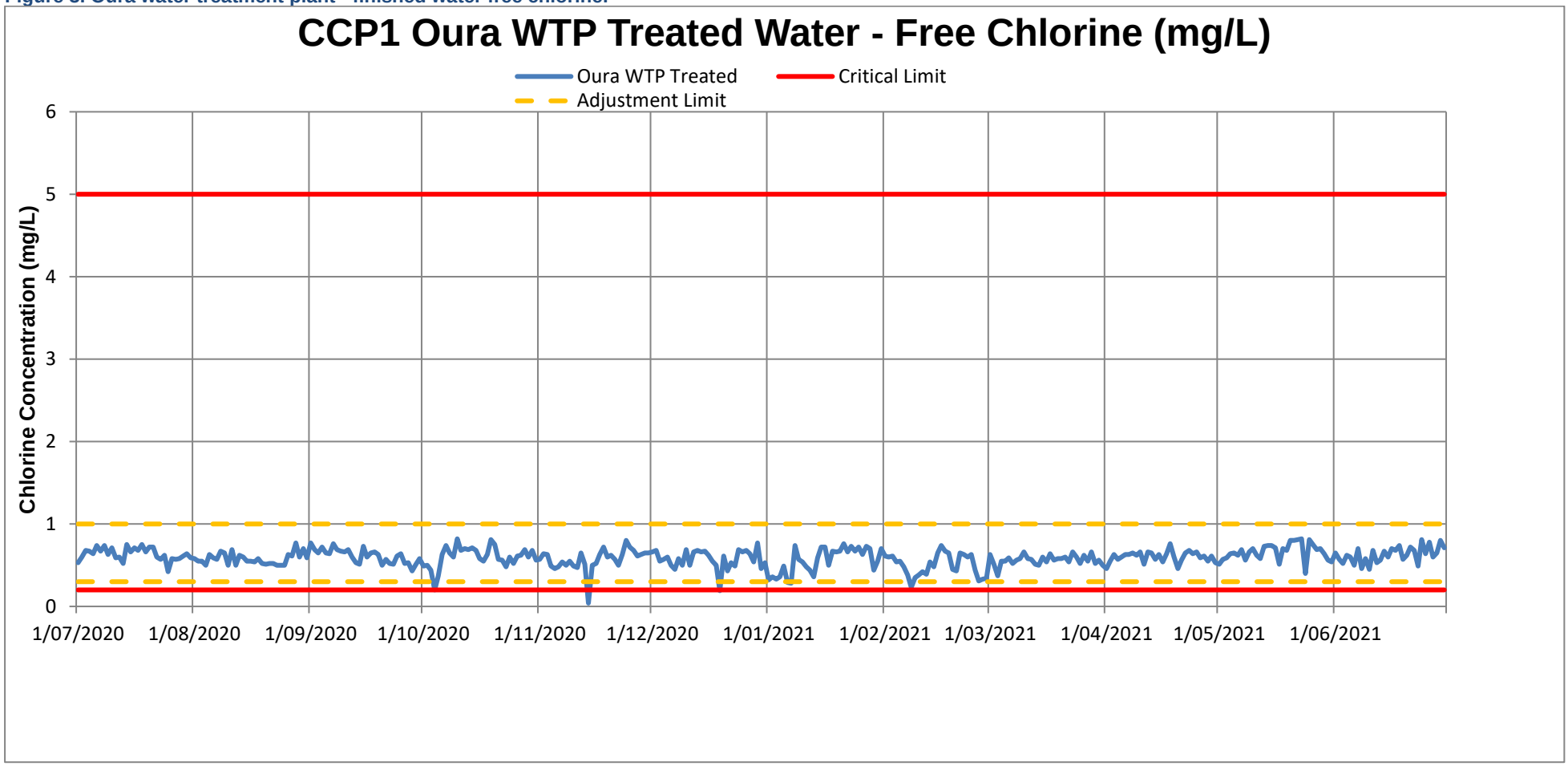

Figure 3 above is a representation of Free Chlorine in the water leaving the Oura Water Treatment Plant which employs a logarithmic scale on vertical axis. The red lines are our Critical Control Points (CCP) for the concentration of chlorine in the water and the orange lines are our Operational control points. As is indicated above, GWCC is consistently within the CCP throughout the year with only 1 exceedance and explained in Table 4 above.

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

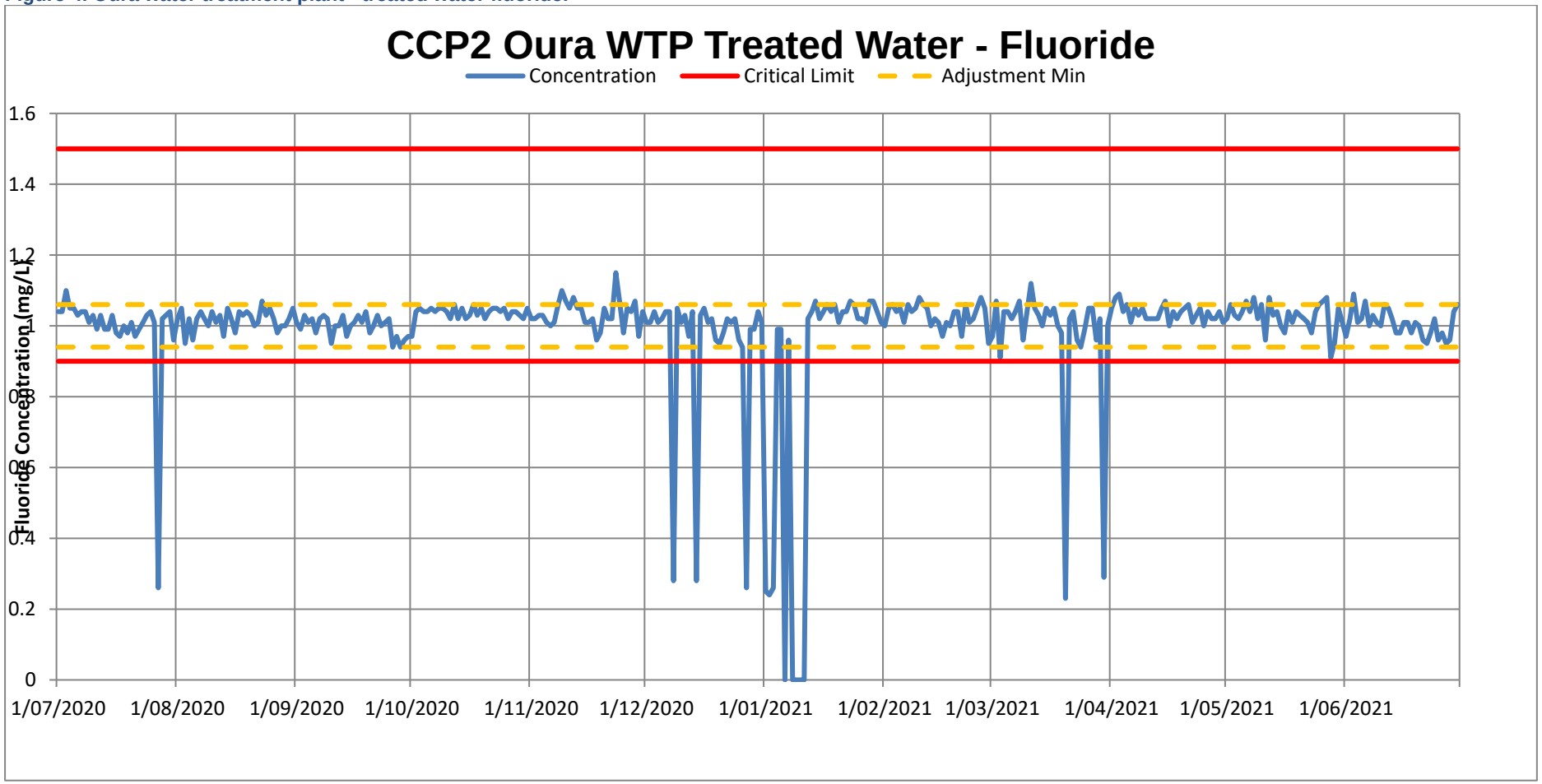

Figure 4 above is a representation of the Finished Water Fluoride in the water leaving the Oura Water Treatment Plant. The red lines are our Critical Control Points (CCP) limits for the concentration of Fluoride in the water and the orange lines are our Operational control points. As is indicated above,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

Figure 5: Mt Daylight finished water Free Chlorine

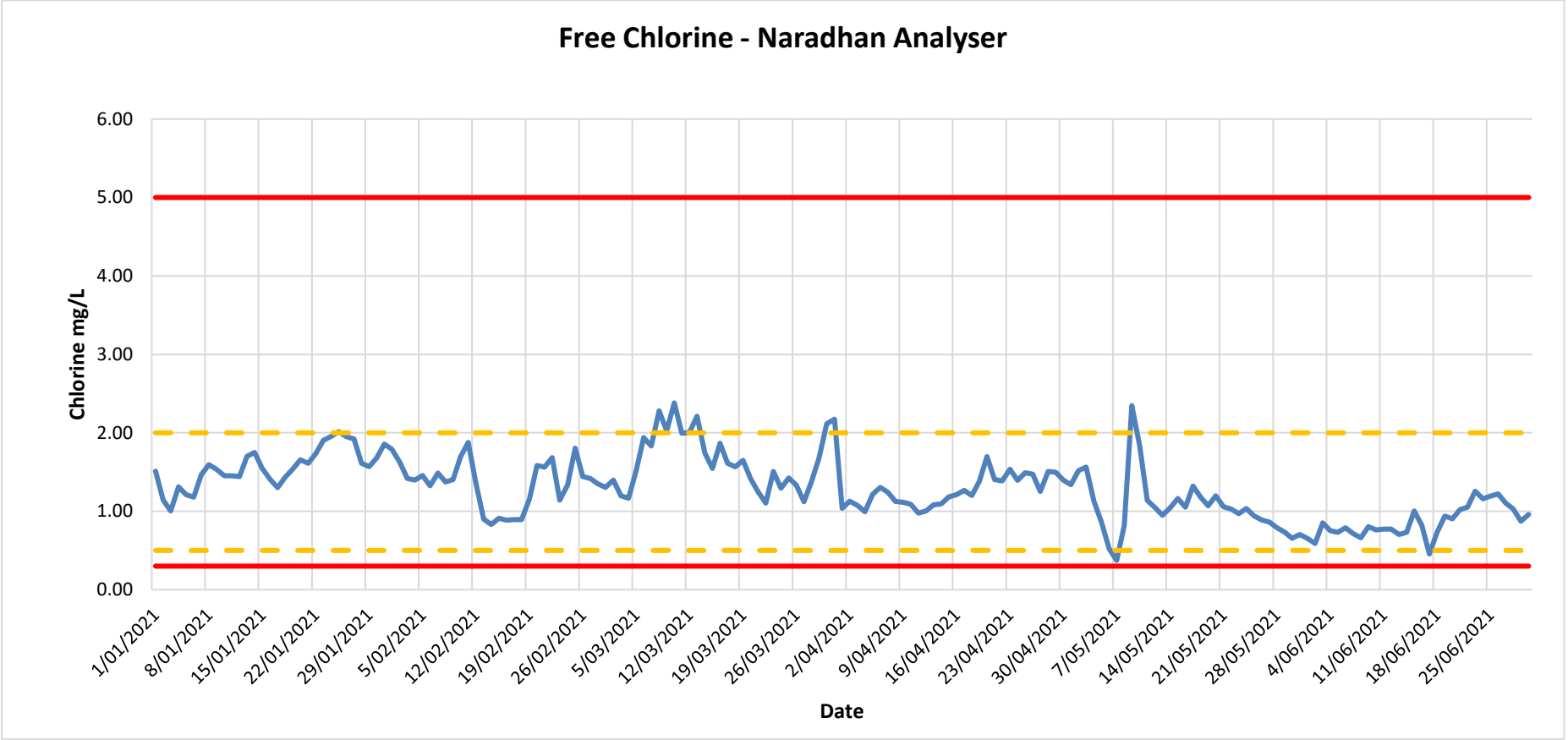

Figure 5 above is representative of the finished water Free Chlorine for the Mt Daylight system. As can be seen GWCC have only been receiving data from the new Clear SCADA since the 1st of January 2021. The red lines are our CCPs, and the orange lines are the operational limits. The readings are all within the critical limits.

Fluoride Critical Limit exceedance

See Table 3. Critical limit exceedances - Jugiong and Table 4. Critical limit exceedances - Oura.

Table 6. Fluoride critical limit exceedances – Summary all results in (mg/L)

Date	Scheme	Recorded Concentration (mg/L)	Amount Exceeded By (mg/L)
24/7/20	Jugiong	0.73	-0.17
24/12/20	Jugiong	0.74	-0.16
8/4/21	Jugiong	0.31	-0.59
8/5/21	Jugiong	0.75	-0.15
9/5/21	Jugiong	0.83	-0.07
27/7/20	Oura	0.26	-0.64
8/12/20	Oura	0.28	-0.62
14/12/20	Oura	0.28	-0.62
27/12/20	Oura	0.26	-0.64
1/1/21	Oura	0.25	-0.65
2/1/21	Oura	0.24	-0.66
3/1/21	Oura	0.26	-0.64
20/3/21	Oura	0.23	-0.67
30/3/21	Oura	0.29	-0.61

Water Quality

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 and compliance purposes. GWCC also conducted several 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 1296 microbial water samples to be either tested by NSW Health or tested 'in-house' by GWCC Water Quality staff. See table 7 below.

The drinking water is also tested throughout the period for chemicals which may be present in the water, a total of 186 water samples were carried out during the reporting period, and all were tested by NSW Health's FASS laboratory. From the 186 total samples collected and tested, 116 were treated water samples taken in the distribution system and 70 were raw or bore water samples.

GWCC also undertake pesticide sampling of the drinking water across the entire scheme. These samples were tested by a NATA accredited laboratory for the 2020/21 reporting year with a total of 14 samples collected and tested for the presence of pesticides. All sample results were compliant with parameters set out in the ADWG.

It is also a requirement for GWCC to test for Radiological characteristics in the ground water supplies every 2 years, for the 2020/21 reporting year, 5 Radiological samples were taken and tested by Australian Nuclear Science and Technology Organisation (ANSTO). Results can be seen in table 11.

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 2099 chlorine test were conducted onsite throughout the year. These tests include both Total and Free chlorine. Historically, a running spreadsheet of results was updated by office staff once data is received by the distribution staff which was then located in GWCC new database Content Manager (doc 18/1344). Water outlook has since been rolled out to the distribution staff to upload the results of the chlorine tests to eliminate double handling of data and direct registration within our water quality database. Since this implementation of WaterOutlook (WO) to staff, there has been 4210 chlorine test results uploaded into the database. See table 10 below, 'GWCC entire distribution system chlorine management'.

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 the GWCC distribution systems, as well as tests conducted onsite and at GWCC Water Treatment plants.

Table 7. Micro sampling summary

Microorganisms Summary					
Tests conducted	**Tested by FASS**	**Non-compliant samples**	**Tested In House**	**Non-compliant samples**	**(Total)**
Jugiong	78	0	208	1	286
Oura	270	0	481	0	751
Mt Arthur	64	0	91	0	155
Mt Daylight	26	0	78	0	104
Total	438	0	858	0	1296

New South Wales Health – Micro Monitoring

The NSW 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 438 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

Comprehensive Chemical Sample Summary

Table 8. 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	70	See Table 15	48	See list below Some samples are non-Compliant for more than 1 parameter
Comprehensive Chemical for Raw and/or Bore Data	105			

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 these schemes. As can be seen from table 6 above GWCC has conducted 70 comprehensive chemical samples for our treated water and 105 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** – 25 raw water samples were taken from the duty bores each month and 35 Treated water samples taken from the distribution system.
- **Jugiong** – 15 raw water samples taken from the Murrumbidgee River and 11 Treated water samples were taken from the distribution system.
- **Mt Daylight** – Raw water samples were taken from the duty bore each month a total of 16 samples for the reporting period and 2 Treated water samples taken from the distribution system.
- **Mt Arthur** - Raw water samples were taken from the duty bore each month, a total of 16 samples for the reporting period and 8 Treated water samples taken from the distribution system.

Table 9. Breakdown of number of samples with parameters exceeding ADWG values – Treated Water only.

Site	Indicator Non-Compliant							
	Selenium	Iron	Manganese	Colour	Turbidity	pH	Fluoride	Lead
Distribution – Oura Scheme	1		4			8	15	
Distribution – Jugiong Scheme							11	
Distribution – Mt Arthur Scheme						1	8*	

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 'on duty' bores are sampled every month and samples sent to FASS for testing. A total of 57 samples were taken during the reporting period from a combination of Oura Bores, Mt Arthur Bores and Mt Daylight bores.

Chlorine Distribution Summary

Table 8 below

Table 10. GWCC entire distribution system chlorine management

Chlorine Distribution System Monitoring	in Situ test results for the 2020/21 year	Total in Situ test results for Chlorine - since implementation of Water Outlook
Entire Scheme	2099	4210

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

Radiological Sampling

NSW Health Drinking Water Monitoring Program indicates that Ground water supplies are to be tested every 2 years for Radiological characteristics. Table 11 below shows the results of these tests. All samples are within ADWG guidelines, and all were conducted in 2020/21.

Table 11. Results of radiological sampling

Sample description	Client ID	Ansto ID	Gross Alpha (Bq/L)	Gross Beta (Bq/L)
Mt Daylight	Bore 1	C0702	0.14 ± 0.02	0.19 ± 0.01
Mt Daylight	Bore 2	C0703	0.13 ± 0.02	0.14 ± 0.01
Matong	Bore 1	C0704	<0.03	<0.03
Matong	Bore 2	C0705	0.21 ± 0.02	0.08 ± 0.01
Oura	Bore 4	C0706	0.03	0.03 ± 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 daily basis to help with the operation of the plants and to determine correct amounts of chlorine, soda ash, poly and fluoride that need to be injected into the water to ensure treatment process efficiencies and to make it suitable for consumption. Below is a list of the tests conducted via either online monitoring equipment or grab samples. The table also provides 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 Oura & Jugiong WTPs every month and sent to FASS for testing. Results can be seen in the Fluoride Compliance Summary report in appendix C.

Table 12. 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

Jugiong Water Treatment Plant - Water Quality

Every month a sample is taken from the different stages of the water treatment process at the Jugiong Water treatment Plant. These samples are tested by The FASS lab and the results are used to make operational changes to the treatment process.

- Raw/River Water
- Clarified Water
- Filtered Water
- Finished or Clear Water

A summary of these results is detailed below:

Table 13: Jugiong Water treatment Plant Operational Monitoring Results

Raw/River Water			Clarified Water			Filtered			Finished Water		
min	mean	max	min	mean	max	min	mean	max	min	mean	max
0.06	0.17	0.35	0.06	0.15	0.35	0.06	0.16	0.35	0.06	0.21	0.35
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.02	0.03	0.06	0.02	0.03	0.03	0.02	0.03	0.06	0.02	0.04	0.06
0.00	0.01	0.02	0.00	0.01	0.02	0.00	0.01	0.02	0.00	0.01	0.02
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
15.00	19.09	31.90	15.00	18.42	31.90	15.00	20.59	31.90	15.00	23.53	31.90
13.00	31.93	89.00	13.00	28.12	28.12	13.00	30.90	89.00	13.00	41.59	89.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
28.00	38.07	56.00	28.00	39.13	39.13	28.00	39.42	56.00	28.00	40.81	56.00
0.00	0.00	0.02	0.00	0.00	0.02	0.00	0.01	0.02	0.00	0.01	0.02
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.12	0.16	0.28	0.12	0.16	0.28	0.12	0.18	0.28	0.12	0.20	0.28
60.90	87.44	166.90	60.90	82.03	82.03	60.90	85.49	166.90	60.90	100.74	166.90
0.22	0.52	1.08	0.22	0.60	1.08	0.22	0.52	1.08	0.22	0.69	1.08
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5.70	9.65	21.19	5.70	8.75	21.19	5.70	10.85	21.19	5.70	13.51	21.19
0.05	0.10	0.21	0.05	0.09	0.09	0.05	0.09	0.21	0.05	0.11	0.21
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1.00	1.67	3.00	1.00	1.71	1.71	1.00	1.76	3.00	1.00	1.88	3.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
7.30	7.71	7.90	7.30	7.60	7.60	7.30	7.63	7.90	7.30	7.60	7.90
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
12.00	21.27	50.00	12.00	19.03	50.00	12.00	24.29	50.00	12.00	31.05	50.00
6.00	10.93	17.00	6.00	10.99	10.99	6.00	10.99	17.00	6.00	11.28	17.00
83.00	133.60	282.00	83.00	126.20	282.00	83.00	152.23	282.00	83.00	184.35	282.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.70	12.68	30.20	0.70	13.56	30.20	0.70	13.72	30.20	0.70	17.04	30.20
0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.01
0.05	0.08	0.12	0.05	0.07	0.12	0.05	0.08	0.12	0.05	0.09	0.12

Table 14. 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 15 below.

Table 15. Summary of non-compliant water quality data from operational monitoring

Date	Location	Parameter	Exceedance	Correction	Preventive action	Notes
Jugiong Scheme						
6/7, 14//7, 20/7, 22/7 28/7, 4/8, 10/8, 18/8 27/8 1/9, 8/9, 16/9, 12/10, 13/10, 19/10, 23/10, 28/10, 2/11, 9/11, 11/11, 23/11, 1/12, 9/12, 14/12, 22/12, 30/12, 7/1, 12/1, 14/1, 19/1, 3/2, 9/2,13/2 14/2, 19/2, 22/2, 2/3, 9/3, 11/3, 16/3, 23/3, 30/3, 29/3, 6/4, 13/4 20/4, 27/4, 3/5, 11/5, 18/5, 25/5, 23/4	**Young Storage Outlet**	Free Cl	0.14, 0.08, 0.02, 0.12, 0.15, 0.06, 0.03, 0.23, 0.07, 0.02, 0.11, 0.02, 0.16, 0.1, 0.07, 0.2, 0.02, 0.02, 0.02, 0.05, 0.05, 0.03, 0.04, 0.16, 0.15, 0.02, 0.02, 0.02, 0.02, 0.05, 0.07, 0.02, 0.02, 0.02, 0.02, 0.02, 0.02, 0.02, 0.02, 0.12, 0.05, 0.05, 0.02, 0.03, 0.02, 0.02, 0.02, 1.87, 0.18, 0.1, 0.18,	Manually Dose	Extra monitoring of Cl upstream	End of line + large storage resulting in elevated age. GWCC has workshopped this issue with NSW Health, DPIE and Hilltops Shire as part of the new SLA development.
16/9, 9/6	**Young Storage Outlet**	Turbidity (NTU)	1.18, 1.34			

Date	Location	Parameter	Exceedance	Correction	Preventive action	Notes
27/4	**Young Storage Outlet**	pH	9.22	Recalibrate analyser		
14/1	**Young Storage Outlet**	Temperature	26.6			
16/9, 9/2, 29/3,	**Young Terminal Inlet**	Free Cl	0.02, 0.03, 0.16			
16/8, 16/9	**Young Terminal Inlet**	Turbidity (NTU)	1.72, 1.34			
9/6	**Black Range**	Turbidity (NTU)	1.22			
22/7, 16/9, 23/10, 11/9, 11/9, 9/12, 29/3, 4/5, 20/5, 9/6	**Harden Town offtake**	Free Cl	0.02, 0.02, 0.04, 0.02, 0.02, 0.02, 0.02, 0.02, 0.03, 0.06, (mg/L)	Manually Dose harden Town res	Extra Monitoring Upstream for early detection	An hydraulic review of Cowangs to Young supply system is currently being investigated
20/5, 9/6	**Harden Town offtake**	Turbidity	1.1, 1.17			Major renewal works were being undertaken at the time of elevated turbidity
29/4, 9/6, 30/6	**Jugiong Booster Balance Tank Outlet**	Turbidity	1.06, 1.01, 1.1			Major renewal works were being undertaken at the time of elevated turbidity
6/2	**Jugiong Booster Balance Tank Outlet**	Temperature	25.1			
14/1, 29/3,	**Cowangs reservoir Inlet**	Free Cl	0.02, 0.02, (mg/L)	Manual Dose	Monitor Cl coming out of plant, run sample water longer	
6/2	**Cowangs reservoir Inlet**	Turbidity (NTU)	2.14			
6/2	**Cowangs reservoir Inlet**	Temperature	25.2			
1/9, 8/10, 13/10, 23/10, 23/10,28/10, 2/11, 9/12, 6/1, 19/1,, 9/2, 9/2, 14/2, 16/2,	**Cowangs reservoir Outlet**	Free Cl	0.02, 0.09, 0.12, 0.13, 0.1, 0.18, 0.18, 0.17, 0.13, 0.2, 0.02, 0.02, 0.02, 0.02,			An hydraulic review of Cowangs to Young supply system is currently

Date	Location	Parameter	Exceedance	Correction	Preventive action	Notes
22/2, 2/3, 9/3, 16/3, 30/3, 29/3, 13/4, 27/4, 11/5,			0.02, 0.13, 0.14, 0.11, 0.02, 0.08, 0.12			being investigated
9/6	**Cowangs reservoir Outlet**	Turbidity (NTU)	1.66			
19/8, 16/9, 15/10, 11/11, 11/11, 9/12, 8/2, 14/2, 4/3, 29/3, 27/4, 9/6, 29/6	**New Horizon Gundagai Rd**	Free Cl	0.06, 0.02,0.06, 0.02, 0.02 0.02, 0.02, 0.04, 0.02, 0.02, 0.02, 0.02, 0.1, 0.11	Manual Dose upstream	Monitor Cl in distribution	
27/4	**New Horizon Gundagai Rd**	pH	8.53			
9/6	**New Horizon Gundagai Rd**	Turbidity (NTU)	1.57			
22/7, 9/6, 29/6,29/6	**Cootamundra depot**	Turbidity (NTU)	2.7, 1.24, 1.24			
22/7, 10/8, 19/8, 16/9, 24/9, 2/11, 9/11, 11/11, 17/11, 23/11, 1/12, 14/12, 22/12, 30/12, 12/1, 3/2, 8/2, 9/2, 14/2, 22/2, 4/3, 8/3, 23/3, 29/3, 6/4, 20/4, 27/4, 3/5, 18/5, 25/5, 21/6, 29/6,	**Stockinbingal Bowling Club**	Free Cl	0.02, 0.02, 0.02, 0.02, 0.02, 0.02, 0.02, 0.04, 0.02, 0.02, 0.1, 0.16, 0.07,0.03, 0.02, 0.02, 0.02, 0.13, 0.02, 0.02, 0.02, 0.02, 0.02, 0.02, 0.02, 0.02, 0.02, 0.02, 0.18, 0.03, 0.13, 0.17 (mg/L)	Manual Dose	Monitor Cl in Distribution System	
14/1, 14/2	**Stockinbingal Bowling Club**	Turbidity (NTU)	2.28, 2.28			
6/7, 20/7, 4/8, 12/8, 18/8, 19/8, 27/8, 1/9, 8/9, 15/9, 29/9, 8/10, 13/10, 19/10, 28/10, 2/11, 9/11, 11/11, 17/11, 23/11, 1/12, 9/12, 9/12, 14/12, 22/12, 30/12, 7/1, 12/1,	**Bauloora Res**	Free Cl	0.04, 0.15, 0.08, 0.06, 0.02, 0.07, 0.03, 0.02, 0.02, 0.13, 0.1, 0.02, 0.02, 0.2, 0.42, 0.07, 0.03, 0.27, 0.05, 0.15, 0.2, 1.15, 0.34, 0.2, 0.2, 0.25, 0.11, 0.02,	Manual Dose	Monitor Cl in Distribution system	GWCC recorded its lowest ever demand period for the Jugiong water supply scheme. This directly decreases our storage turnover within the

Date	Location	Parameter	Exceedance	Correction	Preventive action	Notes
14/1, 19/1, 27/1, 3/2, 9/2, 14/2, 16/2, 22/2, 2/3, 4/3, 8/3, 16/3, 23/3, 29/3, 6/4, 13/4, 20/4, 27/4, 3/5, 11/5, 18/5, 25/5, 9/6, 21/6, 29/6			0.31, 0.17, 0.21, 0.02, 0.02, 0.31, 0.02, 0.4, 0.02, 0.02, 0.4, 0.02, 0.09, 0.02, 0.02, 0.13, 0.02, 0.03, 0.2, 0.03, 0.02, 0.14, 0.31, 0.18, 0.21, (mg/L)			distribution system.
6/2	**Bauloora Res**	Temperature	26.9			
17/10, 14/11	**Bauloora Res**	Turbidity (NTU)	1.27, 1.03			
19/8, 16/9, 15/10, 11/11, 11/11, 9/12, 8/2, 4/3, 29/3, 29/6	**PRV Pit, Cnr Dirnaseer / Olympic way**	Free Cl	0.08, 0.43, 0.45, 0.29, 0.35, 0.42, 0.32, 0.03, 0.13, 0.16			
14/1, 14/2,	**PRV Pit, Cnr Dirnaseer / Olympic way**	Temperature	25.9, 25.9			
9/6	**PRV Pit, Cnr Dirnaseer / Olympic way**	Turbidity (NTU)	3.9			
6/7, 14/7, 21/7, 22/7, 28/7, 10/8, 18/8, 19/8, 1/9, 8/9, 17/9, 29/9, 8/10, 13/10, 19/10, 28/10, 2/11, 9/11, 11/11, 17/11, 1/12, 9/12, 9/12, 14/12, 22/12, 30/12, 7/1, 12/1, 19/1, 27/1, 3/2, 9/2, 8/2, 14/2, 22/2, 2/3, 4/3, 8/3, 16/3, 23/3, 30/3, 29/3, 29/3, 6/4, 12/4, 20/4, 27/4, 3/5, 11/5, 18/5, 25/5, 9/6, 9/6, 21/6, 29/6	**Dirnaseer reservoir**	Free Cl	0.02, 0.12, 0.06, 1.01, 0.09, 0.02, 0.02, 1.97, 0.04, 0.02, 0.02, 0.02, 0.03, 0.02, 0.05, 0.02, 0.02, 0.04, 0.1, 0.04, 0.03, 0.02, 0.02, 0.02, 0.02, 0.02, 0.02, 0.02, 0.02, 0.02, 0.02, 0.02, 0.02, 0.08, 0.02, 0.02, 0.02, 0.02, 0.02, 0.02, 0.08, 0.02, 0.02, 0.02, 0.06, 0.15, 0.06, 0.14, 0.18, (mg/L)	Manual Dose	Monitor Cl in Distribution system	Atom Consulting prepared a Chlorination Issues – Background Report, this report recommends further investigation into chlorine residual in the distribution network to ensure the risk of recontaminati on is reduced to an acceptable level. Funding was requested through Health but declined
6/2	**Dirnaseer reservoir**	Temperature	27.6			

Date	Location	Parameter	Exceedance	Correction	Preventive action	Notes
9/6	**Dirnaseer reservoir**	Turbidity (NTU)	2.7			
24/9	**Wallendbeen Roundabout**	Turbidity (NTU)	1.05			
22/7, 19/8, 16/9, 15/10, 11/11, 9/12, 14/1, 4/3, 29/3, 9/6, 29/9,	**Town offtake Springdale**	Free Cl	0.02, 0.02, 0.02, 0.02, 0.02, 0.02, 0.04, 0.05, 0.04, 0.02, 0.02, 0.02, (mg/L)	Manual dose	Monitor cl in Distribution system	Near the end of the line for the Jugiong system
22/7, 16/9, 15/10, 11/11, 8/2, 29/3, 29/6	**Town offtake Springdale**	pH	8.55, 8.54, 8.6, 8.77, 8.69, 8.67, 8.61			
16/9, 9/2, 4/3, 29/3,	**Wallendbeen School**	Free Cl	0.04, 0.02, 0.14, 0.05, mg/L	Manual Dose Upstream	Monitor Cl in distribution	
19/8, 16/9	**Wallendbeen School**	Turbidity (NTU)	1.3, 3.49			
14/1, 29/3, 27/4	**Wallendbeen School**	pH	8.65, 8.69, 8.87			
14/7, 9/2, 9/2, 22/2, 16/3, 30/3, 4/5, 11/5,	**Rosehill Pump Station**	Free Cl	0.09, 0.02, 0.03, 0.02, 0.03, 0.09, 0.06 (mg/L)	Manual Dose	Monitor Cl in distribution	
Oura Scheme						
13/1	**Tara Pump Station Discharge**	Free Cl	0.12			
13/1, 23/2	**Tara Pump Station Discharge**	Temperature	25.5, 26.4			
16/7, 9/9, 8/10, 21/4, 28/6	**Tara Pump Station Discharge**	pH	8.75, 8.56, 8.68, 8.64, 8.62			
13/1, 24/2	**Ariah Park Res**	Temperature	25.5, 26.4			
11/8	**Wellman's St, Ariah Park**	pH	8.73			
2/2, 22/3	**Beckom Hotel**	Free Cl	0.03, 0.12 mg/L			
16/7, 9/9, 8/10, 4/11, 21/4, 1/6, 17/6, 28/6	**Beckom Hotel**	pH	8.95, 8.56, 8.77, 8.81, 8.82, 8.65, 8.71, 8.87			
9/9, 8/10, 4/11, 21/4, 28/6	**Ardlethan**	pH	8.55, 8.85, 8.69, 8.56, 8.65		Mains Flushing/ Cleaning, pH correction	
13/1, 2/2, 22/3,	**Barellan Res**	Free Cl	0.03, 0.13, 0.1			

Date	Location	Parameter	Exceedance	Correction	Preventive action	Notes
7/12, 13/1, 2/2, 24/2, 26/2	**Barellan Res**	Temperature	25.6, 27.6, 25.6, 26.5, 26			
16/7, 9/9, 8/10, 4/11, 21/4, 28/6	**Barellan Res**	pH	8.92, 8.63, 8.77, 8.69, 8.72, 8.54			
18/6	**Temora BT Inlet**	Free Cl	0.09			
22/2, 8/3	**Temora BT inlet**	Temperature	26, 27			
18/6	**Temora town res outlet**	Free Cl	0.15			
22/2, 8/3	**Temora town res outlet**	Temperature	26, 26			
20/1	**Temora town res outlet**	Turbidity (NTU)	1.53			
7/4,	**Temora High School**	Free Cl	0.18			
20/1, 10/2	**Temora High School**	Temperature	25.2, 26.4			
20/1	**Temora High School**	Turbidity (NTU)	1.08			
8/7, 19/11, 20/1	**Beattie St Temora**	Free Cl	0.14, 0.04, 0.1			
19/11, 20/1, 10/2, 10/3, 7/4	**Beattie St Temora**	Temperature	27.3, 30, 30.1, 27.5, 26.1			
8/7, 29/7, 24/9, 19/11	**Beattie St Temora**	pH	8.8, 8.65, 8.72, 8.51			
27/8	**Beattie St Temora**	Turbidity (NTU)	3.58			
20/1	**Temora West School**	Free Cl	0.19			
20/1, 10/2, 10/3, 7/4	**Temora West School**	Temperature	28.4, 28.2, 26.6, 25.8			
8/7, 29/7, 27/8, 24/9, 22/10, 7/4, 10/5, 9/6	**Temora West School**	pH	8.9, 8.74, 8.67, 8.87, 8.52, 8.61, 8.61, 8.77			
19/11	**Temora Caravan Park**	Free Cl	0.02			
19/11, 20/1, 10/2, 10/3, 7/4	**Temora Caravan Park**	Temperature	29.4, 27.6, 29.1, 25.5, 26.3			
27/8, 22/10	**Temora Caravan Park**	Turbidity (NTU)	1.02, 19.8			
8/7, 7/4	**Temora Caravan Park**	pH	8.8, 8.53			
19/11, 20/1, 10/2	**Cartwrights Hill reservoir**	Free Cl	0.1, 0.17, 0.15			
1/2,	**Cartwrights Hill reservoir**	Temperature	26			
20/1	**Cartwrights Hill reservoir**	Turbidity (NTU)	1.5			

Date	Location	Parameter	Exceedance	Correction	Preventive action	Notes
13/7, 28/10, 3/11, 22/12, 9/2, 31/5	**Marrar**	Free Cl	0.02, 0.02, 0.02, 0.08, 0.19, 0.02			
26/8	**Marrar**	Turbidity (NTU)	1.83			
17/12, 21/1, 11/2, 19/3	**Old Junee**	Temperature	26.5, 25.7, 26.5, 25.1			
18/10	**Junee Public School**	Free Cl	0.18			
8/10	**Eurollie Rd**	Free Cl	0.14			
23/10, 21/10, 18/11, 18/1, 16/2, 8/3, 8/4	**Illabo Hotel**	Free Cl	0.15, 0.15, 0.02, 0.12, 0.14, 0.16, 0.17 (mg/L)	Manual Dose	Monitor Distribution	
14/7, 4/8, 10/8, 1/9, 8/9, 13/10, 19/10, 2/11, 17/11, 23/11, 14/12, 30/12, 7/1, 12/1, 19/1, 27/1, 3/2, 20/4, 3/5, 18/5, 2/6, 21/6	**Bethungra Res**	Free Cl	0.14, 0.1, 0.11, 0.04, 0.07, 0.02, 0.11, 0.09, 0.19, 0.17, 0.18, 0.13, 0.16, 0.05, 0.17, 0.08, 0.06, 0.11, 0.15, 0.05, 0.19, 0.14, 0.02			
29/7, 23/9, 21/10, 18/11, 10/12, 18/1, 16/2, 8/3	**Wantabadgery**	Free Cl	0.16, 0.13, 0.15, 0.05, 0.17, 0.11, 0.16, 0.14	Manual Dose	Monitor Distribution	
13/12/2, 17/628/6	**Ardlethan**	Free Cl	0.03, 0.11, 0.02, 0.02			
30/12, 25/11	**Barmedman**		0.15, 0.12			
16/7, 1/6	**Central School, Ariah Park**	pH	8.7, 8.79			
22/3, 24/3	**Barellan Low Level**	Free Cl	0.15, 0.14			
17/7, 22/4	**Ariah Park Golf Club**	pH	8.6, 8.6		Flushing, pH correction	
25/11	**Barmedman Park**	Free Cl	0.12			
8/7, 28/7, 13/8, 2/9, 8/10, 29/10, 2/6, 10/6	**Barmedman Park**	pH	8.64, 8.57, 8.83, 8.8, 8.6, 8.54, 8.59, 8.76		Mains Flushing/ Cleaning, pH correction	
11/1, 25/1, 28/1, 12/2, 15/2	**Barmedman Park**	Temperature	25.1, 27.6, 25.4, 28.3, 25.4			
8/7, 13/8, 13/8, 2/9, 8/10, 22/10, 29/10, 17/3,	**Wyalong Pump Station Meter**	pH	8.77, 8.91, 8.86, 8.87, 8.79, 8.51, 8.71, 8.9,		Mains Flushing/ Cleaning, pH correction	

Date	Location	Parameter	Exceedance	Correction	Preventive action	Notes
14/4, 2/6, 10/6			8.61, 8.6, 8.85			
25/1	**Wyalong Pump Station Meter**	Temperature	27.8			
8/7, 28/7, 2/9, 8/10, 29/10, 17/3, 14/4, 2/6, 10/6	**Wyalong School, George Bland Ave**	pH	8.76, 8.78, 8.88, 8.72, 8.72, 8.78, 8.56, 8.72, 8.83		Mains Flushing, pH correction	
25/1	**Wyalong School, George Bland Ave**	Temperature	28			
8/7, 13/8, 2/9, 8/10, 29/10, 25/11, 17/3, 2/6, 10/6	**Perseverance St west Wyalong**	pH	8.89, 8.88, 8.87, 8.81, 8.81, 8.53, 8.76, 8.79, 8.83		Mains Flushing, pH correction	
25/11, 25/1, 17/2, 17/3	**Perseverance St west Wyalong**	Temperature	26.2, 31.6, 25.4, 26			
10/6	**West Wyalong Public School**	Free Cl	0.17(mg/L)			
8/7, 28/7, 23/8, 2/9, 8/10, 29/10, 25/11, 17/2, 17/3, 2/6, 10/6	**West Wyalong Public School**	pH	8.85, 8.95, 8.92, 8.93, 8.91, 8.8, 8.55, 8.59, 8.91, 8.83, 8.9, 8.74		Mains Flushing/ Cleaning, pH correction	Near end of the line of Oura
26/11, 25/1, 17/2	**West Wyalong Public School**	Temperature	26, 30, 29.1			
8/7, 13/8, 2/9, 29/10, 25/11, 17/3, 14/4, 10/6	**West Wyalong Terminal Storage**	pH	8.74, 8.8, 8.86, 8.7, 8.57, 8.75, 8.51, 8.75		Mains Flushing, pH correction	Near end of line of Oura
19/1, 25/1, 27/1, 12/2, 15/12, 17/2, 19/2, 22/2, 1/3, 5/3, 8/3, 15/3	**West Wyalong Terminal Storage**	Temperature	25.7, 28.3, 27.8, 26, 26, 26.1, 25.7, 25.8, 25.9, 25.2, 25.8, 25.5			
8/7, 28/7, 13/8, 2/9, 8/10, 29/10, 25/11, 17/2, 17/3, 14/4, 2/6, 10/6,	**Calleen reservoir Outlet**	pH	9.03, 9.08, 9.08, 9.13, 9.21, 8.98, 8.64, 8.67, 8.97, 8.88, 9.05, 9.12		Mains Flushing/ Cleaning, pH correction	Near end of line of the Oura system
16/1, 25/1, 27/1, 22/2	**Calleen reservoir Outlet**	Temperature	25.3, 28.7, 26.8, 25.5			

Date	Location	Parameter	Exceedance	Correction	Preventive action	Notes
8/7, 28/7, 13/8, 2/9, 8/10, 29/10, 25/11, 22/12, 25/1, 17/2, 17/3, 14/4, 2/6, 2/6, 10/6	**Ungarie town res**	pH	9.12, 9.19, 9.39, 9.23, 9.29, 9.34, 8.93, 8.62, 8.63, 8.93, 9.19, 9.12, 9.33, 9.38		Mains Flushing/ Cleaning, pH correction	Ungarie is the end of a long distribution system
28/12, 4/1, 12/1, 15/1, 22/2, 12/3, 17/3	**Ungarie town res**	Free Cl	0.17, 0.1, 0.11, 0.1, 0.16, 0.1			
12/1, 15/1, 25/1, 27/1, 17/2, 22/2, 9/3	**Ungarie town res**	Temperature	25.4, 25.3, 30, 28.9, 26, 27.1, 25.5			
2/9,	**Bing Waller Park, Ungarie**	pH	9.29		Flush mains, pH correction	End of a long system
4/1, 12/1, 12/3	**Bing Waller Park, Ungarie**	Free Cl	0.15, 0.1,0.1			
16/11, 1/12, 3/12, 7/12, 11/12, 18/12, 21/12, 29/12, 4/1, 12/1, 27/1, 5/2, 12/2, 15/2, 19/2, 22/2, 5/3, 9/3, 12/3, 15/3, 22/3, 6/4, 8/4	**Bing Waller Park, Ungarie**	Temperature	26.1, 27.2, 28, 26.7, 27.1, 30.5, 27.2, 29.9, 29.4, 29, 31.5, 28, 30.7, 30.2, 29.3, 28.8, 28.7, 27.2, 25.2, 25.9, 25.5			
8/7, 13/8, 8/10, 29/10, 25/11, 25/1, 17/2, 17/3, 24/3, 14/4, 2/6, 10/6	**Ungarie central School**	pH	9.12, 9.33, 9.23, 9.24, 8.93, 8.59, 8.9, 9.25, 9.08, 9.03, 9.31, 9.27,		Mains Flushing/ Cleaning, pH correction	End of a long system
17/3, 24/3	**Ungarie central School**	Free Cl	0.17, 0.11			
25/11, 25/1, 17/2	**Ungarie central School**	Temperature	27, 34.1, 28.9			
27/7	**Mirrool Park**	Free Cl	0.05			
8/7, 29/7, 8/10, 6/11, 19/11, 20/1, 10/2, 1/3, 10/3, 7/4, 16/4, 23/4, 11/6	**Temora East res**	Free Cl	0.15, 0.1, 0.14, 0.18, 0.15, 0.04, 0.02, 0.1, 0.05, 0.02, 0.05, 0.05, 0.07	Manual dosing		Water can be from either Oura or Jugiong or both (end of Jugiong scheme)
8/7, 29/7, 27/8, 24/9, 22/10, 10/3, 7/4, 11/5	**Temora East res**	pH	8.7, 8.7, 8.66, 8.84, 8.79, 8.7, 8.55, 8.68			

Date	Location	Parameter	Exceedance	Correction	Preventive action	Notes
Mt Arthur Scheme						
21/12, 13/1, 3/2, 24/3, 24/3,	**Matong School**	Free Cl	0.11, 0.14, 0.02, 0.15, 0.07, 0.08	Manual Dose	Monitor	
16/7, 9/10, 5/11, 24/3, 24/3	**Matong School**	pH	9.2, 9.25, 8.79, 9, 9.19			
17/12, 13/1, 3/2, 23/2	**Matong School**	Temperature	28.1, 29, 25.1, 25.9			
22/4,	**Ganmain High Level**	Free Cl	0.11			
17/12, 14/1, 13/1	**Ganmain High Level**	Temperature	26.1, 28, 27.5			
17/12, 13/1, 3/2,	**Hay Industry display Centre Ganmain**	Temperature	29.3, 29.4, 27.3			
9/10, 5/11, 3/2, 23/2, 24/3, 28/6	**Coolamon (Allawah Lodge)**	Free Cl	0.08, 0.02, 0.09, 0.02, 0.12, 0.14	Manual Dose	Monitor	
17/12, 13/1	**Coolamon (Allawah Lodge)**	Temperature	26.5, 29			
9/10, 5/11, 3/2, 23/2, 28/6	**Coolamon Central School**	Free Cl	0.08, 0.02, 0.09, 0.02, 0.12, 0.14			
9/10	**Coolamon Central School**	pH	8.68			
17/12, 20/12, 13/1, 3/2	**Coolamon Central School**	Temperature	28.8, 25.7, 27.2, 25.1			
5/11, 16/3,	**High Level North Coolamon**	Free Cl				
17/12, 14/1, 13/1, 22/1, 28/1	**High Level North Coolamon**	Temperature	26.2, 25.8, 27.2, 25.8, 25.4			
13/1	**“Tolmie” Wagga rd Coolamon**	Temperature	27.5			
17/12	**Ganmain Pre School**	Temperature	26.2			
17/2	**Ganmain Public School**	Temperature	29.2			
6/7 – 28/6 (whole of reporting period)	**Grong Grong Park**	Free Cl	0.02 – 0.42 all samples with exception of 2 were all			

Date	Location	Parameter	Exceedance	Correction	Preventive action	Notes
			under 0.2 mg/L			
17/12, 15/1, 13/1, 3/2, 4/2, 23/2	**Grong Grong Park**	Temperature	29.2, 31.5, 31.5, 26.9, 28, 26.9			
22/4, 7/5, 27/5, 28/6,	**Matong Low Level**	Free Cl	0.19, 0.17, 0.18, 0.04			
14/12, 14/1	**Matong Low Level**	Temperature	26.5, 27.5			
9/2,	**Matong Public Toilets**	0.05				
6/7, 12/8, 29/9, 3/11, 25/11, 11/12, 21/12, 4/1, 14/1, 11/5, 31/5, 18/6, 28/6	**Grong Grong (town res)**	Free Cl	0.03, 0.1, 0.02, 0.02, 0.02, 0.02, 0.02, 0.02, 0.02, 0.02, 0.02, 0.02, 0.03	Manual Dose	Monitor	
25/11, 21/12, 14/1	**Grong Grong (town res)**	Temperature	25.3, 26.3, 29.2			
16/3, 2/2, 1/3, 16/3	**Coolamon South res**	Free Cl	0.17, 0.18, 0.13, 0.13,			
14/1, 28/1	**Coolamon South res**	Temperature	25.9, 25.8			
9/2,	**Matong High res**	Free Cl	0.15			
14/1, 15/1	**Matong High res**	temperature	28, 26.8			
Mt Daylight Scheme						
24/11, 26/11, 3/12, 7/12, 18/12, 21/12, 22/12, 24/12, 29/12, 4/1, 12/1, 20/1, 21/1, 15/2, 19/2, 22/2, 23/2, 1/3, 5/3, 9/3, 12/3, 15/3,	**Hannan Res**	Temperature	25.1, 26.5, 25.8, 25.2, 26.4, 26.2, 25.6, 26, 26.3, 26.1, 27.8, 26.3, 27.7, 26.5, 27.5, 28.7, 25.6, 27, 26.6, 26.9, 26.8, 25.4			
24/11, 26/11, 3/12, 18/12, 21/12, 24/12, 29/12, 4/1, 9/1, 12/1, 20/1, 21/1, 27/1, 12/2, 15/2, 19/2, 22/2, 23/2, 1/3, 9/3, 12/3	**Naradhan res Outlet**	Temperature	25.1, 27, 25.3, 25.3, 26.3, 25.5, 25.8, 25.9, 25.1, 26.6, 26.7, 27.8, 28.1, 25.9, 25.7,25.7, 27.1, 26.7, 26			

Date	Location	Parameter	Exceedance	Correction	Preventive action	Notes
8/7, 7/10, 7/12, 17/3, 26/3, 1/6,	**North Weethalle Res**	Free Cl	0.17, 0.16, 0.18, 0.17, 0.13,	Manual Dose	Monitor	
25/11, 21/12, 24/12, 29/12, 4/1, 12/1, 18/1, 20/1, 21/1, 27/1, 15/2, 22/2, 23/2, 1/3, 5/3, 9/3, 12/3	**North Weethalle Res**	Temperature	25.3, 25.5, 25.5, 25.8, 25.5, 26.2, 26.9, 27.2, 26.7, 29.2, 26.1, 27.7, 25.4, 26.5, 25.9, 26, 26.1			
8/7, 7/10, 29/10, 29/10, 2/11, 9/11, 24/11, 3/12, 7/12, 22/12, 24/12, 12/1, 21/1, 23/2, 12/3, 26/3, 8/4, 13/4, 21/5, 24/5, 1/6, 28/6	**Russell trading Weethalle**	Free Cl	0.11, 0.1, 0.12, 0.19, 0.18, 0.16, 0.1, 0.1, 0.07, 0.1, 0.15, 0.15, 0.1, 0.14, 0.18, 0.13, 0.18, 0.11, 0.12, 0.15, 0.1, 0.15	Manual Dose	Monitor	
16/11, 24/11, 25/11, 3/12, 7/12, 11/12, 18/12, 21/12, 22/12, 24/12, 29/12, 4/1, 9/1, 12/1, 21/1, 27/1, 12/2, 15/2, 19/2, 22/2, 23/2, 1/3, 5/3, 9/3, 12/3, 15/3, 17/3, 22/3,	**Russell trading Weethalle**	Temperature	25.8, 27.7, 28.3, 27.8, 28.1, 25.3, 26.8, 27.8, 27, 27.6, 29.1, 28.8, 27.8, 28.8, 30.7, 31.1, 26.9, 28.3, 29.2, 30.6, 26.1, 28.5, 26, 28.8, 28.8, 26.5, 25.6, 25.8			
3/12, 26/3, 21/5, 1/6,	**Nariah Res**	Free Cl	0.15, 0.05, 0.1, 0.05	Manual Dose	Monitor	
16/1, 21/1, 27/1, 22/2, 1/3, 9/3	**Nariah Res**	Temperature	26, 25.8, 27.7, 26.1, 26.5, 25.2			
7/10, 29/10, 2/11, 24/11, 7/12, 11/12, 4/1, 12/1, 12/3, 15/6	**Tallimba Park**	Free Cl	0.18, 0.18, 0.15, 0.17, 0.15, 0.12, 0.15, 0.1, 0.1	Manual Dose	Monitor	
16/11, 24/11, 25/11, 3/12, 7/12, 11/12, 18/12, 21/12, 24/12, 9/1, 12/1, 20/1, 27/1, 12/2, 15/2, 19/2,	**Tallimba Park**	Temperature	25.2, 25.2, 25.4, 25.3, 25.7, 25.3, 25.7, 25.9, 26, 26.1, 27.5, 27.2, 30.3, 27.5, 26, 27.5,			

Date	Location	Parameter	Exceedance	Correction	Preventive action	Notes
22/2, 23/2, 1/3, 8/3			28.8, 25.9, 26.9, 26			
17/3	**Tallimba School**	Free Cl	0.09			
22/12, 21/1	**Tallimba School**	Temperature	27.2, 26.5			
2/9	**Tallimba Inn**	Free Cl	0.18			
21/9, 16/11, 7/12, 4/1, 20/1, 9/3, 26/3, 21/5,	**Nobbies Res**	Free Cl	0.09, 0.18, 0.05, 0.1, 0.19, 0.19, 0.05, 0.1			
3/12, 18/12, 29/12, 4/1, 12/1, 20/1, 27/1, 27/1, 12/2, 22/2, 22/2, 1/3, 5/3, 9/3, 15/3,	**Nobbies Res**	Temperature	25.3, 25.1, 25.9, 25.4, 26.3, 26.6, 25.8, 29.4, 25.9, 27.8, 27.8, 28, 25.9, 25.8, 25.7	Manual Dose	Monitor	
24/9, 7/10, 7/12, 12/3, 21/5, 1/6,	**Weethalle Res**	Free Cl	0.1, 0.19, 0.18, 0.15, 0.15, 0.09	Manual Dose	Monitor	
3/12, 18/12, 21/12, 24/12, 29/12, 4/1, 12/1, 20/1, 27/1, 12/2, 15/2, 19/5, 22/2, 1/3, 5/3, 9/3, 12/3	**Naradhan Steel res**	Temperature	25.6, 25.4, 26.2, 25.5, 25.3, 26, 26.6, 26.7, 28.1, 25.9, 25.7, 26.2, 27.1, 26.7, 25.3, 26.7, 26			
16/11, 24/11, 3/12, 18/12, 21/12, 24/12, 29/12, 9/1, 20/1, 27/1, 15/2, 19/2, 22/2, 1/3, 5/3, 9/3, 12/3, 15/3, 6/4, 8/4	**Naradhan Park**	Temperature	25.1, 26.2, 28.9, 27.5, 28.2, 26.8, 26.6, 26.3, 30.1, 26.9, 27.2, 30.1, 27.5, 26.9, 27.2, 30.1, 27.5, 26.9, 27.2, 26.2, 27.3, 25.6, 25.3			
3/12, 18/12, 21/12, 24/12, 29/12, 20/1, 22/2, 1/3, 9/3, 12/3, 15/3	**Naradhan Pump Station**	Temperature	25.1, 25.6, 25.2, 26, 25.5, 26.2, 26.1, 25.7, 25.9, 26.1, 25.4			

Water Quality Discussion

Throughout the reporting period GWCC have conducted a total of 1296 microbial water samples to be either tested by NSW Health or tested ‘in-house’ by GWCC Water Quality staff.

The water is also tested throughout the reporting period for chemicals which may be present in the water, a total of 175 water samples were collected and tested for chemicals during the reporting period all were tested by NSW Health FASS Lab, not all samples were compliant and within Australian Drinking Water Guideline limits (AWDG). See table 12 for a summary of the non-compliant parameters and from what scheme the sample were undertaken.

Another initiative undertaken by GWCC in the monitoring of chlorine within the distribution system across the entire scheme. These tests are conducted routinely by the distribution staff and a total of 4149 chlorine test were conducted onsite. These tests include both Total and Free chlorine. A running spreadsheet of results is constantly updated by office staff once data is received by the distribution staff and is now located in GWCC new database Content Manager (doc 18/1344). *Results are now entered into WaterOutlook and no longer manually entered the chlorine history spreadsheet.

A review of the water quality monitoring was conducted by Atom consulting in 2018 and the recommendations were adopted and implemented by GWCC.

Customer Complaints

Table 16. Customer complaints registered in the 2020/21 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
Jul-20	5	4	19				1	
Aug-20	4	2	16		1			
Sep-20	15	12	13		2			1
Oct-20	10	8	25			2		
Nov-20	30	19	28	1	8	2		
Dec-20	14	12	36					
Jan-21	37	34	39		1			
Feb-21	27	25	45	1	1			
Mar-21	13	13	32					
Apr-21	9	8	26			1		
May-21	23	22	20	1				
Jun-21	16	10	20	1	3			2

Although GWCC has fixed 319 bursts for the year only 5 were reported through to Customer Service/request System and labelled as "Complaint".

There was a total of 203 complaints made during the reporting period 2020/21. Most complaints that were made pertained to discoloured water totalling 169. This is an increase of 73 compared to 96 complaints recorded in 2019/20. These complaints allowed staff to determine those certain areas in the Coolamon and Junee reticulation system required attention. Thus, GWCC had reservoirs cleaned and dead ends flushed on numerous occasions. GWCC also conducted a study into the Coolamon and related townships to better handle the issue causing customer complaints. It has also allowed GWCC to identify that accumulation of iron and manganese cause the majority of incidents when responded throughout high demand periods.

In previous years (2019) GWCC 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 related townships. Whilst undertaking this flushing/cleaning, turbidity and chlorine residual testing were undertaken on a pre and post operation for the reticulation system. Throughout the Coolamon township, concentrated turbidity results were recorded as high as 171 NTU in dead ends, with an average of approximately 25 NTU across the system. Comparing against historical records of the number of complaints, this method has drastically reduced the number of customer complaints received from these areas through the previous reporting period. A recommendation has been made for the development of new flushing technology to be utilised fulltime for the management of all the reticulated systems. This may remove the current requests for increased water treatment process at significant cost.

Please note the below pre and post No-Des project test results detailed within the graphs below.

The blue trend indicating a significant reduction in turbid water after the flushing program being completed. Spike shown was caused by Burst within the reticulation system.

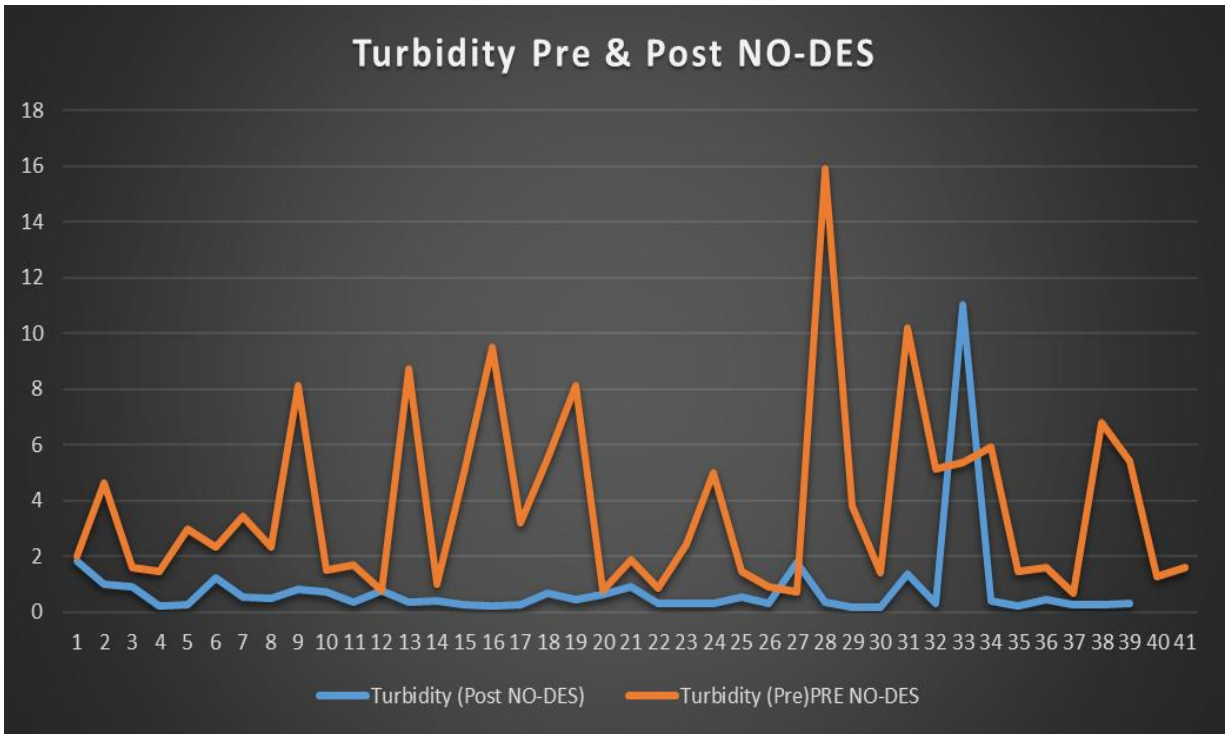

Figure 5: Turbidity Pre or Post No Des

The below blue trend is indicating consistent levels of chlorine residual with improved water quality after NO-D project. Dip correlates to the burst indicated within the above graph 2.

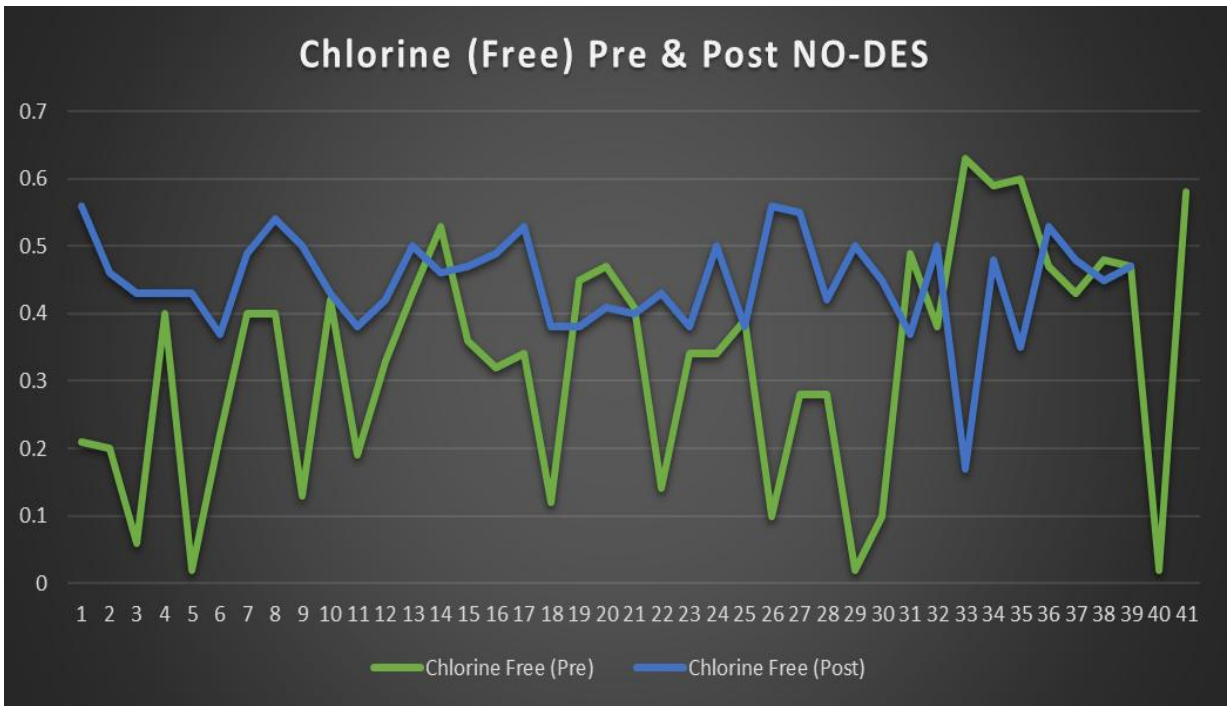

Figure 6: Free Chlorine Pre and Post No des

Further to the implementation of automated flushing system on the notorious dead end located within Kingdom Drive in February 2019, GWCC has received practically no complaints from customers serviced on this pipeline. As such, the flushing system installed is assisting with handling of customer complaints.

Water Quality Incidents

Table 17. Summary of incidents and emergencies, recommendations, and preventative actions

Details of Incident/Emergency	Investigation Recommendations	Preventive Action Undertaken
No Water Quality Incidents have been reported for the report period 2020/21	-	-

Please note that whilst GWCC did not record any incidents, we assisted Hilltops Shire Council during their recent boiled water alert. GWCC also attended and contributed to a debrief workshop with Hilltops Shire, NSW Health and DPIE for this event.

Staff Development and Training

Incident and Emergency Response Training

GWCC have implemented and completed Incident and Emergency response training in accordance with their PIRMP obligations. This training has been undertaken by relevant staff and stakeholders. In addition to this GWCC requested the facilitation of a workshop and scenario training with its Bulk Councils in November 2020. This was facilitated by Atom Consulting and funded by NSW Health. NSW Health, Hilltops Shire, Cootamundra Gundagai Shire and DPIE were all in attendance. 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 18 below indicates all the additional training that individual GWCC staff have undertaken during the reporting period of 2020/21.

Table 18. Full list of staff training for the 2020/21 reporting period.

NAME	COURSE	Date Completed	Expiry Date (if applicable)	Training Provider
Nicol Kelly	Fire warden Training	9/09/2020	9/09/2021	Ferst Training Solutions
Kathryn Lowe	Fire warden Training	9/09/2020	9/09/2021	Ferst Training Solutions
Lynette Breust	Fire warden Training	9/09/2020	9/09/2021	Ferst Training Solutions
Mike Reid	Fire warden Training	18/06/2020	9/09/2021	Ferst Training Solutions
Sammy Jung	Fire warden Training	18/06/2020	9/09/2021	Ferst Training Solutions

Geoff Veneris	Fire warden Training	18/06/2020	9/09/2021	Ferst Training Solutions
Rhys Collins	Confined Spaces Refresh	15/09/2020	15/09/2023	Triple 0 Solutions
James Butler	Confined Spaces Refresh	15/09/2020	15/09/2023	Triple 0 Solutions
Brendon Ford	Confined Spaces Refresh	15/09/2020	15/09/2023	Triple 0 Solutions
George Basham	Confined Spaces Refresh	15/09/2020	15/09/2023	Triple 0 Solutions
Mick Lewis	Confined Spaces Refresh	22/09/2020	15/09/2023	Triple 0 Solutions
Luke Townsend	Confined Spaces Refresh	15/09/2020	15/09/2023	Triple 0 Solutions
Mick Annetts	Confined Spaces Refresh	15/09/2020	15/09/2023	Triple 0 Solutions
Shane Hartshorn	Confined Spaces Refresh	15/09/2020	15/09/2023	Triple 0 Solutions
Shane Baldry	Confined Spaces Refresh	15/09/2020	15/09/2023	Triple 0 Solutions
Zane Cronk	Confined Spaces Refresh	15/09/2020	15/09/2023	Triple 0 Solutions
Rod Ryan	Confined Spaces Refresh	15/09/2020	15/09/2023	Triple 0 Solutions
Nigel Marion	Confined Spaces Refresh	15/09/2020	15/09/2023	Triple 0 Solutions
Nicol Kelly	Confined Spaces Refresh	22/09/2020	22/09/2023	Triple 0 Solutions
Geoff Veneris	Confined Spaces Refresh	22/09/2020	22/09/2023	Triple 0 Solutions
Chris Breen	Confined Spaces Refresh	22/09/2020	22/09/2023	Triple 0 Solutions
Matt Bett	Confined Spaces Refresh	22/09/2020	22/09/2023	Triple 0 Solutions
Robin Davis	Confined Spaces Refresh	22/09/2020	22/09/2023	Triple 0 Solutions
Chris Fealy	Confined Spaces Refresh	22/09/2020	22/09/2023	Triple 0 Solutions
Andrew Derrick	Confined Spaces Refresh	22/09/2020	22/09/2023	Triple 0 Solutions
Mick Diggins	Confined Spaces Refresh	22/09/2020	22/09/2023	Triple 0 Solutions
Sean Tiernan	Confined Spaces Refresh	22/09/2020	22/09/2023	Triple 0 Solutions
Mike Read	Confined Spaces Refresh	22/09/2020	22/09/2023	Triple 0 Solutions
Paul Goesch	Confined Spaces Refresh	22/09/2020	22/09/2023	Triple 0 Solutions
James Carr	Confined Spaces Refresh	22/09/2020	22/09/2023	Triple 0 Solutions
Matt Cooper	Confined Spaces	17/09/2020	17/09/2023	Triple 0 Solutions
Barry Shepherd	Confined Spaces	17/09/2020	17/09/2023	Triple 0 Solutions
Daniel Flack	Confined Spaces	17/09/2020	17/09/2023	Triple 0 Solutions
Liam Welch	Confined Spaces	22/09/2020	22/09/2023	Triple 0 Solutions
Myrka Robichaud	Confined Spaces	17/09/2020	17/09/2023	Triple 0 Solutions
Adam Ryall	Confined Spaces	17/09/2020	17/09/2023	Triple 0 Solutions
Liam Moston	Confined Spaces	17/09/2020	17/09/2023	Triple 0 Solutions
Adam Ryall	Pumping Fundamentals	27/10/2020		Strategic Achievement
Blake Hingerty	Pumping Fundamentals	27/10/2020		Strategic Achievement
Dilrosh Jayawardene	Pumping Fundamentals	27/10/2020		Strategic Achievement
Geoff Veneris	Pumping Fundamentals	27/10/2020		Strategic Achievement
Jack Fuller	Pumping Fundamentals	27/10/2020		Strategic Achievement
James Butler	Pumping Fundamentals	27/10/2020		Strategic Achievement
Les Scott	Pumping Fundamentals	27/10/2020		Strategic Achievement
Rod Ryan	Pumping Fundamentals	27/10/2020		Strategic Achievement
Shane Baldry	Pumping Fundamentals	27/10/2020		Strategic Achievement
Zane Cronk	Pumping Fundamentals	27/10/2020		Strategic Achievement

Adam Ryall	Advanced Pumping Fundamentals	28/10/2020		Strategic Achievement
Blake Hingerty	Advanced Pumping Fundamentals	28/10/2020		Strategic Achievement
Dilrosh Jayawardene	Advanced Pumping Fundamentals	28/10/2020		Strategic Achievement
Geoff Veneris	Advanced Pumping Fundamentals	28/10/2020		Strategic Achievement
Jack Fuller	Advanced Pumping Fundamentals	28/10/2020		Strategic Achievement
James Butler	Advanced Pumping Fundamentals	28/10/2020		Strategic Achievement
Les Scott	Advanced Pumping Fundamentals	28/10/2020		Strategic Achievement
Rod Ryan	Advanced Pumping Fundamentals	28/10/2020		Strategic Achievement
Shane Baldry	Advanced Pumping Fundamentals	28/10/2020		Strategic Achievement
Zane Cronk	Advanced Pumping Fundamentals	28/10/2020		Strategic Achievement
Chris Breen	Administration of Construction Contracts	16/11/2020		Contract Control International
James Carr	Administration of Construction Contracts	16/11/2020		Contract Control International
Zane Cronk	Administration of Construction Contracts	16/11/2020		Contract Control International
Rob Davis	Administration of Construction Contracts	16/11/2020		Contract Control International
Brendon Ford	Administration of Construction Contracts	16/11/2020		Contract Control International
Jack Fuller	Administration of Construction Contracts	16/11/2020		Contract Control International
Paul Goesch	Administration of Construction Contracts	16/11/2020		Contract Control International
Dilrosh Jayawardene	Administration of Construction Contracts	16/11/2020		Contract Control International
Nigel Marion	Administration of Construction Contracts	16/11/2020		Contract Control International
Mike Read	Administration of Construction Contracts	16/11/2020		Contract Control International
Myrka Robichaud	Administration of Construction Contracts	16/11/2020		Contract Control International
Les Scott	Administration of Construction Contracts	16/11/2020		Contract Control International
Chris Breen	Superindentents Workshop	18/11/2020		Contract Control International
James Carr	Superindentents Workshop	18/11/2020		Contract Control International

Zane Cronk	Superindentents Workshop	18/11/2020		Contract Control International
Rob Davis	Superindentents Workshop	18/11/2020		Contract Control International
Brendon Ford	Superindentents Workshop	18/11/2020		Contract Control International
Jack Fuller	Superindentents Workshop	18/11/2020		Contract Control International
Paul Goesch	Superindentents Workshop	18/11/2020		Contract Control International
Dilrosh Jayawardene	Superindentents Workshop	18/11/2020		Contract Control International
Nigel Marion	Superindentents Workshop	18/11/2020		Contract Control International
Mike Read	Superindentents Workshop	18/11/2020		Contract Control International
Myrka Robichaud	Superindentents Workshop	18/11/2020		Contract Control International
Les Scott	Superindentents Workshop	18/11/2020		Contract Control International
Micheal Annetts	RF EME Awareness Course	4/01/2021		
Shane Baldry	RF EME Awareness Course	4/01/2021		
Shane Barrett	RF EME Awareness Course	4/01/2021		
Ian Basham	RF EME Awareness Course	4/01/2021		
James Butler	RF EME Awareness Course	4/01/2021		
Tony Corby	RF EME Awareness Course	4/01/2021		
Andrew Derrick	RF EME Awareness Course	4/01/2021		
Rob Drummond	RF EME Awareness Course	4/01/2021		
Chris Fealy	RF EME Awareness Course	4/01/2021		
Daniel Flack	RF EME Awareness Course	4/01/2021		
Jack fuller	RF EME Awareness Course	4/01/2021		
Paul Goesch	RF EME Awareness Course	4/01/2021		
Blake Hingerty	RF EME Awareness Course	4/01/2021		
Dilrosh Jayawardene	RF EME Awareness Course	4/01/2021		
Stephen Ledgard	RF EME Awareness Course	4/01/2021		
Michael Lewis	RF EME Awareness Course	4/01/2021		
Nigel Marion	RF EME Awareness Course	4/01/2021		
Mike Read	RF EME Awareness Course	4/01/2021		
Myrka Robichaud	RF EME Awareness Course	4/01/2021		
Adam Ryall	RF EME Awareness Course	4/01/2021		
Rod Ryan	RF EME Awareness Course	4/01/2021		
Barry Shepherd	RF EME Awareness Course	4/01/2021		
Sean Tiernan	RF EME Awareness Course	4/01/2021		
Brady Gilchrist	Excel Int-Adv	16/06/2021		Class Training
Breah Coleman	Excel Int-Adv	15/06/2021		Class Training

Brendon Ford	Excel Int-Adv	16/06/2021		Class Training
Chris Breen	Excel Int-Adv	15/06/2021		Class Training
Dilrosh Jayawardene	Excel Int-Adv	16/06/2021		Class Training
Eleni McCabe	Excel Int-Adv	16/06/2021		Class Training
George Basham	Excel Int-Adv	15/06/2021		Class Training
Gerard Carr	Excel Int-Adv	15/06/2021		Class Training
Hannah Gillard	Excel Int-Adv	15/06/2021		Class Training
Kate Lowe	Excel Int-Adv	15/06/2021		Class Training
Lyn Breust	Excel Int-Adv	16/06/2021		Class Training
Michele Curran	Excel Int-Adv	16/06/2021		Class Training
Mike Read	Excel Int-Adv	16/06/2021		Class Training
Nicol Kelly	Excel Int-Adv	16/06/2021		Class Training
Pahul Patil	Excel Int-Adv	16/06/2021		Class Training
Shane Baldry	Excel Int-Adv	16/06/2021		Class Training
Simone Fouracre	Excel Int-Adv	16/06/2021		Class Training
Stephen Ledgard	Excel Int-Adv	15/06/2021		Class Training
Tony Corby	Excel Int-Adv	16/06/2021		Class Training
Ali Wood	Excel Int-Adv	15/06/2021		Class Training
Aaron Burnett	Word Basics & Beyond	18/05/2021		Class Training
Blake Hingerty	Word Basics & Beyond	18/05/2021		Class Training
Chris Fealy	Word Basics & Beyond	18/05/2021		Class Training
Daniel Flack	Word Basics & Beyond	18/05/2021		Class Training
George Basham	Word Basics & Beyond	18/05/2021		Class Training
Jack Stuart	Word Basics & Beyond	18/05/2021		Class Training
Jeremy Coleman	Word Basics & Beyond	18/05/2021		Class Training
Luke Townsend	Word Basics & Beyond	18/05/2021		Class Training
Rod Ryan	Word Basics & Beyond	18/05/2021		Class Training
Shane Barrett	Word Basics & Beyond	18/05/2021		Class Training
Ray McCarthy	Word Basics & Beyond	18/05/2021		Class Training
Aaron Burnett	Excel Basics & Beyond	18/05/2021		Class Training
Blake Hingerty	Excel Basics & Beyond	18/05/2021		Class Training
Chris Fealy	Excel Basics & Beyond	18/05/2021		Class Training
Daniel Flack	Excel Basics & Beyond	18/05/2021		Class Training
Jack Stuart	Excel Basics & Beyond	18/05/2021		Class Training
Jeremy Coleman	Excel Basics & Beyond	18/05/2021		Class Training
Luke Townsend	Excel Basics & Beyond	18/05/2021		Class Training
Ray McCarthy	Excel Basics & Beyond	18/05/2021		Class Training
Rod Ryan	Excel Basics & Beyond	18/05/2021		Class Training
Shane Barrett	Excel Basics & Beyond	18/05/2021		Class Training
Brady Gilchrist	Word Int-Adv	19/05/2021		Class Training
Breah COleman	Word Int-Adv	19/05/2021		Class Training
Eleni McCabe	Word Int-Adv	19/05/2021		Class Training
Gerard Carr	Word Int-Adv	19/05/2021		Class Training

Lyn Breust	Word Int-Adv	19/05/2021		Class Training
Les Scott	Word Int-Adv	19/05/2021		Class Training
Cecilia Backman	Word Int-Adv	20/05/2021		Class Training
Hannah Gillard	Word Int-Adv	20/05/2021		Class Training
Mike Read	Word Int-Adv	20/05/2021		Class Training
Nicol Kelly	Word Int-Adv	20/05/2021		Class Training
Simone Fouracre	Word Int-Adv	20/05/2021		Class Training
Zac Mahon	Word Int-Adv	20/05/2021		Class Training
Ali Wood	Word Int-Adv	20/05/2021		Class Training
Jack Fuller	Dogging	26/02/2021		Provision Safety
Les Scott	Dogging	26/02/2021		Provision Safety
Rod Ryan	Dogging	26/02/2021		Provision Safety
Jack Fuller	Rigging	12/03/2021		Provision Safety
Les Scott	Rigging	12/03/2021		Provision Safety
Rod Ryan	Rigging	12/03/2021		Provision Safety
Dilrosh Jayawardene	AQF3	15/03/2021	15/03/2024	Chemcert
Dean Wiggins	AQF3	15/03/2021	15/03/2024	Chemcert
James Butler	AQF3	15/03/2021	15/03/2024	Chemcert
Dean Wiggins	Forklift Licence	1/04/2021		Mick Humphries Training Group
Adam Ryall	Dogging	16/04/2021		Provision Safety
Liam Moston	Dogging	16/04/2021		Provision Safety
Blake Hingerty	Dogging	16/04/2021		Provision Safety
Adam Ryall	Rigging	23/04/2021		Provision Safety
Liam Moston	Rigging	23/04/2021		Provision Safety
Blake Hingerty	Rigging	23/04/2021		Provision Safety
Aaron Burnett	HR Licence	24/05/2021		Service NSW
Liam Wlech	HR Licence	25/05/2021		Service NSW
Blake Hingerty	HR Licence	26/05/2021		Service NSW
Jack Fuller	HR Licence	31/05/2021		
Dean Wiggins	EWP	21/05/2021		Mick Humphries Training Group
Jeremy Coleman	Working at Heights	9/04/2021	9/04/2024	Mick Humphries Training Group
Liam Moston	Working at Heights	9/04/2021	9/04/2024	Mick Humphries Training Group
Dean Wiggins	Working at Heights	9/04/2021	9/04/2024	Mick Humphries Training Group
Dean Wiggins	Confined Spaces	10/03/2021	10/03/2024	Mick Humphries Training Group
Applying Values at Goldenfields Water - all staff				

Preventing and Harassment - all staff				

Continuous Improvement Plan

Table 19 below is a summary of all items in the Continuous Improvement plan that have been completed or actioned during the 2020/21 reporting period.

Table 19. Continuous improvement plan activities that have progressed, been completed or been added during the period 2019/20

Action no.	Item	Progress	Date for completion	Who is responsible
1	*GWCC to consider installing an online free chlorine analyser at Oura disinfection point (after 30 min contact time).*	*Burket analyser has been installed and operating since early 2020 - Completed*	*July 2021*	*Manager Production and Services*
4	*GWCC to conduct internal training (or refresher training) on correct sampling techniques*	*all compliance sampling is conducted by Water Quality Staff now who are trained and specialised. The only testing that occurs from distribution staff is now just chlorine operational samples. Water Quality Staff continue development, and all maintain their cert 3 in water treatment plant operations - Completed*	*July 2021*	
13	*GWCC to consider installing online chlorine analysers at Oura PS*	*works were complete and commissioned in early 2020 - Completed*	*July 2021*	
23	*GWCC to complete live chlorine monitoring system for reticulation system*	*staff undertake significant amount of additional operational testing for the retic systems - completed*	*July 2021*	*Manager Production and Services*
24	*GWCC to consider developing SOP for fluoride hopper cleaning*	*new induction procedure was completed and implemented in 2020 - completed*	*July 2021*	*Manager Production and Services*
26	*GWCC to develop SOPs for operational and supporting activities, such as plant operation, mains break repair, mains flushing, etc.*	*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 - Completed*	*July 2021*	*Manager Production and Services*
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 - Completed*	*July 2021*	*Manager Engineering*
31	*Determine the level of water quality training required for new staff and add to induction program*	*Water quality staff now managing all compliance requirements of the DWMS. Their training is being developed in line with the National Training Package 2020. we are working with the NSW Water Directorate and TWRRP Team for access to new training providers which has delayed our continual*	*July 2021*	*Manager Production and Services*

Action no.	Item	Progress	Date for completion	Who is responsible
		development requirements. Staff undertake a review of their Staff Development Plans every 6 months - Completed		
32	*Develop and implement competency checklist/schedule on sampling methodology*	*All compliance sampling conducted by Quality staff now who hold a minimum of cert 3 in water treatment operations. - Completed*	*July 2021*	*Manager Production and Services*
46	*Identify existing preventive measures from catchment to consumer for each significant hazard or hazardous event and estimate the residual risk*	*GWCC staff monitor and maintain its raw water systems via monthly monitoring lab result. In addition to that we are altered by any changes to Murrumbidgee discharges from Water NSW - Completed*	*July 2021*	*Manager Engineering*
49	*Identify procedures required for processes and activities from catchment to consumer*	*this is documented and managed as part of our DWMS and associated annual reviews - Completed*	*July 2021*	*Manager Production and Services*
53	*Establish a consumer complaint and response program, including appropriate training of employee*	*process is now business as usual with utilisation of council's customer service complaints system utilised to log and report on issues - Completed*	*July 2021*	*Manager Engineering*
56	*Develop mechanisms and communication procedures to increase employee's awareness of and participation in drinking water quality management*	*GWCC issue relevant update emails, SOP's and guidelines to all staff when changes occur. Additional training including scenario training is undertaken as well. Scenario training was conducted with Bulk Councils involved in late 2020 - Completed*	*July 2021*	*Manager Engineering*
60	*establish programs to increase understanding of the water supply system*	*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 Jugiong WTP and gives an overview of catchment to tap process for students and/or community groups if requested - Completed*	*July 2021*	
76	*Bulk User Service Level Agreement*	*Water Qual component has been completed and a draft is currently being developed by Lindsay Taylor Lawyers - Completed*	*July 2021*	
78	*Emergency response training*	*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 quality incidents that are to be used for management - Completed*	*July 2021*	

Review of DWMS Implementation

Adoption of the Drinking water Management System occurred in February 2018 and the implementation has been reviewed annually. 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 20. 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 2019/20	*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 2020/21	*Geoff Veneris and Chris Breen*	*Operational and verification 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*

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Table 21. Summary of external reviews.

Date	Reviewer	Scope	Findings	Actions
			No external reviews have been undertaken	

Reservoir inspections

GWCC conducted regular reservoir inspections throughout the reporting period. They have a schedule for weekly 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 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 not so important. (At this point a formal electronic database has not been kept for all inspections) however condition assessments completed

by Aqualift are managed within the ASAM database. GWCC is currently working to implement the reservoir inspections in WaterOutlook so that all information can be gathered electronically and acted on accordingly. Currently all internal risk management processes are managed via a detailed prioritisation spreadsheet with works distributed out to relevant divisions for works to be completed.

Detailed and condition rating reservoir Inspections were conducted by Aqualift (Councils contracted divers for cleaning and inspection) during the reporting period. A full report of their findings has been provided in Appendix. C below is a summary of their report.

Table 22. Summary of reservoir inspections and outcomes

Date	Reservoirs inspected	Findings	Corrective actions
12/5/2021	Ardlethan Town	- The entry hatch covers are light weight, and they would be easy to break into. - There is a short length of heavily corroded ladder present that is unsafe to use. It should be replaced with a NextStep FRP ladder 10700mm long with a 400mm standoff to fit below the entry hatch effectively. The existing davit system should only be used as a secondary rescue device, with a suitable vertical ladder as the primary means of entering and exiting the tank safely	- Replace entry hatches with an appropriate material - Remove corroded ladder - Replace davit device
11/5/2021	Ariah Park Terminal No 1	- There is corrosion occurring inside the entry hatch framing - A new vertical ladder 5500mm long should be mounted onto the floor and the side of the entry hatch frame, with intermediate supports 1200mm long.	- It should be relocated closer to the wall and made from aluminium to match the rest of the platform materials.
11/5/2021	Ariah Park Terminal No 2	- There is corrosion occurring inside the entry hatch framing - A new vertical ladder 5500mm long should be mounted onto the floor and the side of the entry hatch frame, with intermediate supports 1200mm long.	- It should be relocated closer to the wall and made from aluminium to match the rest of the platform materials.
12/5/2021	Ariah Park Town	- The entry hatch cover is light weight and the width of 500mm is poorly sized for divers or operators wearing confined space equipment. Future upgrades should allow more room to access the tank safely. - There is a short length of heavily corroded ladder present that is unsafe to use. It should be replaced with a Nextep FRP ladder 10600mm long with a 400mm standoff to fit below the entry hatch effectively	
25/6/2021	Barellan High Level	- The safety cable system fitted inside the caged ladders makes climbing difficult and does not	

		improve the overall safety on the tank. - The walls and floor have been recoated and many repairs have been carried out. There are fine cracks present in the floor coating and many blisters are also developing	
25/6/2021	Barellan Terminal 008	- The roof vents have no upstream flashings fitted to drain away the roof water and this ponding will corrode the adjacent roof sheets. Two of the turbine vents have also frozen and need to be replaced before they break away and leave the tank open to bird entry - There are significant areas of wrinkled liner material present, and this makes vacuuming or sweeping of the tank difficult. There are several sections of floor liner which are covering over small rocks, which are present in the underlay material. The liner will split at these areas and require patching when future leakage occurs.	
23/6/2021	Bectric No 1 012	- The entry hatch cover is lightweight, and it is unsealed around the edges. Small birds and vermin can enter past the unsealed roof edge corrugations. - The galvanised centre post and base are heavily corroded and should be replaced with a SS Aquapost	
23/6/2021	Bectric No 2 013	- The entry hatch cover is lightweight, and it is unsealed around the edges. The roof edge corrugations are not sealed against bird or vermin entry and there was one dead bird in the sediment - The galvanised centre post and base are heavily corroded and should be replaced with a SS Aquapost	
15/5/2021	Coolamon North HL	- The hatch is small, and the cover is light weight. It is also not effectively sealed around the edges of the frame where the internal ladder stiles extend through. - There is a significant amount of corrosion nodules present on the lower wall areas and most appear to be passivated. However there have been patch repairs carried out across the floor and some sections are still displaying active corrosion.	

		The CP system needs to be monitored and adjusted accordingly	
15/5/2021	Coolamon North LL	- The external access ladder and roof platform system have been upgraded. - The two main rafters have significant surface corrosion present, as the original coating has peeled off. They are still structurally sound however	
16/5/2021	Coolamon South HL	- The external areas appear to be in good condition - 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	
19/5/2021	Cowangs No 1 034	- There is an upstream flashing between the roof sheets and the platform area which is creating ponding and contamination build-up. - The floor coating has totally blistered, some the size of cricket balls. There are several areas on the wall floor section where the coating has separated away, but it is difficult to ascertain if leakage is occurring. There is also blistering present on the wall coating, but to a lesser degree than the floor condition.	
20/5/2021	Cowangs No 2 035	- There is an upstream flashing between the roof sheets and the platform area which is creating ponding and contamination build-up. - The floor coating has totally blistered, some the size of cricket balls. There is also blistering present on the wall coating, but to a lesser degree than the floor condition	
20/5/2021	Cowangs No 3 036	- There is an upstream flashing between the roof sheets and the platform area which is creating ponding and contamination ingress. The roof ridge capping is also not well sealed against leaf litter ingress, as evidenced by the leaf debris inside the tank - There is corrosion on the overflow riser and base	
17/5/2021	Junee BT No 1 059	- The entry hatch requires a raised edge and an over lapping cover to	

		seal more effectively. - The internal walls have had many leak repairs carried out in the past and the sealant is now blistering in a lot of areas...it will fail prematurely. There are two SS ladder sections fitted to an existing intermediate platform which is heavily corroded.	
18/5/2021	Junee BT No 3 116	- There is slight external seepage present in two wall base areas @ 10 and 2 o'clock. There is a foam material on the external and internal wall base area and possibly a water stop system in between. In both cases there is a crack running from beneath the wall which may be causing the problem. - The internal areas appear to be OK	
22/6/2021	Tara 095	- A dedicated platform area is required to make the tank safe to work on and the small entry hatch is neither sealed or effectively secured against unauthorised access - There are fine cracks and some root ingress in the wall floor area, but no obvious external leakage is noted at present.	
13/5/2021	Temora BT 096	- The platform area and associated hatches are not effectively sealed against contamination entry. - The internal areas appear to be in good condition.	
13/5/2021	Temora East 097	- The external areas appear to be in good condition - The internal areas appear to be OK	
14/5/2021	Temora Town HL	- The entry hatch is small for safe diver entry. It should have been enlarged while the roof was removed during the recoating process. The front flashing section under the entry hatch frame has several conduit holes which are not effectively sealed against birds or vermin. There are no effective handrails fitted around the working area on the roof. This would have been a minor cost while the recoating project was taking place - There are several coating delamination defects present, under the overflow base and around the edges of the wall hatch and scour	

Appendix A – Water quality data

Water Quality Graphs

Jugiong Water Treatment Plan

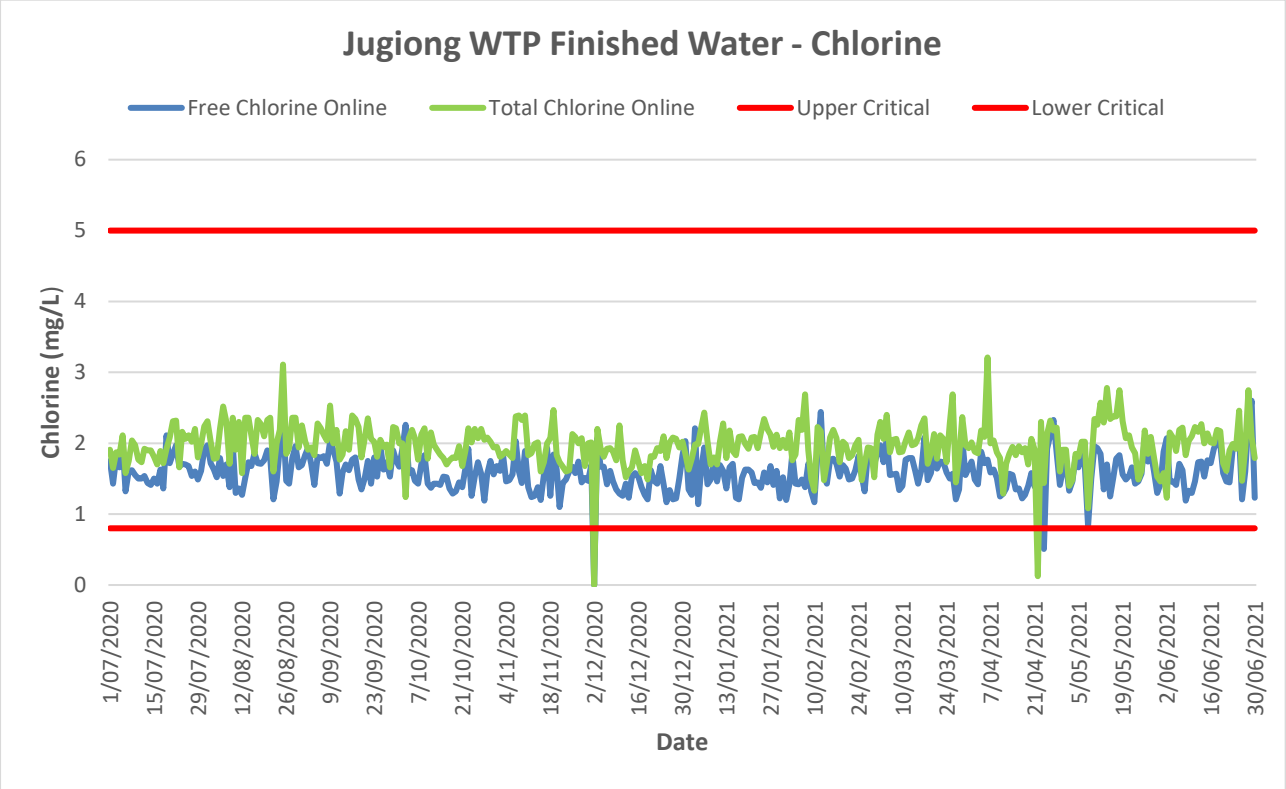
Jugiong Water Treatment Plant data has been represented in the following graphs and commentary. The following data has been taken from the new Wateroutlook Database that GWCC is currently building with an external party, SafeGroup.

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 for disinfection.

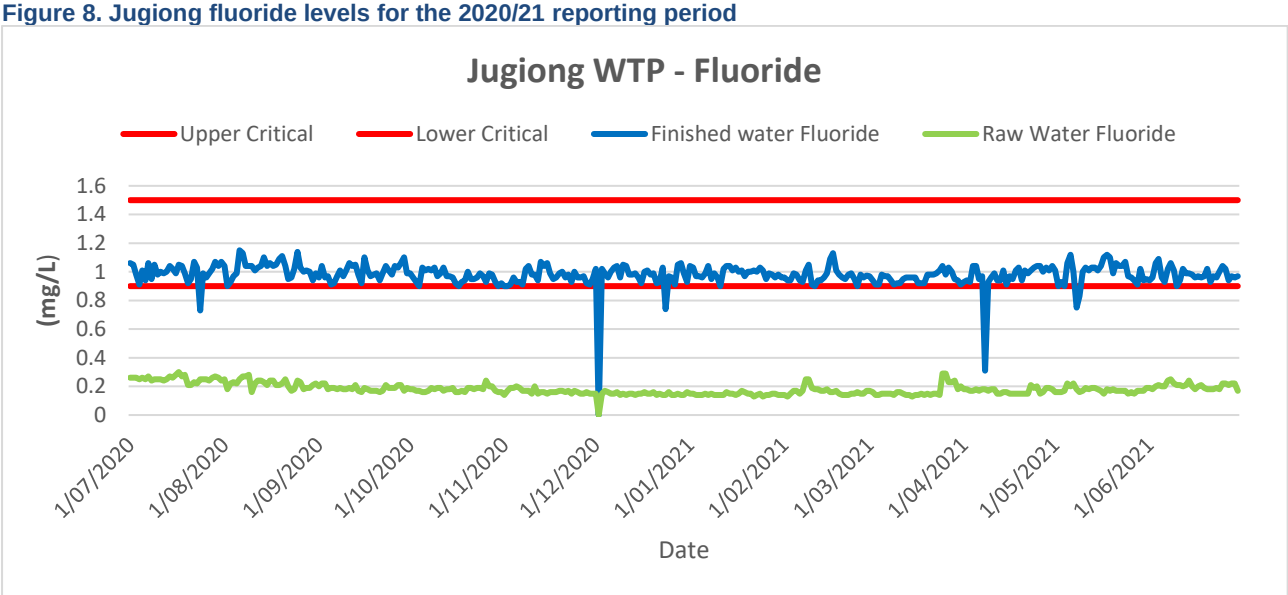
- The chlorine target leaving the WTP is 1.8mg/L with amber alerts sent if chlorine drops below 1.2mg/L or goes over 2mg/L.
- The alert becomes critical with DWMS protocols implemented when chlorine levels drop below 0.8mg/L in summer and 0.5mg/L in winter. Figure 5 below represents the Finished water 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 4 times throughout the reporting period which was due to analyser failure requiring recalibration.
- A free/residual chlorine of 0.124mg/L was the lowest recorded result on the 22/4/2021. The highest total cl recorded was on the 6/4/2021 with a value of 3.21mg/L.
- The average Free Chlorine for the reporting year was 1.6mg/L and average Total chlorine reading was 1.98mg/L.

Figure 7. Jugiong chlorine levels for the 2020/21 reporting period



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 0.15 mg/L (Raw Water concentration) and a maximum value of 1.15 mg/L (Finished water Concentration). The Finished water Fluoride at the Jugiong Water Treatment Plant has failed to meet its minimum value of 0.95mg/L on only 5 occasions throughout the reporting period. These exceedances were due to equipment failure or breakdown.

Figure 8. Jugiong fluoride levels for the 2020/21 reporting period



BOM rainfall data indicates that the spikes in the Jugiong raw water can be attributed to heavy and /or sustained rain events that occurred upstream of the Water Treatment Plant.

Figure 9. Jugiong raw water turbidity for the 2020/21 reporting period

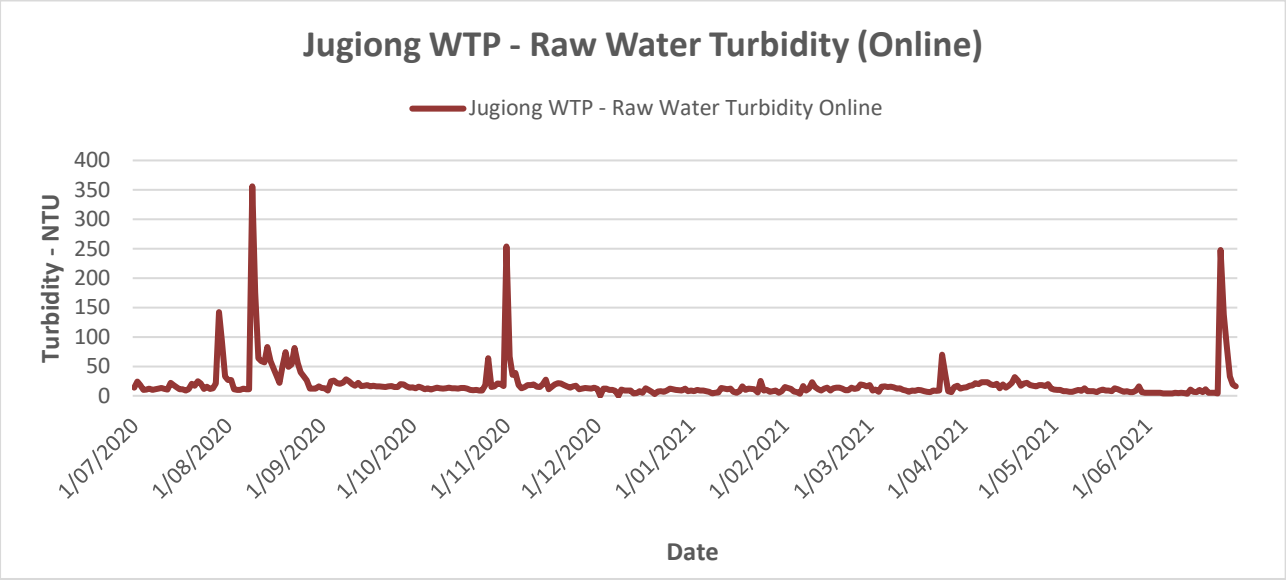


Figure 10. Jugiong finished water turbidity for the 2020/21 reporting period

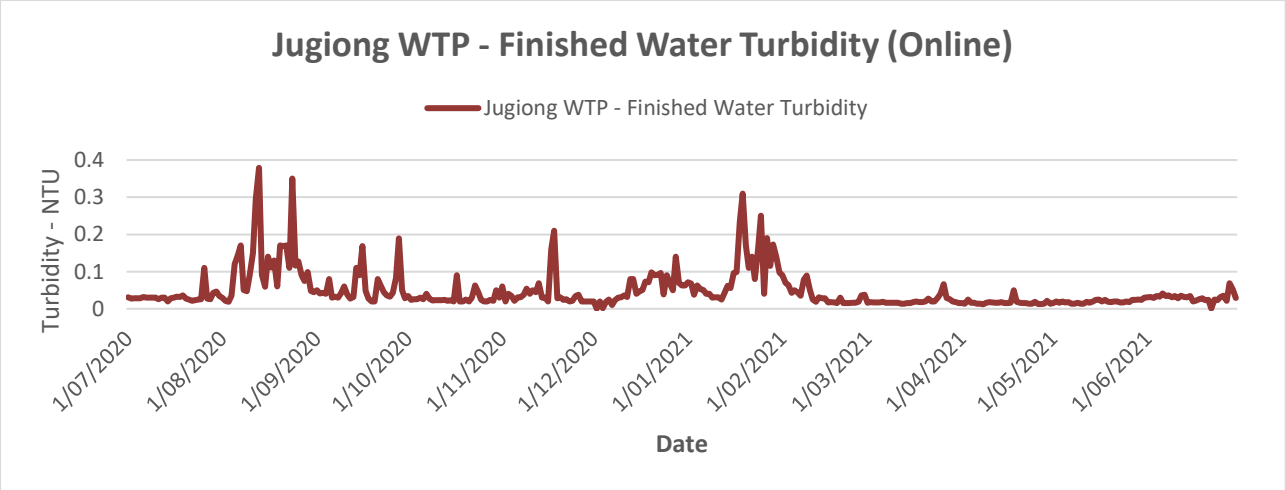
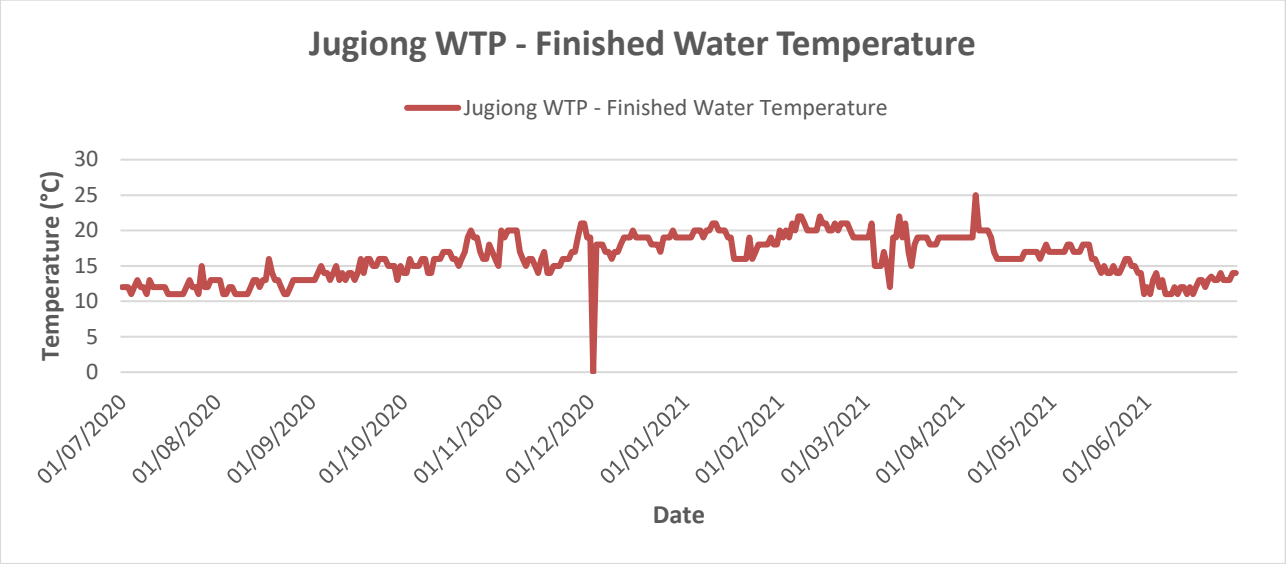


Figure 11. Jugiong finished water temperature for the 2020/21 reporting period



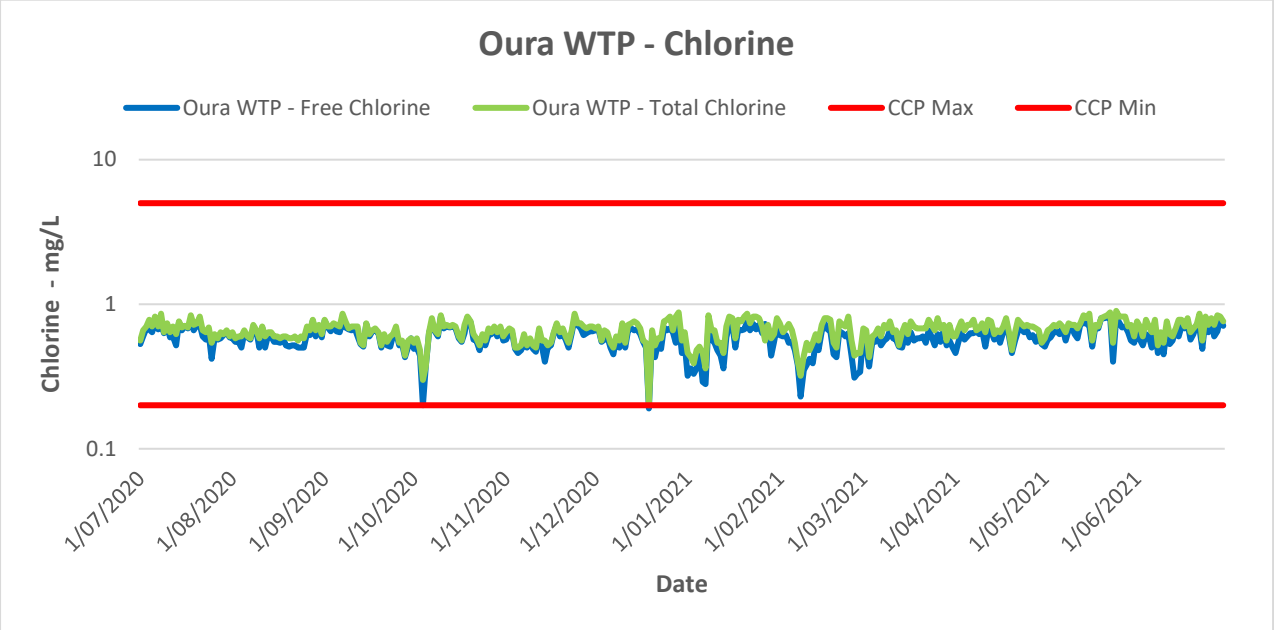
Oura Treatment Plant

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 of the ground water extracted from bores in Gumly Borefield. It is used to eliminate chlorine sensitive pathogens for disinfection. The chlorine target for GWCC coming out of the Oura WTP is 0.5 mg/L. An amber alert is issued through WaterOutlook when chlorine residual 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.

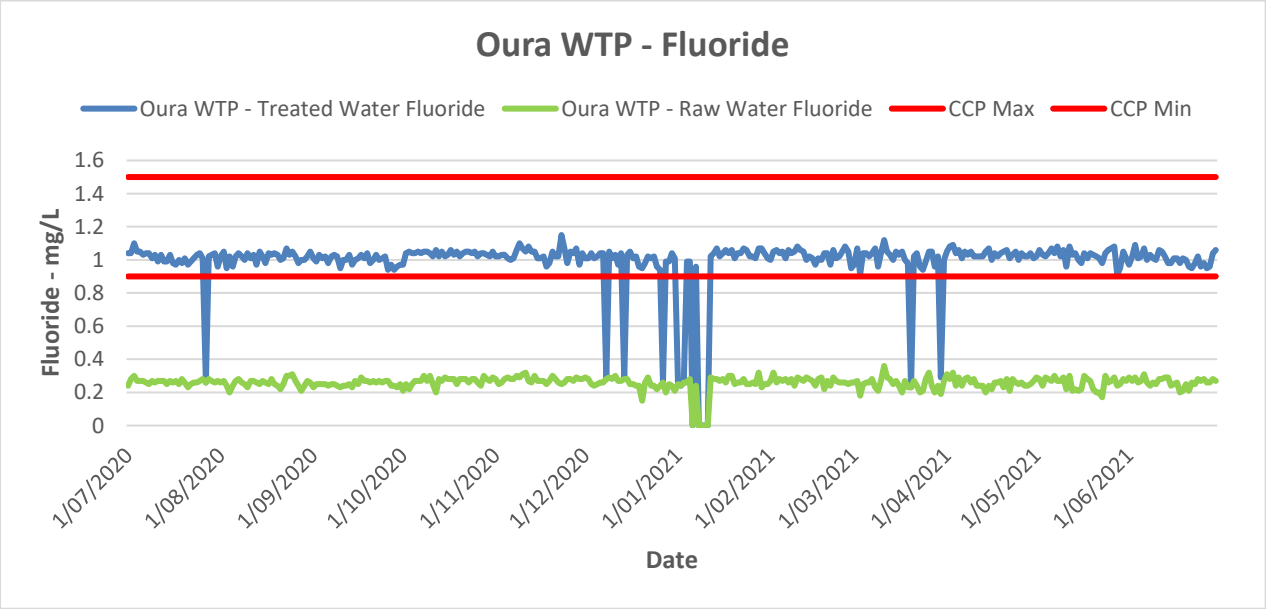
Figure 12. Oura chlorine levels for the 2020/21 reporting period



As can be seen in Figure 12, 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. 0.59mg/L (FCl) and 0.66mg/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. Overall a very good result for the Oura WTP operations.

There were no exceedances for chlorine dosing in the 2020/21 financial year.

Figure 13. Oura fluoride levels for the 2020/21 reporting period



As can be seen in Figure 13, the raw fluoride content from the Oura Bores is very consistent remaining mostly between 0.2mg/L and 0.4mg/L for the reporting period 20/21. Raw water fluoride averaged 0.26mg/L for the 20/21 period.

The treated water fluoride was mostly consistent over the reporting period only recording 5 exceedances. **All exceedances were be attributed to equipment failure.**

Figure 14. Oura collection tank turbidity levels for the 2020/21 reporting period

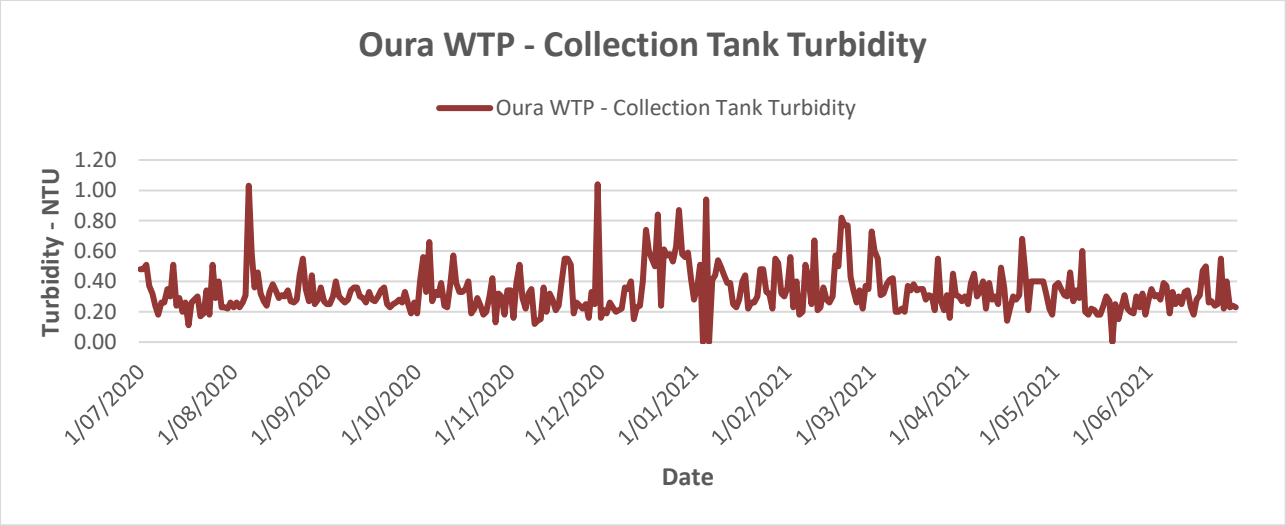


Figure 14 shows the turbidity at the Oura collection tank. Australian Drinking Water Guidelines (ADWG) indicates that turbidity should be <5 NTU (Nephelometric Turbidity Units). As can be seen, there have been no exceedances of this limit for the 2020/21 reporting period.

Figure 15. Oura treated water temperature for the 2020/21 reporting period

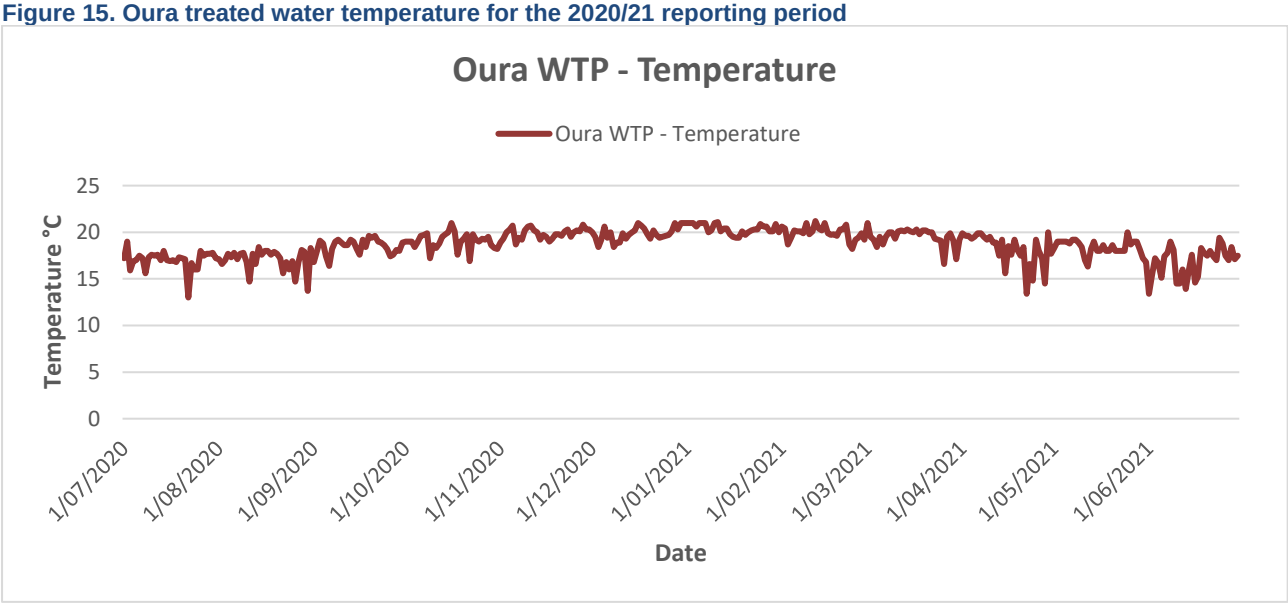


Figure 15 shows the relationship between the temperatures of the treated water with time over the reporting period. As you would surmise, it follows a seasonal trend in that the treated water is warmer in summer and colder in winter.

Water Quality Data Summary

Include a summary of available water quality data over the reporting period here:

- *Raw water*
- *Treated water*
- *Reticulation*
- *Verification*

This data has been generated using the monitoring template spreadsheet, located in the NSW Drinking Water database

Table 23. Raw water measured parameters pertaining to water quality in the 2020/21 reporting period - Jugiong

Parameter	Minimum	Average	Maximum	Lower Critical Limit	Upper Critical Limit	No. Samples
Fluoride	0.13	0.18	0.3			365
Turbidity - Online	0	10.01	356			365
Turbidity Offline	1.2	21.08	482			365
Colour	30	63	580			365
pH	7.05	7.69	8.12			365
Temperature	10	16.8	23			365

Table 24. Raw water measured parameters pertaining to water quality in the 2020/21 reporting period - Oura

Parameter	Minimum	Average	Maximum	Lower Critical Limit	Upper Critical Limit	No. Samples
Fluoride	0.15	0.26	0.36			365
pH	6.12	7.19	7.86			365
Temperature	13	18.71	21.2			365
Turbidity	0.11	0.34	1.04			365

Table 25. Treated water measured parameters pertaining to water quality in the 2020/21 reporting period - Jugiong

Parameter	Minimum	Average	Maximum	Lower Critical Limit	Upper Critical Limit	No. Samples
Turbidity Online	0.001	0.047	0.379			365
Turbidity – Offline	0.02	0.17	0.61		1	365
Colour	5	5	5			365
pH	7.05	7.48	7.93	7	8	365
Temperature	11	16.1	25			365
Alkalinity	10	89	800			365
Hardness	60	104.8	210			365
Free Chlorine – Online	0.51	1.6	2.6	0.8	5	366
Total chlorine – Online	0.87	1.76	2.65			365
Fluoride	0.31	0.98	1.15	0.9	1.5	365

Table 26. Treated water measured parameters pertaining to water quality in the 2020/21 reporting period - Oura

Parameter	Minimum	Average	Maximum	Lower critical limit	Upper critical limit	No. samples
Fluoride	0.23	1	1.15	0.9	1.5	365
pH	6.38	7.38	7.89			365
Free Chlorine	0.04	0.59	0.82	0.2	5	365
Total Chlorine	0.2	0.66	0.9			365
Temperature	13	18.71	21.2			365

Reticulation Water Quality Reporting

Table 27. Water quality parameters in Jugiong reticulation - Chemistry

Characteristic	Guideline Value	Min	Mean	Max	Sample Count	% meeting guideline values
Aluminium	0.2000	0.02	0.0233	0.03	3	100.00
Antimony	0.0030	0.00005	0.0001	0.0001	3	100.00
Arsenic	0.0100	0.0005	0.0005	0.0005	3	100.00
Barium	2.0000	0.0232	0.0303	0.0384	3	100.00
Boron	4.0000	0.0089	0.0101	0.0109	3	100.00
Cadmium	0.0020	0.00005	0.0001	0.00005	3	100.00
Calcium	10000.0000	16.8	18.3000	20.4	3	100.00
Chloride	250.0000	29	36.0000	48	3	100.00
Chromium	0.0500	0.0005	0.0005	0.0005	3	100.00
Copper	2.0000	0.003	0.0047	0.007	3	100.00
Fluoride	1.5000	0.83	0.8567	0.89	3	100.00
Iodine	0.5000	0.01	0.0133	0.02	3	100.00
Iron	0.3000	0.005	0.0050	0.005	3	100.00
Lead	0.0100	0.0001	0.0002	0.0005	3	100.00
Magnesium	10000.0000	7.69	9.1767	10.82	3	100.00
Manganese	0.5000	0.0089	0.0173	0.0242	3	100.00
Mercury	0.0010	0.0004	0.0004	0.0004	3	100.00
Molybdenum	0.0500	0.0003	0.0003	0.0003	3	100.00
Nickel	0.0200	0.0004	0.0005	0.0006	3	100.00
Nitrate	50.0000	2	2.0000	2	3	100.00
Nitrite	3.0000	0.05	0.0500	0.05	3	100.00
pH	6.5 - 8.5	7.5	7.6000	7.7	3	100.00
Selenium	0.0100	0.0035	0.0035	0.0035	3	100.00
Silver	0.1000	0.0001	0.0001	0.0001	3	100.00
Sodium	180.0000	28	37.3333	44	3	100.00
Sulfate	500.0000	52	61.3333	79	3	100.00
Total Dissolved Solids (TDS)	600.0000	147	175.0000	213	3	100.00
Total Hardness as CaCO3	200.0000	73.6	83.4667	95.5	3	100.00
True Colour	15.0000	0.5	0.8333	1	3	100.00
Turbidity	5.0000	0.05	0.4000	1.1	3	100.00
Uranium	0.0170	0.00005	0.0001	0.0001	3	100.00
Zinc	3.0000	0.05	0.0700	0.09	3	100.00

Table 28. Water quality parameters in Oura reticulation - Chemistry

Characteristic	Guideline Value	Min	Mean	Max	Sample Count	% meeting guideline values
Aluminium	0.2000	0.005	0.0055	0.01	11	100.00
Antimony	0.0030	0.00005	0.0001	0.00005	11	100.00
Arsenic	0.0100	0.001	0.0015	0.003	11	100.00
Barium	2.0000	0.0122	0.0139	0.0156	11	100.00
Boron	4.0000	0.0094	0.0173	0.0233	11	100.00
Cadmium	0.0020	0.00005	0.0001	0.00005	11	100.00
Calcium	10000.0000	10.1	12.1273	14.6	11	100.00
Chloride	250.0000	15	20.0909	28	11	100.00
Chromium	0.0500	0.0005	0.0005	0.001	11	100.00
Copper	2.0000	0.001	0.0061	0.015	11	100.00
Fluoride	1.5000	0.91	0.9973	1.16	11	100.00
Fluoride (WU result)	1.5000	0.91	1.0055	1.07	11	100.00
Fluoride Ratio	0.8 - 1.2	0.9	1.0109	1.11	11	100.00
Iodine	0.5000	0.02	0.0373	0.13	11	100.00
Iron	0.3000	0.005	0.0550	0.28	11	100.00
Lead	0.0100	0.0001	0.0006	0.0016	11	100.00
Magnesium	10000.0000	8.64	9.3873	10.77	11	100.00
Manganese	0.5000	0.0512	0.0922	0.1183	11	100.00
Mercury	0.0010	0.0004	0.0004	0.0004	11	100.00
Molybdenum	0.0500	0.0001	0.0001	0.0002	11	100.00
Nickel	0.0200	0.0002	0.0002	0.0002	11	100.00
Nitrate	50.0000	0.5	0.5455	1	11	100.00
Nitrite	3.0000	0.05	0.0500	0.05	11	100.00
pH	6.5 - 8.5	7.7	7.8091	8	11	100.00
Selenium	0.0100	0.0035	0.0035	0.0035	11	100.00
Silver	0.1000	0.0001	0.0001	0.0001	11	100.00
Sodium	180.0000	17	20.0909	24	11	100.00
Sulfate	500.0000	0.5	4.1364	7	11	100.00
Total Dissolved Solids (TDS)	600.0000	97	109.3636	126	11	100.00
Total Hardness as CaCO3	200.0000	61.5	68.9455	80.8	11	100.00
True Colour	15.0000	0.5	0.5909	1	11	100.00
Turbidity	5.0000	0.05	0.6182	1.6	11	100.00
Uranium	0.0170	0.0002	0.0004	0.0006	11	100.00
Zinc	3.0000	0.04	0.0545	0.08	11	100.00

Table 29. 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	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	0.0093	0.0093	0.0093	1	100.00
Boron	4.0000	0.04	0.0400	0.04	1	100.00
Cadmium	0.0020	0.00005	0.0001	0.00005	1	100.00
Calcium	10000.0000	10.9	10.9000	10.9	1	100.00
Chloride	250.0000	40	40.0000	40	1	100.00
Chromium	0.0500	0.0005	0.0005	0.0005	1	100.00
Copper	2.0000	0.067	0.0670	0.067	1	100.00
Fluoride	1.5000	0.69	0.6900	0.69	1	100.00
Iodine	0.5000	0.05	0.0500	0.05	1	100.00
Iron	0.3000	0.07	0.0700	0.07	1	100.00
Lead	0.0100	0.0005	0.0005	0.0005	1	100.00
Magnesium	10000.0000	6.85	6.8500	6.85	1	100.00
Manganese	0.5000	0.01	0.0100	0.01	1	100.00
Mercury	0.0010	0.0004	0.0004	0.0004	1	100.00
Molybdenum	0.0500	0.0003	0.0003	0.0003	1	100.00
Nickel	0.0200	0.0002	0.0002	0.0002	1	100.00
Nitrate	50.0000	0.5	0.5000	0.5	1	100.00
Nitrite	3.0000	0.05	0.0500	0.05	1	100.00
pH	6.5 - 8.5	7.7	7.7000	7.7	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	44	44.0000	44	1	100.00
Sulfate	500.0000	7	7.0000	7	1	100.00
Total Dissolved Solids (TDS)	600.0000	147	147.0000	147	1	100.00
Total Hardness as CaCO3	200.0000	55.4	55.4000	55.4	1	100.00
True Colour	15.0000	0.5	0.5000	0.5	1	100.00
Turbidity	5.0000	0.2	0.2000	0.2	1	100.00
Uranium	0.0170	0.00005	0.0001	0.00005	1	100.00
Zinc	3.0000	0.05	0.0500	0.05	1	100.00

Table 30. 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	0.0003	0.0005	2	100.00
Arsenic	0.0100	0.001	0.0015	0.002	2	100.00
Barium	2.0000	0.0866	0.0885	0.0904	2	100.00
Boron	4.0000	0.0332	0.0368	0.0403	2	100.00
Cadmium	0.0020	0.00005	0.0003	0.0005	2	100.00
Calcium	10000.0000	22.5	24.7000	26.9	2	100.00
Chloride	250.0000	97	100.5000	104	2	100.00
Chromium	0.0500	0.0005	0.0013	0.002	2	100.00
Copper	2.0000	0.021	0.0210	0.021	2	100.00
Fluoride	1.5000	0.43	0.4600	0.49	2	100.00
Iodine	0.5000	0.13	0.1350	0.14	2	100.00
Iron	0.3000	0.005	0.0075	0.01	2	100.00
Lead	0.0100	0.0008	0.0010	0.0012	2	100.00
Magnesium	10000.0000	18.03	20.0850	22.14	2	100.00
Manganese	0.5000	0.0016	0.0026	0.0035	2	100.00
Mercury	0.0010	0.0004	0.0004	0.0004	2	100.00
Molybdenum	0.0500	0.0019	0.0024	0.0029	2	100.00
Nickel	0.0200	0.0005	0.0008	0.0011	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	7.2	7.3500	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	74	81.5000	89	2	100.00
Sulfate	500.0000	36	38.0000	40	2	100.00
Total Dissolved Solids (TDS)	600.0000	336	336.5000	337	2	100.00
Total Hardness as CaCO3	200.0000	130.4	144.3500	158.3	2	100.00
True Colour	15.0000	1	1.0000	1	2	100.00
Turbidity	5.0000	0.6	0.8500	1.1	2	100.00
Uranium	0.0170	0.0031	0.0034	0.0037	2	100.00
Zinc	3.0000	0.1	0.1150	0.13	2	100.00

Table 31. 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	0.0127	0.0000	0.1125	0	1	79	1	0	0	98.73
Free Chlorine	0.2 - 5	mg/L	0.2481	0.0600	0.3491	0.01	1.97	78	50	1	0.02	35.90
pH	6.5 - 8.5		8.0604	8.0150	0.3873	7.25	9.22	78	11	8.69	7.47	85.90
Temperature	30.0000	C	17.5456	17.5000	4.6240	8.9	26.6	79	0	25	10.4	100.00
Total Chlorine	5.0000	mg/L	0.4038	0.2600	0.4169	0.05	2.2	79	0	1.35	0.05	100.00
Total Coliforms	0.0000	mpn/100 mL	4.3797	0.0000	23.4446	0	145	79	5	5	0	93.67
Turbidity	5.0000	NTU	0.6435	0.3550	0.7746	0.13	4.04	78	0	2.7	0.19	100.00

Table 32. 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	0.0325	0.0000	0.5408	0	9	277	1	0	0	99.64
Free Chlorine	0.2 - 5	mg/L	0.4375	0.3950	0.2523	0.02	1.42	276	40	0.97	0.1	85.51
pH	6.5 - 8.5		8.3685	8.3800	0.4591	7.42	9.33	276	115	9.08	7.59	58.33
Temperature	30.0000	C	18.6981	18.3000	5.5515	6	31.6	276	3	27.6	10.6	98.91
Total Chlorine	5.0000	mg/L	0.5294	0.4800	0.2701	0.03	1.7	276	0	1.1	0.16	100.00
Total Coliforms	0.0000	mpn/100 mL	0.0866	0.0000	0.8207	0	10	277	6	0	0	97.83
Turbidity	5.0000	NTU	0.5007	0.4100	0.3583	0.11	2.63	276	0	1.08	0.17	100.00

Table 33. 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	66	0	0	0	100.00
Free Chlorine	0.2 - 5	mg/L	0.3806	0.3450	0.2762	0.02	1.6	66	18	0.72	0.02	72.73
pH	6.5 - 8.5		7.6340	7.5500	0.4747	6.96	9.2	58	3	8.68	7.08	94.83
Temperature	30.0000	C	21.1333	23.5000	6.5062	10	31.5	66	1	29.2	10.8	98.48
Total Chlorine	5.0000	mg/L	0.4636	0.4500	0.2984	0.05	1.8	66	0	0.8	0.09	100.00
Total Coliforms	0.0000	mpn/100 mL	0.8485	0.0000	4.4141	0	31	66	4	2	0	93.94
Turbidity	5.0000	NTU	0.5455	0.3800	0.4673	0.16	2.4	66	0	1.76	0.17	100.00

Table 34. 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	26	0	0	0	100.00
Free Chlorine	0.2 - 5	mg/L	0.3112	0.2600	0.2154	0.07	0.91	26	8	0.76	0.09	69.23
pH	6.5 - 8.5		7.3558	7.3450	0.2392	6.95	8	26	0	7.66	6.97	100.00
Temperature	30.0000	C	20.2538	20.4500	6.0324	11	30.7	26	1	28.3	11.6	96.15
Total Chlorine	5.0000	mg/L	0.4081	0.3650	0.2246	0.12	0.98	26	0	0.94	0.12	100.00
Total Coliforms	0.0000	mpn/100 mL	0.0000	0.0000	0.0000	0	0	26	0	0	0	100.00
Turbidity	5.0000	NTU	0.5538	0.4150	0.4564	0.16	2.1	26	0	1.7	0.16	100.00

Verification Monitoring – Jugiong

Table 35. Summary of NSW Health's drinking water monitoring program data for the Jugiong scheme

Analysis Type	Characteristic	Guideline Value	Units	Min	Mean	Max	Sample Count
Chemistry	Aluminium	0.2000	mg/L	0.02	0.0233	0.03	3
	Antimony	0.0030	mg/L	0.00005	0.0001	0.0001	3
	Arsenic	0.0100	mg/L	0.0005	0.0005	0.0005	3
	Barium	2.0000	mg/L	0.0232	0.0303	0.0384	3
	Boron	4.0000	mg/L	0.0089	0.0101	0.0109	3
	Cadmium	0.0020	mg/L	0.00005	0.0001	0.00005	3
	Calcium	10000.0000	mg/L	16.8	18.3000	20.4	3
	Chloride	250.0000	mg/L	29	36.0000	48	3
	Chromium	0.0500	mg/L	0.0005	0.0005	0.0005	3
	Copper	2.0000	mg/L	0.003	0.0047	0.007	3
	Fluoride	1.5000	mg/L	0.83	0.8900	0.99	4
	Fluoride (WU result)	1.5000	mg/L	0.96	0.9600	0.96	1
	Fluoride Ratio	0.8 - 1.2		0.97	0.9700	0.97	1
	Iodine	0.5000	mg/L	0.01	0.0133	0.02	3
	Iron	0.3000	mg/L	0.005	0.0050	0.005	3
	Lead	0.0100	mg/L	0.0001	0.0002	0.0005	3
	Magnesium	10000.0000	mg/L	7.69	9.1767	10.82	3
	Manganese	0.5000	mg/L	0.0089	0.0173	0.0242	3
	Mercury	0.0010	mg/L	0.0004	0.0004	0.0004	3
	Molybdenum	0.0500	mg/L	0.0003	0.0003	0.0003	3
	Nickel	0.0200	mg/L	0.0004	0.0005	0.0006	3
	Nitrate	50.0000	mg/L	2	2.0000	2	3
	Nitrite	3.0000	mg/L	0.05	0.0500	0.05	3
	pH	6.5 - 8.5		7.5	7.6000	7.7	3
	Selenium	0.0100	mg/L	0.0035	0.0035	0.0035	3
	Silver	0.1000	mg/L	0.0001	0.0001	0.0001	3
	Sodium	180.0000	mg/L	28	37.3333	44	3
	Sulfate	500.0000	mg/L	52	61.3333	79	3
	Total Dissolved Solids (TDS)	600.0000	mg/L	147	175.0000	213	3
	Total Hardness as CaCO3	200.0000	mg/L	73.6	83.4667	95.5	3
	True Colour	15.0000	Hazen Units (HU)	0.5	0.8333	1	3
	Turbidity	5.0000	NTU	0.05	0.4000	1.1	3
	Uranium	0.0170	mg/L	0.00005	0.0001	0.0001	3
	Zinc	3.0000	mg/L	0.05	0.0700	0.09	3

Fluoride Barcode	Fluoride	1.5000	mg/L	0.77	0.8873	1.07	11
	Fluoride (WU result)	1.5000	mg/L	0.91	0.9682	1.06	11
	Fluoride Ratio	0.8 - 1.2		0.93	1.1000	1.25	11
Microbiology	E. coli	0.0000	mpn/100 mL	0	0.0127	1	79
	Free Chlorine	0.2 - 5	mg/L	0.01	0.2481	1.97	78
	pH	6.5 - 8.5		7.25	8.0604	9.22	78
	Temperature	30.0000	C	8.9	17.5456	26.6	79
	Total Chlorine	5.0000	mg/L	0.05	0.4038	2.2	79
	Total Coliforms	0.0000	mpn/100 mL	0	4.3797	145	79
	Turbidity	5.0000	NTU	0.13	0.6435	4.04	78
Operational Monitoring	Fluoride (daily WU)	0.9 - 1.5	mg/L	0.15	0.9812	1.15	337
	Fluoride (weekly WU)	0.9 - 1.5	mg/L	0.83	0.9570	1.1	101

Table 36. Summary of NSW Health's drinking water monitoring program data for the Oura scheme.

Analysis Type	Characteristic	Guideline Value	Units	Min	Mean	Max	Sample Count
Chemistry	Aluminium	0.2000	mg/L	0.005	0.0054	0.01	12
	Antimony	0.0030	mg/L	0.00005	0.0001	0.00005	12
	Arsenic	0.0100	mg/L	0.001	0.0015	0.003	12
	Barium	2.0000	mg/L	0.0113	0.0137	0.0156	12
	Boron	4.0000	mg/L	0.0094	0.0177	0.0233	12
	Cadmium	0.0020	mg/L	0.00005	0.0001	0.00005	12
	Calcium	10000.0000	mg/L	10.1	11.9583	14.6	12
	Chloride	250.0000	mg/L	14	19.5833	28	12
	Chromium	0.0500	mg/L	0.0005	0.0005	0.001	12
	Copper	2.0000	mg/L	0.001	0.0059	0.015	12
	Fluoride	1.5000	mg/L	0.91	1.0033	1.16	12
	Fluoride (WU result)	1.5000	mg/L	0.91	1.0133	1.1	12
	Fluoride Ratio	0.8 - 1.2		0.9	1.0125	1.11	12
	Iodine	0.5000	mg/L	0.02	0.0367	0.13	12
	Iron	0.3000	mg/L	0.005	0.0538	0.28	12
	Lead	0.0100	mg/L	0.0001	0.0006	0.0016	12
	Magnesium	10000.0000	mg/L	8.18	9.2867	10.77	12
	Manganese	0.5000	mg/L	0.0274	0.0868	0.1183	12
	Mercury	0.0010	mg/L	0.0004	0.0004	0.0004	12
	Molybdenum	0.0500	mg/L	0.0001	0.0001	0.0002	12
	Nickel	0.0200	mg/L	0.0002	0.0002	0.0002	12
	Nitrate	50.0000	mg/L	0.5	0.5417	1	12
	Nitrite	3.0000	mg/L	0.05	0.0500	0.05	12
	pH	6.5 - 8.5		7.7	7.8083	8	12
	Selenium	0.0100	mg/L	0.0035	0.0035	0.0035	12
	Silver	0.1000	mg/L	0.0001	0.0001	0.0001	12
	Sodium	180.0000	mg/L	17	19.8333	24	12
	Sulfate	500.0000	mg/L	0.5	4.0417	7	12
	Total Dissolved Solids (TDS)	600.0000	mg/L	97	108.6667	126	12
	Total Hardness as CaCO3	200.0000	mg/L	58.9	68.1083	80.8	12
	True Colour	15.0000	Hazen Units (HU)	0.5	0.6250	1	12
	Turbidity	5.0000	NTU	0.05	0.5833	1.6	12
	Uranium	0.0170	mg/L	0.0002	0.0003	0.0006	12
	Zinc	3.0000	mg/L	0.04	0.0550	0.08	12
Microbiology	E. coli	0.0000	mpn/100 mL	0	0.0325	9	277

	Free Chlorine	0.2 - 5	mg/L	0.02	0.4375	1.42	276
	pH	6.5 - 8.5		7.42	8.3685	9.33	276
	Temperature	30.0000	C	6	18.6981	31.6	276
	Total Chlorine	5.0000	mg/L	0.03	0.5294	1.7	276
	Total Coliforms	0.0000	mpn/100 mL	0	0.0866	10	277
	Turbidity	5.0000	NTU	0.11	0.5007	2.63	276
Operational Monitoring	Fluoride (daily WU)	0.9 - 1.5	mg/L	0.23	1.0005	1.15	329
	Fluoride (weekly WU)	0.9 - 1.5	mg/L	0.9	1.0005	1.07	81

Table 37. Summary of NSW Health's drinking water monitoring program data for the Mt Arthur scheme

Analysis Type	Characteristic	Guideline Value	Units	Min	Mean	Max	Sample Count	Exception Count
Chemistry	Aluminium	0.2000	mg/L	0.005	0.0050	0.005	1	0
	Antimony	0.0030	mg/L	0.00005	0.0001	0.00005	1	0
	Arsenic	0.0100	mg/L	0.0005	0.0005	0.0005	1	0
	Barium	2.0000	mg/L	0.0093	0.0093	0.0093	1	0
	Boron	4.0000	mg/L	0.04	0.0400	0.04	1	0
	Cadmium	0.0020	mg/L	0.00005	0.0001	0.00005	1	0
	Calcium	10000.0000	mg/L	10.9	10.9000	10.9	1	0
	Chloride	250.0000	mg/L	40	40.0000	40	1	0
	Chromium	0.0500	mg/L	0.0005	0.0005	0.0005	1	0
	Copper	2.0000	mg/L	0.067	0.0670	0.067	1	0
	Fluoride	1.5000	mg/L	0.69	0.6900	0.69	1	0
	Iodine	0.5000	mg/L	0.05	0.0500	0.05	1	0
	Iron	0.3000	mg/L	0.07	0.0700	0.07	1	0
	Lead	0.0100	mg/L	0.0005	0.0005	0.0005	1	0
	Magnesium	10000.0000	mg/L	6.85	6.8500	6.85	1	0
	Manganese	0.5000	mg/L	0.01	0.0100	0.01	1	0
	Mercury	0.0010	mg/L	0.0004	0.0004	0.0004	1	0
	Molybdenum	0.0500	mg/L	0.0003	0.0003	0.0003	1	0
	Nickel	0.0200	mg/L	0.0002	0.0002	0.0002	1	0
	Nitrate	50.0000	mg/L	0.5	0.5000	0.5	1	0
	Nitrite	3.0000	mg/L	0.05	0.0500	0.05	1	0
	pH	6.5 - 8.5		7.7	7.7000	7.7	1	0
	Selenium	0.0100	mg/L	0.0035	0.0035	0.0035	1	0
	Silver	0.1000	mg/L	0.0001	0.0001	0.0001	1	0
	Sodium	180.0000	mg/L	44	44.0000	44	1	0
	Sulfate	500.0000	mg/L	7	7.0000	7	1	0
	Total Dissolved Solids (TDS)	600.0000	mg/L	147	147.0000	147	1	0
	Total Hardness as CaCO3	200.0000	mg/L	55.4	55.4000	55.4	1	0
	True Colour	15.0000	Hazen Units (HU)	0.5	0.5000	0.5	1	0
	Turbidity	5.0000	NTU	0.2	0.2000	0.2	1	0
	Uranium	0.0170	mg/L	0.00005	0.0001	0.00005	1	0
	Zinc	3.0000	mg/L	0.05	0.0500	0.05	1	0
Microbiology	E. coli	0.0000	mpn/100 mL	0	0.0000	0	66	0

	Free Chlorine	0.2 - 5	mg/L	0.02	0.3806	1.6	66	18
	pH	6.5 - 8.5		6.96	7.6340	9.2	58	3
	Temperature	30.0000	C	10	21.1333	31.5	66	1
	Total Chlorine	5.0000	mg/L	0.05	0.4636	1.8	66	0
	Total Coliforms	0.0000	mpn/100 mL	0	0.8485	31	66	4
	Turbidity	5.0000	NTU	0.16	0.5455	2.4	66	0

Table 38. Summary of NSW Health's drinking water monitoring program data for the Mt Daylight scheme

Analysis Type	Characteristic	Guideline Value	Units	Min	Mean	Max	Sample Count	Exception Count
Chemistry	Aluminium	0.2000	mg/L	0.005	0.0050	0.005	2	0
	Antimony	0.0030	mg/L	0.00005	0.0003	0.0005	2	0
	Arsenic	0.0100	mg/L	0.001	0.0015	0.002	2	0
	Barium	2.0000	mg/L	0.0866	0.0885	0.0904	2	0
	Boron	4.0000	mg/L	0.0332	0.0368	0.0403	2	0
	Cadmium	0.0020	mg/L	0.00005	0.0003	0.0005	2	0
	Calcium	10000.0000	mg/L	22.5	24.7000	26.9	2	0
	Chloride	250.0000	mg/L	97	100.5000	104	2	0
	Chromium	0.0500	mg/L	0.0005	0.0013	0.002	2	0
	Copper	2.0000	mg/L	0.021	0.0210	0.021	2	0
	Fluoride	1.5000	mg/L	0.43	0.4600	0.49	2	0
	Iodine	0.5000	mg/L	0.13	0.1350	0.14	2	0
	Iron	0.3000	mg/L	0.005	0.0075	0.01	2	0
	Lead	0.0100	mg/L	0.0008	0.0010	0.0012	2	0
	Magnesium	10000.0000	mg/L	18.03	20.0850	22.14	2	0
	Manganese	0.5000	mg/L	0.0016	0.0026	0.0035	2	0
	Mercury	0.0010	mg/L	0.0004	0.0004	0.0004	2	0
	Molybdenum	0.0500	mg/L	0.0019	0.0024	0.0029	2	0
	Nickel	0.0200	mg/L	0.0005	0.0008	0.0011	2	0
	Nitrate	50.0000	mg/L	0.5	0.5000	0.5	2	0
	Nitrite	3.0000	mg/L	0.05	0.0500	0.05	2	0
	pH	6.5 - 8.5		7.2	7.3500	7.5	2	0
	Selenium	0.0100	mg/L	0.0035	0.0035	0.0035	2	0
	Silver	0.1000	mg/L	0.0001	0.0001	0.0001	2	0
	Sodium	180.0000	mg/L	74	81.5000	89	2	0
	Sulfate	500.0000	mg/L	36	38.0000	40	2	0
	Total Dissolved Solids (TDS)	600.0000	mg/L	336	336.5000	337	2	0
	Total Hardness as CaCO3	200.0000	mg/L	130.4	144.3500	158.3	2	0
	True Colour	15.0000	Hazen Units (HU)	1	1.0000	1	2	0
	Turbidity	5.0000	NTU	0.6	0.8500	1.1	2	0
	Uranium	0.0170	mg/L	0.0031	0.0034	0.0037	2	0
	Zinc	3.0000	mg/L	0.1	0.1150	0.13	2	0
Microbiology	E. coli	0.0000	mpn/100 mL	0	0.0000	0	26	0
	Free Chlorine	0.2 - 5	mg/L	0.07	0.3112	0.91	26	8
	pH	6.5 - 8.5		6.95	7.3558	8	26	0
	Temperature	30.0000	C	11	20.2538	30.7	26	1
	Total Chlorine	5.0000	mg/L	0.12	0.4081	0.98	26	0

	Total Coliforms	0.0000	mpn/100 mL	0	0.0000	0	26	0
	Turbidity	5.0000	NTU	0.16	0.5538	2.1	26	0

Appendix B - Continuous Improvement Plan

GWCCC DWMS Action and Improvement Plan

Table 39. 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		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 been implemented for control however is registering trends. A new Burket system will now be installed as a replacement. 1/9/2021 - Burkert Analyser has been installed and operating 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. 1/9/2021 - all compliance sampling is conducted by Water Quality Staff now who are trained and specialised. The only	Low		GWCC DWMS Technical Note 2 Risk Assessment and Critical Control Point Workshop (HydroScience, 2015)

					testing that occurs from distribution staff is now just chlorine operational samples. Water Quality Staff continue development, 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 shows signs of being compromised	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)

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 turbidity 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 leading into fluoride batching tank	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)

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	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 analyser due to reliability of the unit. Trends are however being obtained. 1/9/2021 works 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	2017 - Letters issued to all known water carters within supply area. No responses 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, Barmedman, 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	Capital works	In progress	2017 risk assessment and report developed on the non-pot system and its potential for cross contamination. Further projects to progress to	High	Manager Engineering	GWCC DWMS Technical Note 2 Risk Assessment and Critical Control Point Workshop (HydroScience, 2015)

	and Hylands Bridge (e.g., RPZ, break tank with air gap, etc.)			investigation stage in 2018. 15/10/2019 - Works still outstanding 25/8/2020 Works still outstanding		
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	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 contamination is suspected	Operations and maintenance	Closed	25/11/2016 - Considered as part of emergency procedures	GWCC DWMS Technical Note 2 Risk Assessment and Critical Control Point Workshop (HydroScience, 2015)
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	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		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 are being considered at this stage as water quality team are building data to inform future decisions such as appropriate localities that warrant online monitoring. 25/8/2020 as per previous note on 15/10/2019 - 1/9/2021 as per previous advice and note that staff undertake significant amount of additional operational testing for the retic systems.	Low	Manager Production & Services	GWCC DWMS Technical Note 2 Risk Assessment and Critical Control Point Workshop (HydroScience, 2015)
24	GWCC to consider developing SOP for fluoride hopper cleaning	Procedures and documentation	Complete		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	Very High	Manager Production & Services	GWCC DWMS Technical Note 2 Risk Assessment and Critical Control Point Workshop (HydroScience, 2015)

					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			
25	GWCC to consider developing SOPs for chlorine testing to include manganese interference with reagent	Procedures and documentation	Closed	30/06/2019	15/10/2019 - consideration of developing SOP's has been determined as not required.			GWCC DWMS Technical Note 2 Risk Assessment and Critical 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		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	Medium	Manager Operations	GWCC DWMS Technical Note 2 Risk Assessment and Critical Control Point Workshop (HydroScience, 2015)

					includes all WHS documentation and SOP needs for the organisation			
27	GWCC to include drinking water quality management in the annual report, as recommended in Element 10 of the ADWG	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)
28	Educate community member that owns the private bore near 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 commissioning 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.	Low	Manager Production & Services	GWCC DWMS Technical Note 2 Risk Assessment and Critical Control Point Workshop (HydroScience, 2015)

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 located at the reservoir inlet	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. Analyser 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)
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 everyone's role. However, in terms of induction and competency-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 relevant inductions where	Medium	Human Resource Coordinator	Added as part of action and improvement plan review (25 November 2016)

				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 Training Package 2020. We are working with the NSW Water Directorate and TWRRP Team for access to new training providers 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 sampling	Low	Manager Production & Services	Added as part of action and improvement plan review (25 November 2016)

					conducted by Quality staff now who 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. Emergency 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			Added as part of action and improvement plan review (25 November 2016)

					Wyalong, Temora, and Barmedman now installed and operational.			
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 received 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			Added as part of action and improvement plan review (25 November 2016)

					of every year and reported to NSW Health upon completion.			
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			Added as part of action and improvement plan review (25 November 2016)

					of Wateroutlook system.			
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 be 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 independent 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 undertaken upon incident reporting/lessons learnt scenarios. As the organisations asset and operational maturity increases so too will the levels of assessment and outcomes. - 1/9/2021 GWCC staff monitor and maintain its raw water systems via monthly monitoring lab results. In addition to that we are altered by any changes to Murrumbidgee discharges from Water NSW.	Low	
47	Evaluate alternative or additional		Closed	ongoing	25/8/2020 as per item 46 above		

	preventive measures where improvement is required						
48	Document all procedures and compile into an operation 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 not deemed required at this stage.		Manger Production and Services
49	Identify procedures required for processes and activities from catchment to consumer	Procedures and documentation	Complete		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 part of our DWMS and associated 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 required for data and operational consistency.		Manger Production and Services
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 requirements 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 procedure for complaints handling completed - 1/9/2020 process is now business as usual with utilisation of council's customer service complaints system utilised to log and report on issues	Medium	Manger Production and Services
54	Define communication protocols with the involvement of relevant agencies and prepare a contact list of key people,	Procedures and documentation	Closed	2018	A register of contacts has been completed and Emergency Response Management Plan will need to be reviewed to add the list. 15/10/2019 - works now complete and reviewed annually.		

	agencies, and businesses						
55	develop a public and media communications strategy	Community engagement	Complete	2019	See Ryan for update. 15/10/2019 - complete		
56	Develop mechanisms and communication procedures to increase employee's awareness of and participation in drinking water quality management	Procedures and documentation	Complete		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 changes occur. Additional training including scenario training is undertaken as well. Scenario 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 requirements 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 Jugiong WTP and gives an overview of	Medium	Manger Production and Services

					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 assessment 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 necessary	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 respective 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 being developed by Safe group with several avenues of data collection to be made available once fully rolled out. 15/10/2019 - Additional CRM system is available for registering all documents, emails, and correspondence		Manger Production and Services
67	Document information pertinent to all aspects of drinking water quality management	Procedures and documentation	Implemented		This will evolve as GWCC move forward, relevant information e.g., reservoir inspection sheets to be entered 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 long term 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		

					communicated 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 should 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	Formal Service level agreement be developed and implemented for council's 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	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.

					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.			
77	Complaints Management System	Procedures and documentation	Implemented	Ongoing	Investigate options for a complaint 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.	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
78	Emergency response training	Training	Complete	ongoing	Incident and emergency response training to be developed and referred to in DWMS and undertaken by relevant 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	Medium	Manager production and Services	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.

					- 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 quality incidents that are to be used for management.			(HAS been included into DWMS under Traing)
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). (James Carr 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 October 2021.
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	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

					making the DWMS Annual Reporting information available on Council's website.			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 independent audit of the Drinking Water Management System (DWMS) in the DWMS.	Low	Manager production and Services	Management is 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.

83	Backflow Prevention Program	Ongoing	2016	As per indictor 79 of this document and in accordance with the backflow prevention policy	High	Manager Production and Services	To date 1347 backflow devices have been installed throughout the GWCC Drinking Water areas. 120 installs remain outstanding. 70 Installs have been finalised in the Hilltops LGA to support their operations
84	Chlorine Improvements	Ongoing	2018	As per Atom Report a program to be developed to improve Free Chlorine throughout all Drinking water systems. As per ATOM report	Med	Manager production and Services	Management is currently trying to fill an Urban renewals Coordinator position. This will help with retaining chlorine residuals within the system, by renewing old infrastructure. Also, the strategic placement of online analysers to help determine areas of concern.

Appendix C - Full Reservoir Inspection Report 2019/20

Reservoir Critical Maintenance Priorities Report

26/08/2021

Date:	12/05/2021	**Client Name:**	Goldenfields Water
WS #:	001	**Reservoir Name:**	Ardlethan Town
Asset No:	001	**Location:**	end of Barellan St Ardlethan
Job No:	027716	**Project Number:**	0
Cleaning Due:	12/5/2025	**Inspection Due:**	12/5/2025

External

Area	Priority	Status	Comments
Vandalism structures	2	F	There is evidence of vandal acitivity and graffiti on the site
Walls for the age of the	2	F	There is a lot of calcification present but this is reasonable tank
Entry Hatch easy to break into	2	A	The entry hatch covers are light weight and they would be
Handrails protecting from falls off	1	A	The chains adjacent to the davit are not effective in the roof area

Internal

Area	Priority	Status	Comments
Roof Framing sections and also OK	2	A	There is surface corrosion present on the main rafter significant areas of coating delamination but the purlins are
Ladder Internal that is unsafe to 10700mm long to	1	A	There is a short length of heavily corroded ladder present use - it should be replaced with a Nextep FRP ladder improve the safety of personnel working on the tank

Comments

External Comment:
The entry hatch covers are light weight and they would be easy to break into.

Internal Comment:
There is a short length of heavily corroded ladder present that is unsafe to use. It should be replaced with a Nextep FRP
ladder 10700mm long with a 400mm standoff to fit below the entry hatch effectively. The existing davit system should only
be used as a secondary rescue device, with a suitable vertical ladder as the primary means of entering and exiting the tank
safely.

Reservoir Critical Maintenance Priorities Report

26/08/2021

Date:	11/05/2021	**Client Name:**	Goldenfields Water
WS #:	004	**Reservoir Name:**	Ariah Park Terminal No1
Asset No:	0	**Location:**	off Burley Griffin Way Ariah Park
Job No:	027714	**Project Number:**	0
Cleaning Due:	11/5/2025	**Inspection Due:**	11/5/2025

External

Area	Priority	Status	Comments
Entry Hatch	2	F	There is corrosion occurring inside the entry hatch framing. It should be relocated closer to the wall and made from aluminium to match the rest of the platform materials

Internal

Area	Priority	Status	Comments
Ladder Internal	1	A	A new vertical ladder 5500mm long should be mounted onto the floor and the side of the entry hatch frame, with intermediate supports 1200mm long

Comments

External Comment:
There is corrosion occurring inside the entry hatch framing. It should be relocated closer to the wall and made from aluminium to match the rest of the platform materials.

Internal Comment:
A new vertical ladder 5500mm long should be mounted onto the floor and the side of the entry hatch frame, with intermediate supports 1200mm long.

Reservoir Critical Maintenance Priorities Report

26/08/2021

Date:	11/05/2021	**Client Name:**	Goldenfields Water
WS #:	005	**Reservoir Name:**	Ariah Park Terminal No2
Asset No:	0	**Location:**	off Burley Griffin Way Ariah Park
Job No:	027715	**Project Number:**	0
Cleaning Due:	11/5/2025	**Inspection Due:**	11/5/2025

External

Area	Priority	Status	Comments
Entry Hatch	2	F	There is corrosion occurring inside the entry hatch framing. It should be relocated closer to the wall and made from aluminium to match the rest of the platform materials

Internal

Area	Priority	Status	Comments
Ladder Internal	1	A	A new vertical ladder 5500mm long should be mounted onto the floor and the side of the entry hatch frame, with intermediate supports 1200mm long

Comments

External Comment:
There is corrosion occurring inside the entry hatch framing. It should be relocated closer to the wall and made from aluminium to match the rest of the platform materials.

Internal Comment:
A new vertical ladder 5500mm long should be mounted onto the floor and the side of the entry hatch frame, with intermediate supports 1200mm long.

Reservoir Critical Maintenance Priorities Report

26/08/2021

Date:	12/05/2021	**Client Name:**	Goldenfields Water
WS #:	002	**Reservoir Name:**	Ariah Park Town
Asset No:	002	**Location:**	off Coolamon Rd Ariah Park
Job No:	027717	**Project Number:**	0
Cleaning Due:	12/5/2025	**Inspection Due:**	12/5/2025

External

Area	Priority	Status	Comments
Walls	2	F	There are numerous weepage spots on the walls but all appear to be sealing at present. The walls are reasonable for their age, but a suitable coating should be considered to prolong the effective life span of the tank
Entry Hatch	1	A	The entry hatch cover is light weight and it has been bent open at one time. The width of 500mm is poorly sized for divers or operators wearing confined space equipment. Future upgrades should allow more room to access the tank safely
Roof Platforms	2	A	The platform has drainage holes present that enter into the tank
Handrails	1	A	The handrail chains adjacent to the davit are unsafe to personnel working in this area. A more secure protection system is required

Internal

Area	Priority	Status	Comments
Roof Framing	2	F	There is surface corrosion present on the main rafter and sections of the coating are delaminating, but the purlins appear to be OK
Ladder Internal	1	A	There is a short length of heavily corroded ladder present that is unsafe to use. It should be replaced with a Nextep FRP ladder 10600mm long with 400mm long standoff brackets to make the tank safe for divers

Comments

External Comment:
The entry hatch cover is light weight and the width of 500mm is poorly sized for divers or operators wearing confined space
equipment. Future upgrades should allow more room to access the tank safely.

Internal Comment:
There is a short length of heavily corroded ladder present that is unsafe to use. It should be replaced with a Nextep FRP
ladder 10600mm long with a 400mm standoff to fit below the entry hatch effectively.

Reservoir Critical Maintenance Priorities Report

26/08/2021

Date:	25/06/2021	**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:**	25/6/2025

External

Area	Priority	Status	Comments
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 instead
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 - these are possibly still leaking at times
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.

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

Reservoir Critical Maintenance Priorities Report

26/08/2021

Date:	25/06/2021	**Client Name:**	Goldenfields Water
WS #:	008	**Reservoir Name:**	Barellan Terminal 008
Asset No:	103631903	**Location:**	Barellan Depot Barellan
Job No:	027754	**Project Number:**	0
Cleaning Due:	25/6/2025	**Inspection Due:**	25/6/2025

External

Area	Priority	Status	Comments
Entry Hatch	2	A	The mesh panel fitted under the hatch cover is heavily corroded
Roof Platforms	2	A	The platform area is too small for effective maintenance to be performed
Roof	2	A	The roof vents have no upsteam flashings fitted to drain away the roof water. This ponding will corrode the adjacent roof sheets
Handrails	2	A	The rear hand rails need to be removed to open up the platform for a more effective work area
Ventilation	2	A	Two of the turbine vents have frozen and need to be replaced before they break away and leave the tank open to bird entry

Internal

Area	Priority	Status	Comments
Walls	2	A	The liner is poorly fitted and the extensive wrinkled areas are entrapping sediments
Floor	2	A	There are significant areas of wrinkled liner material and this makes vacuuming or sweeping of the tank difficult. There are several sections of floor liner which are covering over small rocks, which are present in the underlay material. The liner will split at these areas and require patching when future leakage occurs

Comments

External Comment:

The roof vents have no upstream flashings fitted to drain away the roof water and this ponding will corrode the adjacent roof sheets. Two of the turbine vents have also frozen and need to be replaced before they break away and leave the tank open to bird entry.

Internal Comment:

There are significant areas of wrinkled liner material present and this makes vacuuming or sweeping of the tank difficult.

There are several sections of floor liner which are covering over small rocks, which are present in the underlay material. The liner will split at these areas and require patching when future leakage occurs.

Reservoir Critical Maintenance Priorities Report

26/08/2021

Date:	23/06/2021	**Client Name:**	Goldenfields Water
WS #:	012	**Reservoir Name:**	Bectric No1 012
Asset No:	012	**Location:**	Unknown
Job No:	027751	**Project Number:**	off Jepsons Rd
Cleaning Due:	23/6/2025	**Inspection Due:**	23/6/2025

External

Area	Priority	Status	Comments
Entry Hatch	2	A	The entry hatch cover is lightweight and it is unsealed around the edges
Roof	2	A	The roof edge corrugations are not sealed against bird or vermin entry
Bird Proofing	2	A	Small birds and vermin can enter past the unsealed roof edge corrugations

Internal

Area	Priority	Status	Comments
Columns	2	A	The galvanised centre post and base are heavily corroded and should be replaced with a SS Aquapost
Inlet	2	F	The inlet and outlet are common and the pipework is in the centre floor area
Outlet	2	F	The riser section is heavily corroded
Overflow	2	F	The base section is heavily corroded

Comments

External Comment:
The entry hatch cover is lightweight and it is unsealed around the edges. Small birds and vermin can enter past the
unsealed roof edge corrugations.

Internal Comment:
The galvanised centre post and base are heavily corroded and should be replaced with a SS Aquapost.

Reservoir Critical Maintenance Priorities Report

26/08/2021

Date:	23/06/2021	**Client Name:**	Goldenfields Water
WS #:	013	**Reservoir Name:**	Bectric No2 013
Asset No:	013	**Location:**	Unknown
Job No:	027752	**Project Number:**	off Jepsons Rd
Cleaning Due:	23/6/2025	**Inspection Due:**	23/6/2025

External

Area	Priority	Status	Comments
Entry Hatch	2	A	The entry hatch cover is lightweight and it is unsealed around the edges
Roof	2	A	The roof edge corrugations are not sealed against bird or vermin entry
Bird Proofing	1	A	There was one dead bird in the sediment

Internal

Area	Priority	Status	Comments
Columns	2	A	The galvanised centre post and base are heavily corroded and should be replaced with a SS Aquapost
Inlet	2	F	The inlet and outlet are common and the pipework is in the centre floor area
Outlet	2	F	The riser section is heavily corroded
Overflow	2	F	The base section is heavily corroded

Comments

External Comment:
The entry hatch cover is lightweight and it is unsealed around the edges. The roof edge corrugations are not sealed against
bird or vermin entry and there was one dead bird in the sediment.

Internal Comment:
The galvanised centre post and base are heavily corroded and should be replaced with a SS Aquapost.

Reservoir Critical Maintenance Priorities Report

26/08/2021

Date:	15/05/2021	**Client Name:**	Goldenfields Water
WS #:	031	**Reservoir Name:**	Coolamon North HL 031
Asset No:	031	**Location:**	Ardlethan Rd Coolamon
Job No:	027722	**Project Number:**	0
Cleaning Due:	15/5/2023	**Inspection Due:**	15/5/2025

External

Area	Priority	Status	Comments
Entry Hatch	2	F	The hatch is small and the cover is light weight. It is also not effectively sealed around the edges of the frame where the internal ladder stiles extend through

Internal

Area	Priority	Status	Comments
Walls	2	A	There are a significant amount of corrosion nodules present on the lower wall areas. Most appear to be passivated, but there are still a few active sections present
Floor	2	A	There have been patch repairs carried out, but some sections are still displaying corrosion activity
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 hatch is small and the cover is light weight. It is also not effectively sealed around the edges of the frame where the
internal ladder stiles extend through.

Internal Comment:
There are a significant amount of corrosion nodules present on the lower wall areas and most appear to be passivated.

However there have been patch repairs carried out across the floor and some sections are still displaying active corrosion.

The CP system needs to be monitored and adjusted accordingly.

Reservoir Critical Maintenance Priorities Report

26/08/2021

Date:	15/05/2021	**Client Name:**	Goldenfields Water
WS #:	032	**Reservoir Name:**	Coolamon North LL 032
Asset No:	032	**Location:**	Ardlethan Rd Coolamon
Job No:	027723	**Project Number:**	0
Cleaning Due:	15/5/2023	**Inspection Due:**	15/5/2023

External

Area	Priority	Status	Comments

Internal

Area	Priority	Status	Comments

Comments

External Comment:
The external access ladder and roof platform system have been upgraded.

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

26/08/2021

Date:	16/05/2021	**Client Name:**	Goldenfields Water
WS #:	033	**Reservoir Name:**	Coolamon South HL 033
Asset No:	0	**Location:**	off Dyces Rd Coolamon
Job No:	027724	**Project Number:**	0
Cleaning Due:	16/5/2022	**Inspection Due:**	16/5/2022

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 level drops down when a diver is inside the tank. It needs 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

26/08/2021

Date:	19/05/2021	**Client Name:**	Goldenfields Water
WS #:	035	**Reservoir Name:**	Cowangs No1 034
Asset No:	035	**Location:**	near 969 Rose Hill Rd Cootamundra
Job No:	027729	**Project Number:**	0
Cleaning Due:	19/5/2023	**Inspection Due:**	19/5/2023

External

Area	Priority	Status	Comments
Roof Platforms	2	F	There is an upstream flashing between the roof sheets and the platform area which is creating ponding and contamination build-up

Internal

Area	Priority	Status	Comments
Walls	2	F	The wall coating is significantly blistered
Floor	1	A	The floor coating has totally blistered, some the size of cricket balls. There are several areas on the wall floor section where the coating has separated away, but it is difficult to ascertain if leakage is occurring

Comments

External Comment:
There is an upstream flashing between the roof sheets and the platform area which is creating ponding and contamination build-up.

Internal Comment:
The floor coating has totally blistered, some the size of cricket balls. There are several areas on the wall floor section where the coating has separated away, but it is difficult to ascertain if leakage is occurring. There is also blistering present on the wall coating, but to a lesser degree than the floor condition.

Reservoir Critical Maintenance Priorities Report

26/08/2021

Date:	20/05/2021	**Client Name:**	Goldenfields Water
WS #:	034	**Reservoir Name:**	Cowangs No2 035
Asset No:	034	**Location:**	near 969 Rose Hill Rd Cootamundra
Job No:	027732	**Project Number:**	0
Cleaning Due:	20/5/2023	**Inspection Due:**	20/5/2023

External

Area	Priority	Status	Comments
Roof Platforms	2	A	There is an upstream flashing between the roof sheets and the platform area which is creating ponding and contamination build-up

Internal

Area	Priority	Status	Comments
Walls	2	F	The wall coating is significantly blistered
Floor	1	A	The floor coating has totally blistered, some the size of cricket balls

Comments

External Comment:
There is an upstream flashing between the roof sheets and the platform area which is creating ponding and contamination build-up.

Internal Comment:
The floor coating has totally blistered, some the size of cricket balls. There is also blistering present on the wall coating, but to a lesser degree than the floor condition.

Reservoir Critical Maintenance Priorities Report

26/08/2021

Date:	20/05/2021	**Client Name:**	Goldenfields Water
WS #:	036	**Reservoir Name:**	Cowangs No3 036
Asset No:	036	**Location:**	near 969 Rose Hill Rd Cootamundra
Job No:	027733	**Project Number:**	0
Cleaning Due:	21/5/2023	**Inspection Due:**	20/5/2023

External

Area	Priority	Status	Comments
Roof Platforms	1	A	There is an upstream flashing between the roof sheets and the platform area which is creating ponding and contamination ingress
Roof	2	F	The roof ridge capping is not well sealed against leaf litter ingress, as evidenced by the leaf debris inside the tank

Internal

Area	Priority	Status	Comments
Overflow	2	A	There is corrosion on the overflow riser and base

Comments

External Comment:
There is an upstream flashing between the roof sheets and the platform area which is creating ponding and contamination
ingress. The roof ridge capping is also not well sealed against leaf litter ingress, as evidenced by the leaf debris inside the
tank

Internal Comment:
There is corrosion on the overflow riser and base.

Reservoir Critical Maintenance Priorities Report

26/08/2021

Date:	14/05/2021	**Client Name:**	Goldenfields Water
WS #:	039	**Reservoir Name:**	Eurollie Road 039
Asset No:	039	**Location:**	end of Eurollie Rd
Job No:	027721	**Project Number:**	0
Cleaning Due:	14/5/2025	**Inspection Due:**	14/5/2025

External

Area	Priority	Status	Comments
Walls	2	A	There are calcification cracks present and several weeping sections around the wall base area
Entry Hatch	2	F	There is no lock present
Roof	2	A	There are unsealed areas on the roof. The inlet cover is only sitting on top of the roof sheets and it is open on the front edge area
Roof Hatches	2	A	The hatch cover is not effectively sealed around the edges
Bird Proofing	2	A	Small birds can enter past the inlet cover

Internal

Area	Priority	Status	Comments
Roof Framing	2	F	There is corrosion present on the purlins but they are still appear to be OK from a structural perspective
Floor	2	A	There is a small crack around the wall floor area and external weepage is present
Inlet	1	A	The cover over the top fill inlet is not sealed or secured

Comments

External Comment:
There are unsealed areas on the roof. The inlet cover is only sitting on top of the roof sheets and it is open on the front edge
area.

Internal Comment:
There is a small crack around the wall floor area and external weepage is present. There is corrosion present on the purlins
but they are still appear to be OK from a structural perspective.

Reservoir Critical Maintenance Priorities Report

26/08/2021

Date:	17/05/2021	**Client Name:**	Goldenfields Water
WS #:	059	**Reservoir Name:**	Junee BT No1 059
Asset No:	059	**Location:**	off Albert St Junee
Job No:	027726	**Project Number:**	0
Cleaning Due:	17/5/2023	**Inspection Due:**	17/5/2023

External

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

Internal

Area	Priority	Status	Comments
Ladder Internal intermediate	2	F	There are two SS ladder sections fitted to an existing platform which is heavily corroded

Comments

External Comment:
The entry hatch requires a raised edge and an over lapping cover to seal more effectively.

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...it will
fail prematurely. There are two SS ladder sections fitted to an existing intermediate platform which is heavily corroded.

Reservoir Critical Maintenance Priorities Report

26/08/2021

Date:	18/05/2021	**Client Name:**	Goldenfields Water
WS #:	0	**Reservoir Name:**	Junee BT No3 116
Asset No:	0	**Location:**	off Albert St Junee
Job No:	027728	**Project Number:**	0
Cleaning Due:	18/5/2023	**Inspection Due:**	18/5/2023

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.

Reservoir Critical Maintenance Priorities Report

26/08/2021

Date:	22/06/2021	**Client Name:**	Goldenfields Water
WS #:	095	**Reservoir Name:**	Tara 095
Asset No:	095	**Location:**	off Tara Bectric Rd
Job No:	027749	**Project Number:**	0
Cleaning Due:	22/6/2025	**Inspection Due:**	22/6/2025

External

Area	Priority	Status	Comments
Entry Hatch	2	A	The small entry hatch is neither sealed or effectively secured against unauthorised access
Roof Platforms	1	A	A dedicated platform area is required to make the tank safe to work on
Roof Hatches	2	A	There is a hatch over the inlet pipework and another for telemetry access. Neither appears to be sealed effectively
Handrails	2	A	There are no handrails present

Internal

Area	Priority	Status	Comments
Walls	2	F	There are fine cracks and some root ingress in the wall floor area, but no obvious external leakage is noted at present
Floor	2	F	There are fine cracks and some root ingress in the wall floor area
Overflow	2	A	The base section is heavily corroded, but the upper riser section has been replaced

Comments

External Comment:
A dedicated platform area is required to make the tank safe to work on and the the small entry hatch is neither sealed or
effectively secured against unauthorised access.

Internal Comment:
There are fine cracks and some root ingress in the wall floor area, but no obvious external leakage is noted at present.

Reservoir Critical Maintenance Priorities Report

26/08/2021

Date:	13/05/2021	**Client Name:**	Goldenfields Water
WS #:	096	**Reservoir Name:**	Temora BT 096
Asset No:	096	**Location:**	191 Loftus St Temora
Job No:	027719	**Project Number:**	0
Cleaning Due:	13/5/2025	**Inspection Due:**	13/5/2025

External

Area	Priority	Status	Comments
Entry Hatch	2	A	The entry hatch frame and cover are not effectively sealed
Roof Platforms	2	A	The platform area is not effectively sealed
Roof Hatches	2	A	The rescue and float hatches are not effectively sealed

Internal

Area	Priority	Status	Comments

Comments

External Comment:
The platform area and associated hatches are not effectively sealed against contamination entry.

Internal Comment:
The internal areas appear to be in good condition.

Reservoir Critical Maintenance Priorities Report

26/08/2021

Date:	13/05/2021	**Client Name:**	Goldenfields Water
WS #:	097	**Reservoir Name:**	Temora East 097
Asset No:	0	**Location:**	11 Narraburra St Temora
Job No:	027718	**Project Number:**	0
Cleaning Due:	13/5/2025	**Inspection Due:**	13/5/2025

External

Area	Priority	Status	Comments

Internal

Area	Priority	Status	Comments

Comments

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

Internal Comment:
The internal areas appear to be OK.

Reservoir Critical Maintenance Priorities Report

26/08/2021

Date:	14/05/2021	**Client Name:**	Goldenfields Water
WS #:	098	**Reservoir Name:**	Temora Town HL
Asset No:	098	**Location:**	191 Loftus St Temora
Job No:	027720	**Project Number:**	0
Cleaning Due:	14/5/2025	**Inspection Due:**	14/5/2025

External

Area	Priority	Status	Comments
Entry Hatch	2	A	The entry hatch is small for safe diver entry. It should have been enlarged while the roof was removed during the recoating process
Roof Platforms	2	A	A more effective working area should have been included in the tank upgrade
Handrails	1	A	There are no effective hand rails fitted around the working area on the roof. This would have been a minor cost while the recoating project was taking place
Bird Proofing	2	A	The front flashing section under the entry hatch frame has several conduit holes present which are not effectively sealed against birds or vermin

Internal

Area	Priority	Status	Comments
Ladder Internal	2	F	The FRP ladder should have been 3 metres longer to allow for water levels accidentally dropping while a diver is inside the tank

Comments

External Comment:
The entry hatch is small for safe diver entry. It should have been enlarged while the roof was removed during the recoating process. The front flashing section under the entry hatch frame has several conduit holes which are not effectively sealed against birds or vermin. There are no effective handrails fitted around the working area on the roof. This would have been a minor cost while the recoating project was taking place.

Internal Comment:
There are several coating delamination defects present, under the overflow base and around the edges of the wall hatch and scour.

Appendix D - External Auditor Report Summary

Table 40. 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. Aug 2021 – SLA workshops have occurred with Bulk Councils and principal agreement has been finalised on water quality parameters. GWCC has engaged Lindsay Taylor Lawyers to draft a final SLA for issues in 2021.	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 Aug 2021 – Ongoing	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. Aug 2021 – Scenario Training has been undertaken with Bulk Councils and NSW Health, DPIE in late 2020. This was undertaken as part of the SLA workshops.	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