CLONCURRY DRINKING WATER QUALITY MANAGEMENT PLAN

Service Provider ID 36

GBA CONSULTING ENGINEERS

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Contact for enquiries and proposed changes.

If you have any questions regarding this document or if you have a suggestion for improvements, please contact GBA Consulting Engineers.

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1.0 INTRODUCTION

1.1 Drinking Water Quality Management Plan Overview

This is the Drinking Water Quality Management Plan (DWQMP) for Cloncurry Shire Council (CSC) which has been developed in accordance with the requirements of Section 95(3) of the *Water Supply (Safety and Reliability) Act 2008* which commenced on the 1st of July 2008. This document describes how Cloncurry Shire Council provides safe and reliable drinking water services to the communities of Cloncurry and Dajarra, in conjunction with the *Water Supply (Safety and Reliability) Act 2008*.

The purpose of *the Act* is to provide for the safety and reliability of water supply throughout Queensland and it includes provisions relating to the management of drinking water quality, aimed at protecting public health. This outcome is achieved primarily through a regulatory framework for drinking water quality which requires Drinking Water Service Providers to:

- Undertake monitoring and reporting on drinking water quality;
- Have an approved Drinking Water Quality Management Plan (DWQMP).

This DWQMP is prepared consistently with the DWQMP Guideline issued by the Department of Regional Development, Manufacturing and Water (RDMW).

The operation of a water service or a drinking water service is also covered under other State and Commonwealth Legislation. The requirements of the *Water Supply (Safety and Reliability) Act 2008* do not negate the requirements of other Legislation unless expressly stated. The Drinking Water Service Provider (DWSP) is responsible for obtaining any necessary approvals under other Acts to ensure the compliant operation of their services. Other State and Commonwealth Legislation relating to the operations of water services may include:

- Water Legislation Act 2016
- Public Health Act 2005
- Public Health Regulation 2018
- Plumbing and Drainage Act 2018
- Planning Act 2016
- Environmental Protection Act 1994
- Water Act 2000
- Trade Practices Act 1974
- Work Health and Safety Act 2011
- Food Act 2006

1.2 Registered Service Details

This Drinking Water Quality Management Plan relates to the water supply services owned and operated by:

Cloncurry Shire Council, Service Provider ID 36
19- 21 Scarr Street
P.O Box 3
CLONCURRY 4824
P: (07) 4742 4100
E: council@cloncurry.qld.gov.au

The first point of contact in relation to this plan is:

Chris Rohan, Director of Infrastructure & Environment
P: (07) 4742 4100
M: 0477 197 661
E: ChrisR@cloncurry.qld.gov.au

The declared service area maps for each scheme can be located here: https://www.cloncurry.qld.gov.au/downloads/file/1274/cloncurry-revenue-statement-2020-21.

The Administration Centre and main Works Depot are located in Cloncurry, with a Visitor Information Centre also located in Cloncurry.

1.3 Chief Executive Office Endorsement

Cloncurry Shire Council recognises the importance of this DWQMP in the management and provision of safe and reliable drinking water services to the reticulated parts of the Shire. CSC aims to maintain an integrated approach to ensuring that the requirements of this DWQMP are adhered to by all CSC staff and any contractors operating on behalf of CSC. In particular, CSC endorses all outcomes from the current Risk Assessment and all items outlined in the Risk Management Improvement Programme.

…… Date……

Phillip Kierle

Chief Executive Officer

1.4 Cloncurry Shire Council

Cloncurry Shire Council is located in Queensland's north-west and covers an area of 47,971km^2 with a population of approximately 3,644 (as per the 2021 census from the Australian Bureau of Statistics). The Shire consists of four towns, Cloncurry, Dajarra, Kajabbi and Malbon. The administrative centre for the Shire is located in Cloncurry approximately 1,500km north-west of Brisbane and 120km east of Mt Isa. Council provides potable water reticulation to the towns of Cloncurry and Dajarra. In Cloncurry, the water is sourced from nearby surface waters and in Dajarra, water is sourced from dub-Artesian bores.

Historically, the Dajarra scheme has been listed as a non-potable scheme, however, in 2022 it was decided to transition the scheme from non-potable to potable. This decision was made by Council with the intention of seeking to improve the level of service to the town.

Council's 2021- 26 Corporate Plan, developed to provide strategic direction for the Shire, notes water as a key service with Council prioritizing water security, access, supply and quality. Table 1 below outlines the current population and connections for all towns located in the Shire, Figure 1 below is a map of the Shire.

Table 1: Cloncurry Shire Council population and connections.

Scheme Name	Communities Serviced	Current		
		Population	Connections	Demand
Cloncurry	Cloncurry	3,167 (2021 census data)	1,400	2.5 ML
Dajarra*	Dajarra	186 (2021 census)	72	120 kL/day
Kajabbi	Non-potable scheme.	20 (no census information available)	Not applicable.	
Malbon	Non-potable scheme.	10 (no census information available)	Not applicable.	

***While the 2021 census noted the town's population to be 186 people, the normal resident population generally sits closer to 100.**

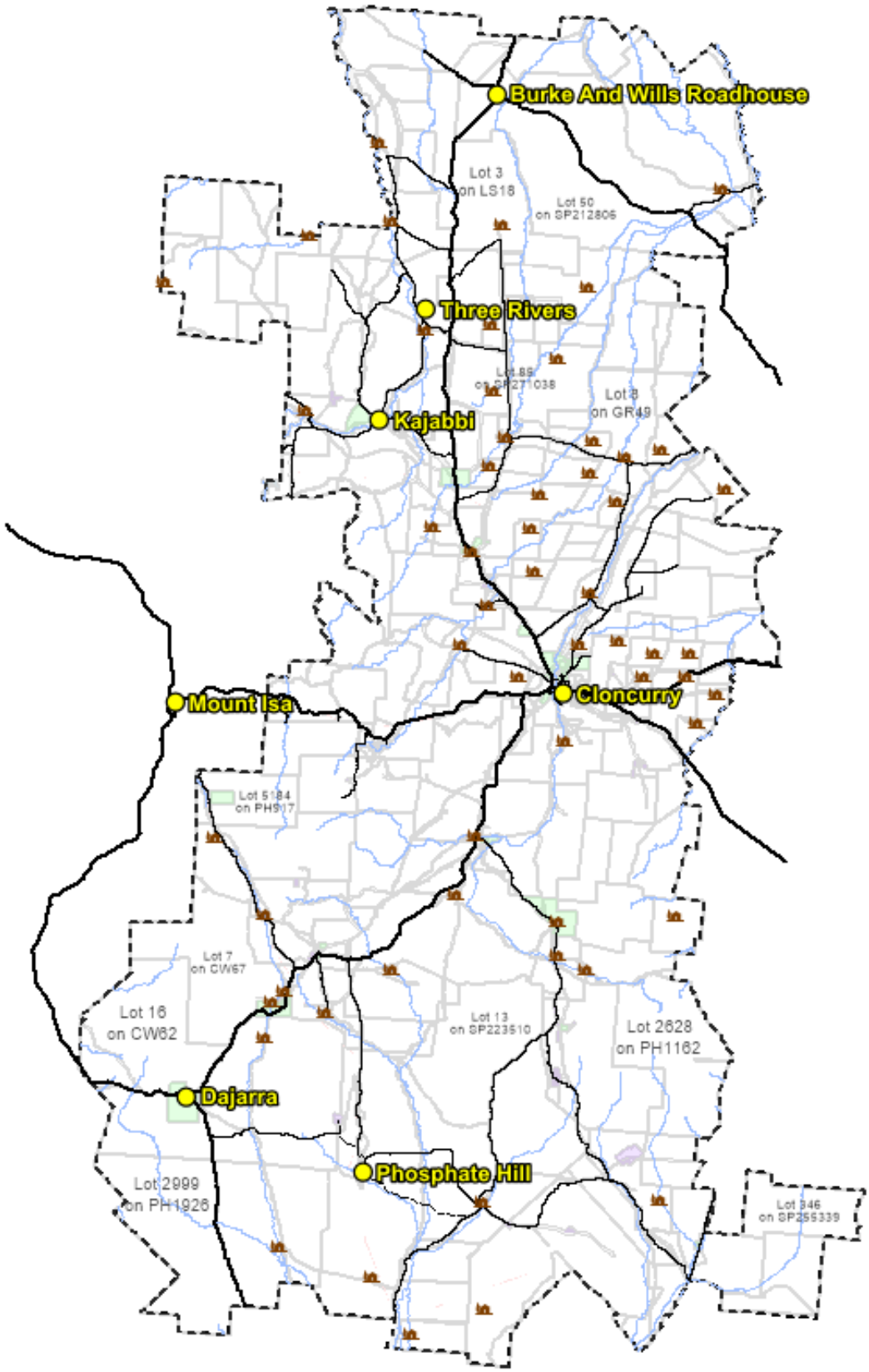

Figure 1: Cloncurry Shire Council Area.

Cloncurry Shire Council Key Stakeholders

Table 2 below identified CSC's key stakeholders, Council works and Regulatory authorities who may affect or be affected by Council's drinking water management decisions or drinking water incidents/events. This register is maintained by Council and updated as required.

Table 2: Cloncurry Shire Council Stakeholders.

Organisation	Contact Name and Details	DWQMP Relevance	Stakeholder engagement in DWQMP
Cloncurry Shire Council	Philip Keirle Chief Executive Officer P: (07) 4746 1600 E: cscceo@cloncurry.qld.gov.au	Council CEO	DWQMP oversight.
	Chris Rohan Director of Infrastructure & Environment P: (07) 4742 4100 E: ChrisR@Cloncurry.qld.gov.au	Overall Supervisor	Risk management participant and DWQMP implementation.
	Megan Anderson Planning & Environmental Manager P: (07) 4742 4100 E: megana@cloncurry.qld.gov.au	Manager	Risk management participant and DWQMP implementation.
	Nathan Dingle Infrastructure Manager P: 0488 320 030 E: nathand@cloncurry.qld.gov.au	Manager	Risk management participant and DWQMP implementation.
GBA Engineers	Isabeau Gavel Senior Environmental Officer P: (07) 4651 5177 M: 0418 411 920 E: igavel@gbaengineers.com.au	Consultancy services	Risk management participant and preparation of DWQMP.
Department of Regional Development, Manufacturing and Water (QLD Government)	Water Supply Regulator P: 1300 596 709 (24-hour hotline) E:DrinkingWater.Reporting@rdmw.qld.gov.au	Regulatory Office	Approval of DWQMP and contact point for Incidents/Events
Queensland Health Public Health Units	North-West (Mt Isa & Gulf) Sector Shop 2, 12 Miles Street, Mt Isa QLD 4825 EH Officer: (07) 4433 6900 PH Nurse: (07) 4744 7186 Townsville Sector 242 Walker Street, Townsville QLD 4810 P: (07) 4433 6900	Public Health Unit	Sets drinking water quality standards under the Act, issues and enforces public health orders

Organisation	Contact Name and Details	DWQMP Relevance	Stakeholder engagement in DWQMP
SunWater	Murray Able P: (07) 4742 5187	Source water provider (Lake Julius, NWQWP)	Provides raw water to Cloncurry
Osmoflo Water Management Pty. Ltd.	Unit 3, 15- 19 Henry Street, Loganholme QLD 4129 P: (07) 3451 2900	External Consultant	Provides WTP operation assistance for Dajarra.
QLD Health Laboratory	39 Kessels Road, Coopers Plains QLD 4108 P: (07) 3096 2803 P: 1800 000 377	Water Analysis Authority	Chemical Analysis/ Reporting Water Quality
QLD Government Chief Information Office	P: (07) 3215 3951 E: qgisvrt@qld.gov.au	Cyber Security Hotline	Cyber Security Assistance
ABC Radio North-west	Queensland-Mt Isa P: (07) 4744 1311 Call: 1300 221 065 Text: 0487 993 222 (rates apply)	Communication	Can be used to broadcast details during water quality events
Ergon	P: 13 22 96	Reticulated Power Supplier	Power outage conduct to assist with Dajarra outages
Cloncurry			
Cloncurry Hospital	1 Musgrave Street, Cloncurry QLD 4824 P: (07) 4742 4500	Local Health Service	Sensitive User
Cloncurry Medical Centre	51 Daintree Street, Cloncurry QLD 4842 P: (07) 4742 1683	Local Health Service	Sensitive User
Ramsay Street General Practice	27 Ramsay Street, Cloncurry QLD 4824 P: (07) 4426 2100	Local Health Service	Sensitive User
Blue Care	16- 20 Steele Street, Cloncurry QLD 4842 P: (07) 4742 1613 E: Cloncurry.cc@bluecare.org.au	Aged Care Services	Sensitive User
Cloncurry State School	Daintree Street, Cloncurry QLD 4824 P: (07) 4742 8333 E: admin@cloncurryss.eq.edu.au	Local School	Sensitive User
St Joseph's Catholic School	Sheaffe Street, Cloncurry QLD 4824 P: (07) 4742 1633 E: clncry@tsv.catholic.edu.au	Local School	Sensitive User
C&K Cloncurry Kindergarten	71 Seymour Street, Cloncurry QLD 4824 P: (07) 4742 1148	Preschool	Sensitive User
Curry Kids Early Learning Centre	6/14 Steele Street, Cloncurry QLD 4824 P: (07) 4742 1728	Preschool	Sensitive User
Dajarra			

Organisation	Contact Name and Details	DWQMP Relevance	Stakeholder engagement in DWQMP
Dajarra Health Clinic	12 Matheson Street, Dajarra QLD 4825 P: (07) 4748 4841	Local Health Service	Sensitive User
Dajarra State School	Matheson Street, Dajarra QLD 4825 P: (07) 4748 4914 E: principal@dajarrass.eq.edu.au	Sensitive User	Sensitive User
Dajarra Roadhouse	1 Letham Street, Dajarra QLD 4825 P: (07) 4748 4844	Local Roadhouse	Can assist in providing information to residents re: drinking water events
Dajarra Hotel	21- 25 Matheson Street, Dajarra QLD 4825 P: (07) 4748 4955	Local Pub	Can assist in providing information to residents re: drinking water events

2.0 CATCHMENT CHARACTERISTICS

2.1 Cloncurry

Cloncurry is a rural town nestled on the banks of the Cloncurry River. The town derives its main income from the mining and pastoral industries with large saleyards located in Cloncurry (downstream of the source water intake). The average annual rainfall is 500mm with the heaviest rains being experienced during the wet season between December and March. However, rainfall within the region is highly variable both within a year and from one year to the next. In some years, a single massive storm may bring more rain than is seen in an entire year of drought.

The land surrounding Cloncurry consists of mostly spinifex hummock grasslands and mixed open woodlands on low, rocky hills. The vegetation is dominated by Snappy Gums (*Eucalyptus racemose*) and the Cloncurry Box Tree (*E. leucophylla*). The soil consists of red and yellow earths with skeletal and rocky outcrops. On the surface, the soil is fine and sandy with grading clays as you get deeper. Surface soil tends to seal and the soil drains poorly at depth.

At present there are approximately eight mines operating in the Shire. The closest being the Ernest Henry Mine, situated 38km north-east of the town. There are also a number of small, abandoned mines in the Shire, however, these are small-scale operations with no processing power and are located significant distances from the town's source water and therefore, not considered a hazard.

Most mines in the Shire produce either Copper, Gold, Magnetite and Uranium. Subsequently, mining within the catchment is viewed as a potential hazard to the town's drinking water supply due to the risk of catchment contamination via. spills during storage and transportation of mined material. Mine sites also pose a threat as large amounts of hazardous chemicals (e.g. petrochemicals) are often stored on-site and contaminated water storages may overflow during rain events. Coppermine Creek runs through the town of Cloncurry and can become highly contaminated from the Copper mine located south of the town. However, this Creek enters the Cloncurry River approximately 5km downstream of the source water intake pumps and therefore, is not regarded as a hazard to the town's drinking water supply.

Other hazards to the Cloncurry River catchment come from unrestricted livestock access along the River and recreational activities on the River.

Lake Julius is a water storage located north-west of Mt Isa, that was constructed in 1976 by damming the Leichhardt River below the junction with the Paroo Creek. The Leichhardt River flows north through Mt Isa, northeast 25km to Lake Moondarra, then further north another ~55km into Lake Julius. Lake Julius provides water to mining and industrial services and to Cloncurry for the town's drinking water. Water is pumped to Cloncurry using the North West Queensland Water Pipeline (NWQWP) which runs over 100km from Lake Julius, east, to the Ernest Henry Mine, with a connection to Cloncurry. SunWater is allocated 15,000 ML per year of water from Lake Julius under the Gulf Resource of Operations Plan, of this amount, CSC is allocated 950 ML.

Lake Julius is situated at an elevation of 224m with a maximum capacity of 107,500 ML. Lake Julius is a significant, large permanent water body in a semi-arid area. The surrounding area is dominated by Lacustrine wetlands with minor areas of Palustrine, forested wetlands. Similar to the Cloncurry River, Lake Julius is subject to contamination from nearby mining activities and low-density cattle grazing with unrestricted livestock access to the Lake. Blue Green Algae outbreaks are also a common occurrence.

Lake Julius is owned and operated by SunWater. Communication protocols have been established between CSC and SunWater with Council Water Operators calling SunWater prior to bringing the NWQWP online and upon discontinuing its use. This ensures that the water sourced from Lake Julius is of a suitable water quality.

2.2 Dajarra

Dajarra is located near the QLD/Northern Territory Border, approximately 150km south-west of Cloncurry. Operation of the Dajarra scheme is challenged by geographical isolation and extreme weather variances.

Dajarra sources it's drinking water supply from the Great Artesian Basin, through a series of sub-Artesian bores. The Great Artesian Basin extends over approximately one-fifth of the Australian continent and contains 8.7 x 10^6 GL of groundwater in the Jurassic sandstone aquifers. It is the largest groundwater and Artesian basin in the world. The basin is located under mostly arid and semi-arid landscapes to the west of the Great Dividing Range. The major sources of recharge for the Great Artesian Basin are through rainfall and stream flow infiltration into the exposed sandstone on the edge of the basin.

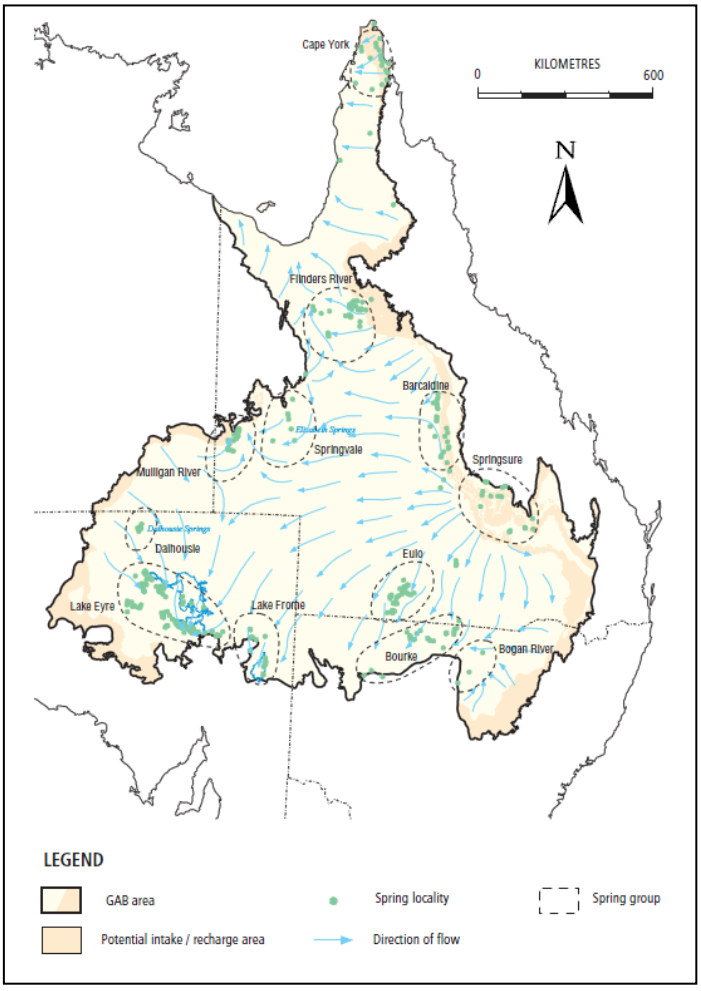

Figure 2: Great Artesian Basin Recharge, Discharge and Flow Diagram.

3.0 CLONCURRY DRINKING WATER SCHEME

The Cloncurry Drinking Water scheme sources its drinking water predominantly from the Lake Julius Dam (due to noticeably higher water quality) and the Cloncurry River (from a series of river wells). Historically, Council also sourced water from the Chinaman Creek Dam (600m upstream of its junction with the Cloncurry River), however, this was discontinued as a raw water source in 2019 due to taste and odour issues. A diversion channel has been constructed from the Cloncurry River to the Chinaman Creek Dam so that harvest pumps can be used to fill the dam if required.

The Cloncurry River Wells system comprises of 4 Wells (Main Well, River Well 1, River Well 2, Walton's Well) and 4 Bores (Bore 1, Bore 2, Bore 4 & Bore 5) of which 3 Wells and 4 bores are used preferentially for drinking water. Walton's Well is used as a non-potable supply to rural residences (rates notices nominate the Walton's Well supply as non-potable), however, it is currently not isolated from the rest of the potable distribution system. All Wells have been constructed with concrete walls and covers and are buried in the riverbed with pumps installed to extract the water. As they are buried in the river, there has not been any issues with flood or debris damage.

The Cloncurry WTP is a conventional WTP providing facilities for chemical coagulation, flocculation, clarification, filtration and disinfection using Chlorine Gas. Raw water is pumped from two separate lines into the WTP. This allows for slightly different treatment processes to manage the different water qualities coming from the two sources (e.g. raw water from the River Wells can be dosed with PAC as required to manage taste and odour issues). Raw water from Lake Julius is pumped from the NWQWP to a breaker tank and pump station, then to a balance tank, before being gravitated directly to the WTP. Raw water from the River Wells is pumped to the re-lift pump station. All raw water entering the WTP is dosed with Soda Ash, Potassium Permanganate, ACH and Polymer in a rapid mixing tank. Jar Testing is undertaken as required to ensure optimal coagulant/polymer dose is added. The Turbidity and pH of the combined raw water is measured online in the mixing tank. ORP is also measured online to ensure that Potassium Permanganate is dosed. A low ORP will indicate underdosing, triggering the plant shut down. Working day visual inspections are conducted to ensure the dosing pumps are working correctly.

Once dosed, the water is passed through the clarifier where flocculated particles are settled. Regular de-sludges occur approximately every hour. The water then passes through rapid gravity duel media filters. Chlorine can be pre-dosed prior to filtration to assist with Total Iron and Manganese issues as required, however, normally, pre-chlorination occurs after clarification to minimise the risk from dis-infection by-products. Filters are cleaned regularly using a reversed flow of water through the media. Filter effluent Turbidity is measured daily to keep track of the filtration process.

Filtered water combines into a single main and is chlorinated using Chlorine Gas prior to being deposited in the 4.1 ML Clear Water Tank (CWT), situated on the north-east side of the WTP. The CWT provides contact time for disinfection, working day Free Chlorine testing is conducted to ensure effective disinfection. There are two back-up Clear Water Tanks which can be utilised if the primary tank requires maintenance. Water from the CWT is then pumped to the Town Reservoir before being reticulated to the town.

Water from the sludge ponds can be fed back to the head of the water treatment plant. The raw water flows into the WTP is approximately 45- 50L/s, while the return water from the sludge ponds only runs at 2L/s, controlled by a pump. Therefore, there is only approximately 5% return of supernatant into the WTP.

The following bypass lines are located in the WTP:

- Bypass line from the combined raw water pipe just prior to the treatment process to the Town Reservoir (line is closed and has never been used);

- Bypass of the clarification step;
- Bypass line for the Town Reservoir (not in use).

All of the bypass lines require manual activation and to date have never been used. All valves are labelled and locked and require approval from the Director of Infrastructure and Environment prior to activation.

Spare pumps and parts are always kept on-hand by Council in case of faults and failure. Any issues are therefore dealt with very promptly without any significant interruption or disruption to operations.

3.1.1 Infrastructure

Table 3: Cloncurry Drinking Water Scheme infrastructure details.

Component		Details			
Source	Name	**Lake Julius**			
	Details	Allocation: 950 ML/year			
	% of Supply	60%			
	Reliability	Water source is reliable, however, NWQWP is not			
	Catchment Categorisation	Class IV Vulnerability, Unprotected Catchment			
	Contamination Sources	Recreational water activities, livestock grazing, mining activities			
	Water Quality Issues	High pH (typically >8) Elevated Iron and Manganese Fluctuating Turbidity			
	Name	**Cloncurry River**			
	Details	Water is sourced from 3 wells (Main Well (5m deep), River Well 1 (9m deep), River Well 2 (9m deep); and 4 Bores (bore 1, bore 2, bore 4 and bore 5)			
	% of Supply	20			
	Reliability	Water is reliable, subject to power outages			
	Catchment Categorisation	Class IV Vulnerability, Unprotected Catchment			
	Contamination Sources	Recreational water activities, livestock grazing, mining activities			
	Water Quality Issues	Elevated Iron and Manganese Fluctuating Turbidity			
	Name	Bore 1	Bore 2	Bore 4	Bore 5
	Details	Artesian RN: 184610 Depth: 14m Drill Date: 2021	Artesian RN: 184626 Depth: 15m Drill Date: 2021	Artesian RN: 184625 Depth: 11m Drill Date: 2021	Artesian RN: 184589 Depth: 23.5m Drill Date: 2021

Component		Details			
		Aquifer: Cloncurry River Alluvium Details: Sealed	Aquifer: Quaternary - Undefined Details: Sealed	Aquifer: Cloncurry River Alluvium Details: Sealed	Aquifer: Cloncurry River Alluvium Details: Sealed
	% of Supply	20			
	Reliability	Reliable.			
	Catchment Categorisation	Class II Vulnerability			
	Contamination Sources	Agricultural practices, mining, septic discharges, industrial waste.			
	Water Quality Issues	Elevated Iron and Manganese.			
	Name	**Chinaman Creek Dam**			
	Details	Constructed: 1993 Capacity: 2,750 ML			
	& of Supply	0% can be used as a back-up supply in emergencies.			
	Reliability	Water and infrastructure reliable			
	Catchment Categorisation	Class IV Vulnerability, Unprotected Catchment			
	Contamination Sources	Recreational water activities, livestock grazing, mining activities			
	Water Quality Issues	Taste and Odour Issues Elevated Iron and Manganese Fluctuating Turbidity			
Source Infrastructure	Type	North West Queensland Water Pipeline			
	Description	Owned/Operated: SunWater (right up until where the pipeline enters the WTP). Length: ~40km			
Treatment	Water Treatment Plant	Constructed: 1996 Upgraded: Major upgrades occurred in 2013/14 Design Capacity: 105 L/s Output: 9.07 ML/day (24 hr operation)			
	Powdered Activated Carbon (PAC) Dosing	One dosing pump, 1000L vat fitted with a mixer and pipe work with non-return valves. Feed water is fed manually. Dosing rate is 20mg/L.			
	Potassium Permanganate Dosing	Under normal operation, dosing is automatic. Duty stand-by pump arrangement. Pumps are calibrated weekly. Discrepancy alarms are sent to SCADA for corrective actions.			

Component		Details
	Soad Ash Dosing	Duty stand-by pump arrangement. Pumps are calibrated weekly. Soda Ash solution is batched automatically. Discrepancy alarms are sent to SCADA for corrective actions.
	ACH Coagulant Dosing	Dosing pumps run automatically when the WTP starts up, manual mode can be used as required. Chemical comes prepared in 1000L boxes that are fed into the base tanks inside the dosing shed. Amount of chemical required is determined via. Jar Testing. Drawdowns are performed to ensure correct dosing. Duty stand-by pump arrangement. Pumps are calibrated weekly. Discrepancy alarms are sent to SCADA for corrective actions.
	Polymer Dosing	500L Mixing Tank, 500L dosing tank, pump skid and control panel.
Treatment Infrastructure	Vacuum Chambers	Cylindrical tank 4.6m high, constructed from polyethylene (HDPE). Provides water to the clarification unit in a pulsating manner. Water is drawn up via. the vacuum pump and when the high level is reached the release valve lets water in to the chamber and the water enters the flocculation/clarification unit.
	Clarification Unit	Water is clarified by a pulsed sludge blanket. The sludge blanket is stabilised by tube settlers which consists of distribution laterals, clarified water launders and auto de-sludge and drainage facilities.
	Filter Unit	Rapid gravity, dual media filters the water from the clarifier. Filters have a constant flow rising level control and include header/lateral floors, distribution baffles, backwash launders and drainage facilities. Flow of water is controlled by actuated butterfly valves located in the inlet and outlet pipe work of the filter. Filter is cleaned by a cleaning cycle which is started either manually or automatically (based on head loss, filter effluent Turbidity or time lapse of 72 hours).
Disinfection	Chlorine Gas	Two Chlorination stations, each containing two cylinders. One station operates whilst the other remains in standby mode. When one station runs out of Chlorine, the other will automatically start operating. One station will generally last between 5- 9 days, depending on water usage. Dosing arrangement is flow paced but can be manually adjusted as required. Target Free Chlorine residual measured after the Clear Water Tank is between 2- 2.5 mg/L.
Distribution and Reticulation System	**Pipe material**	**Polypipe**
	Diameter	450mm runs to the intersection of Short and Shaeffe Streets, from here diameter changes to 100mm or 300mm.
	Age range	25 years @ 2023
	Approx. % of total length	100%

Component		Details
	Areas where potential long detention periods could be expected?	Hospital and Airport.
	Areas where low water pressure (e.g. < 12 m) could be expected during peak or other demand periods?	None.
Reservoirs	Name	**Town Water Reservoir**
	Age	15 years (@2024)
	Capacity	2.5 ML
	Location	South side of the WTP.
	Roofed (Y/N)	Yes.
	Vermin-proof (Y/N)	Yes.
	Runoff directed off roof (Y/N)	Yes.
Sludge Ponds		Water from the sludge ponds can be fed back to the head of the WTP. Settling and detention is used to reduce the contamination load by only skimming water from the top and taking water from the far end of the sludge ponds to feed back to the WTP.

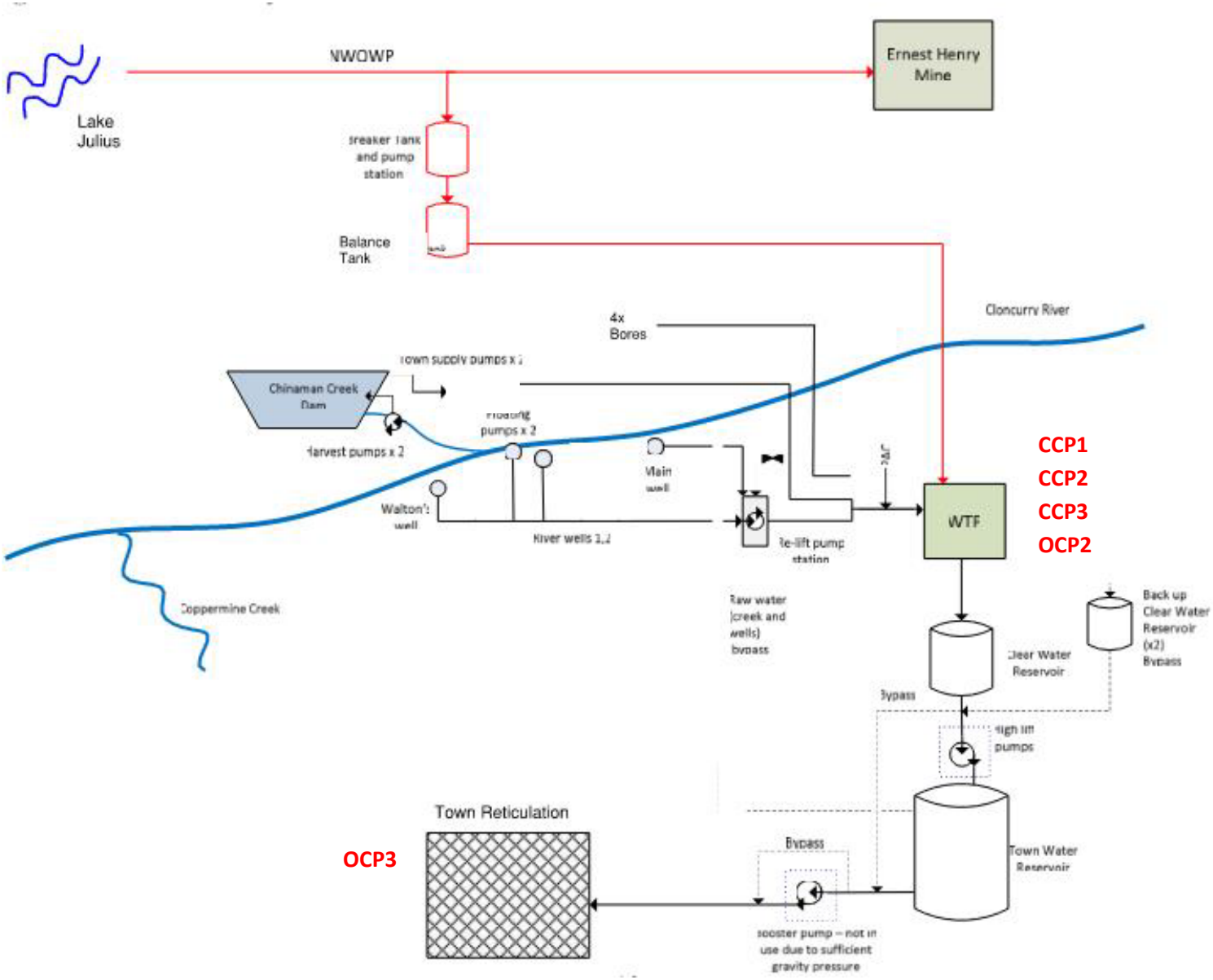

Figure 3: Cloncurry Drinking Water Supply Schematics.

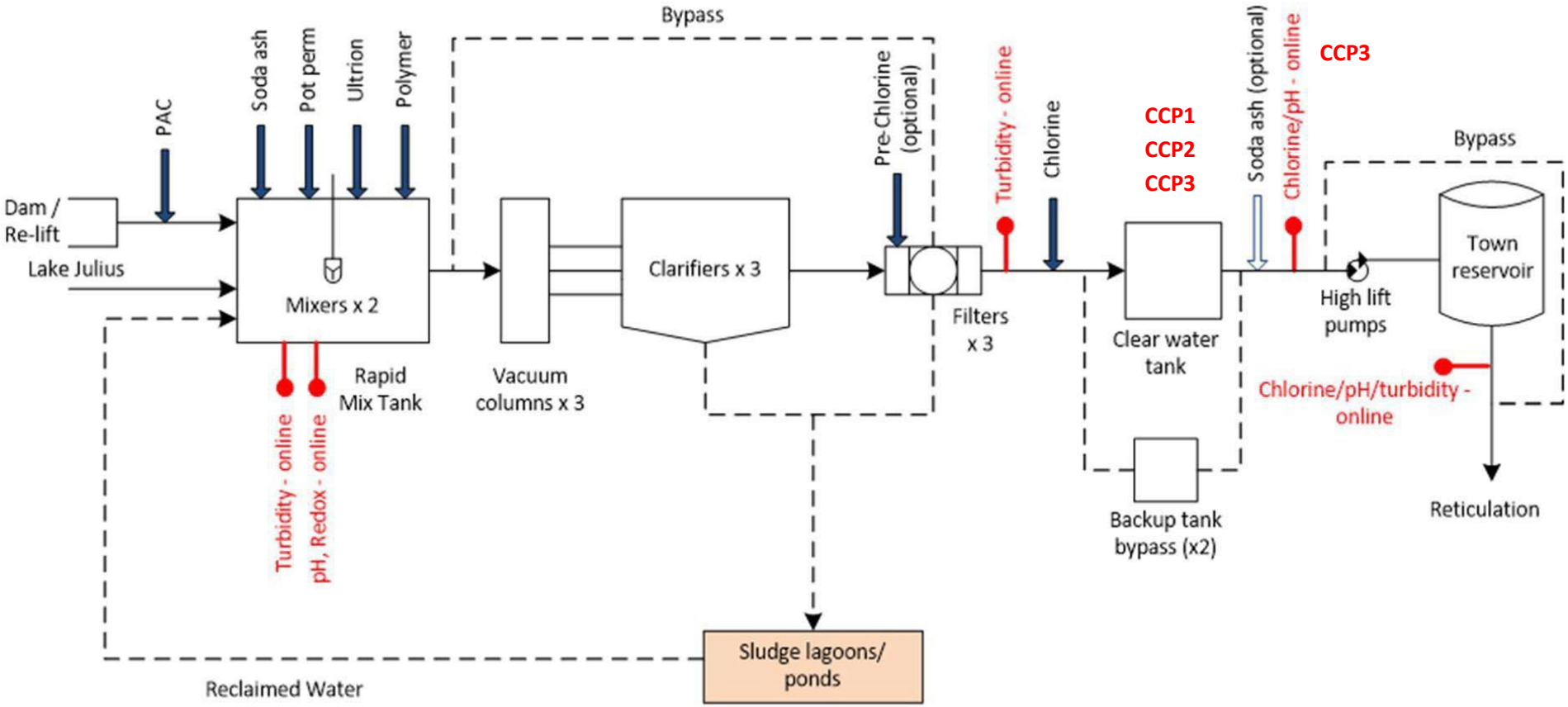

Figure 4: Cloncurry WTP Schematics.

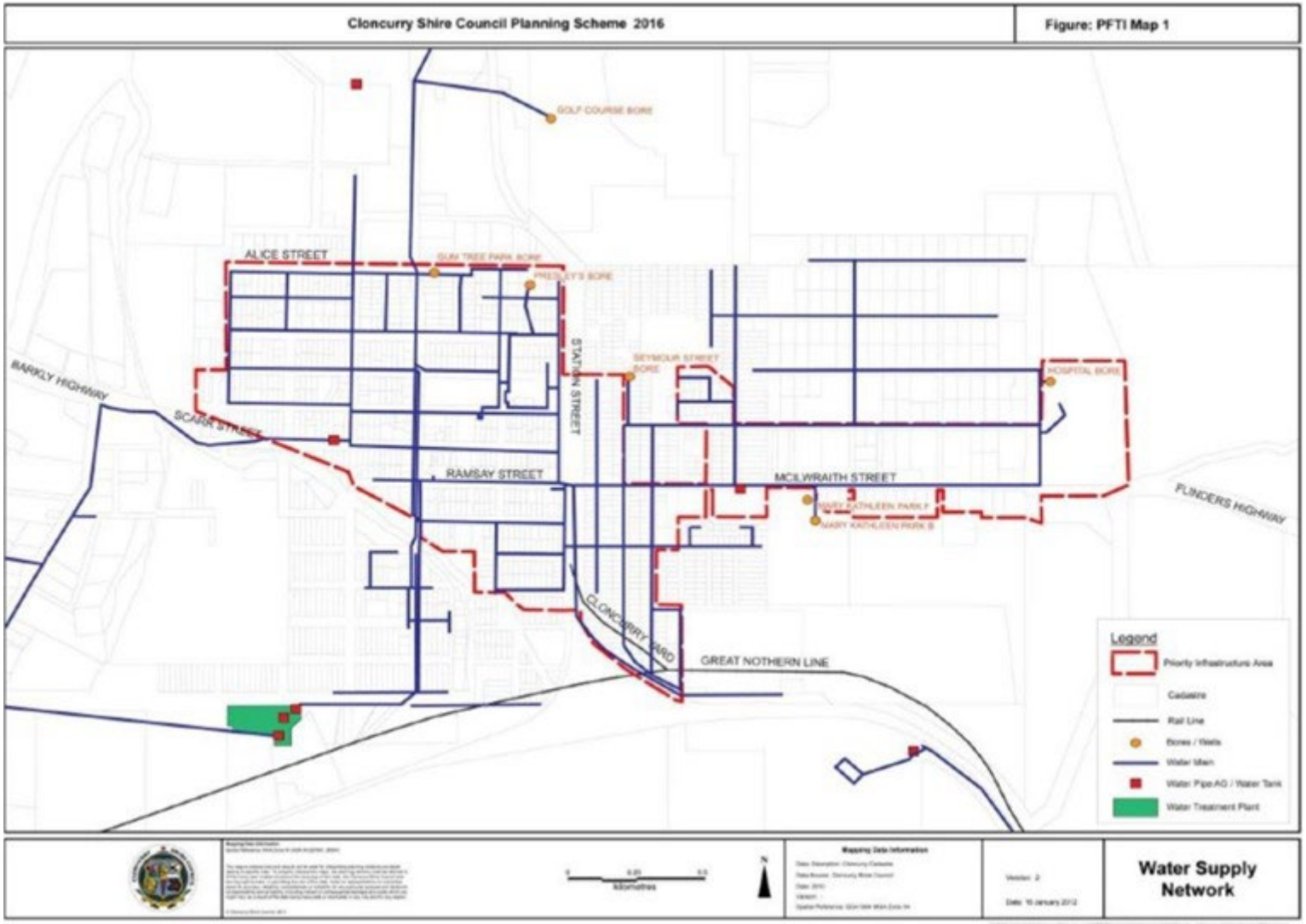

Table 4: Cloncurry Distribution System.

4.0 DAJARRA DRINKING WATER SCHEME

The Dajarra Drinking Water Scheme consists of three sub-Artesian bores; Windmill Bore, High School Bore and Bore #1. In 2020, Council commissioned a Water Treatment Plant for the scheme to combat water quality issues within the town and in 2023. The Dajarra scheme also has one reservoir which is utilised in the normal operation of the scheme. The WTP and town reservoir are located in a locked compound on the western edge of the town (access off the Boulia-Mt Isa Highway); Figure 5.

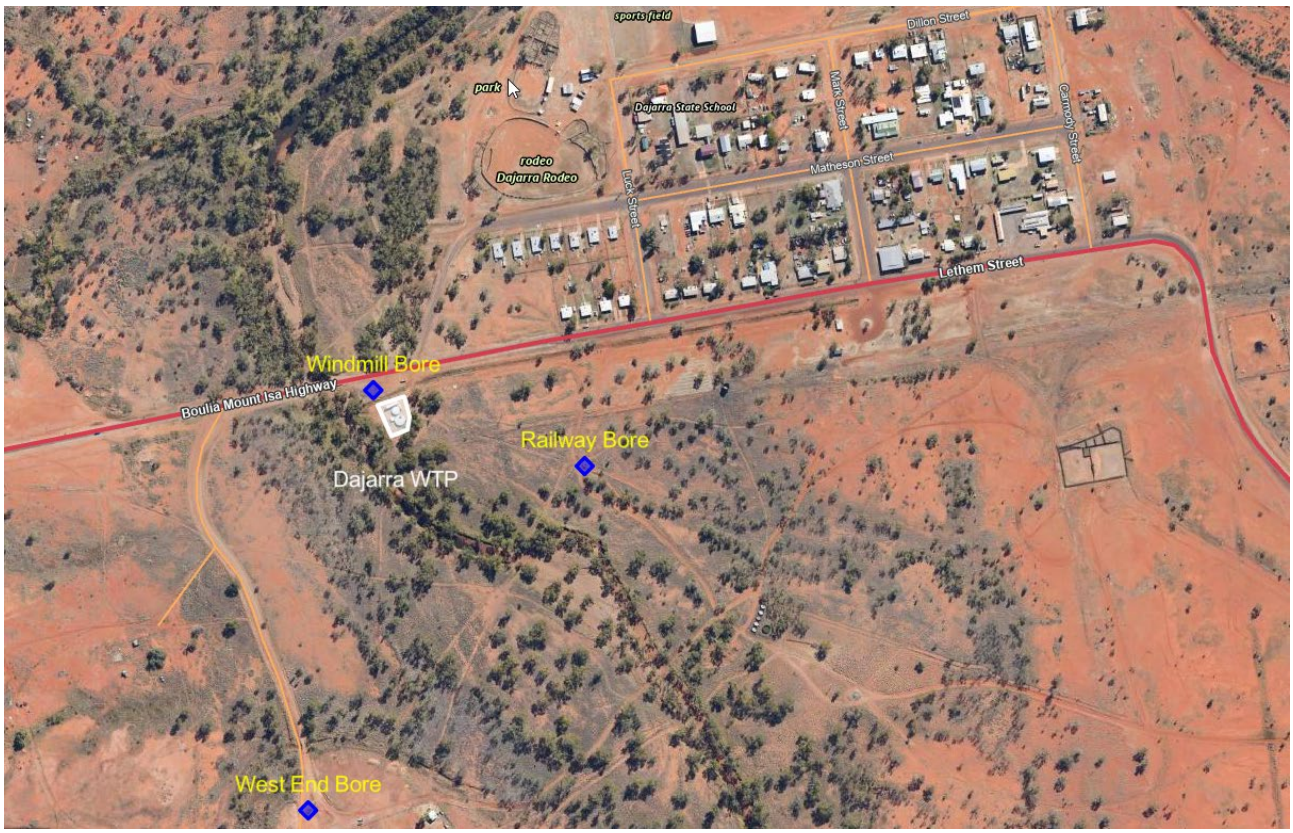

Figure 5: Dajarra drinking water infrastructure locations.

4.1 Water Treatment Plant

Water treatment in Dajarra involves a three-stage process which includes Media Filtration, Nanofiltration and Disinfection. Raw water is manually pumped from each bore into the Mixing Tank. Multimedia Filtration feed pumps then pass the raw water through Multimedia Filters (MMF) which act as a pre-treatment to Nanofiltration, removing suspended solids in the feed water and minimising the risk of particulate and biological matter fouling the downstream Nano filters. The MMFs have a fully automatic backwashing cycle, which is done using feed water. The filters are backwashed based on differential pressure or time. The filter medium consists of an anthracite layer over a sand later which ensures more penetration of the suspended matter into the filter bed, resulting in more efficient filtration and longer runs between cleaning. The sand was last replaced in 2023 when the filters started to go out of spec.

From the MMFs, treated water passes through additional 5-micron pre-filter Cartridge Filters and is then dosed with Antiscalent (Osmotreat SI) before being fed into a single duty Nano filter (NF). The NF feed water is fed into two separate streams, permeate and concentrate. The NF concentrate is discharged from the WTP at 200 kPa, collected and disposed of at the Dajarra sewerage treatment plant. The permeate and is conditioned by being passed through a Calcite Filter which adds necessary hardness and alkalinity to the permeate. The permeate is then dosed with Sodium Hypochlorite (8- 12% concentration). The Sodium Hypochlorite dosing pump is a variable speed and dosing which is adjusted in response to changes in the treated water flow. Permeate conductivity meters measure the permeate

quality. If the high conductivity warning is activated then the off-spec permeate will be diverted to the CIP tank. If the warning remains active for 300 seconds, then the off-spec alarm will generate and the WTP will be under fault. If the warning deactivates within 300 seconds then the off-spec valve will close and the Nanofiltration outlet will diver the permeate to the calcite filters.

The NF unit requires cleaning based on the water quality of the feed water, which usually occurs at quarterly intervals but sometimes, more frequently. The cleaning procedure comprises of the chemical addition procedure, chemical mixing procedure, CIP solution recirculation procedure, soaking procedures and post soak recirculation procedure. Waste generated after CIP is neutralised before discharging to local sump.

Following treatment, water is pumped to an elevated reservoir before being reticulated to the town.

Due to difficulties in obtaining permanent Water Operators in Dajarra, Council have sought assistance form OSMOFLO, an external water consultant which provides 24/7 remote assistance to Council, in addition to quarterly on-site servicing and WTP maintenance and monthly on-site routine inspections, maintenance and chemical replacement. Osmoflow send out Contractors to inspect the WTP every fortnight, with local Council staff available in Dajarra to meet physical call-out requirements in between visits. Finally, Plant Connect software (package used by Osmoflo) is installed at the WTP to access remote sites for the purpose of remote diagnostics.

4.2 Infrastructure

Table 5: Dajarra Drinking Water Scheme Infrastructure Details.

Component		Details		
Source	Name	Windmill Bore	Railway Bore	West End Bore
	% of supply	100%		
	Reliability	100%		
	Catchment Categorisation	Class IV Vulnerability – conservative due to limited water quality data available.		
	Contamination Sources	Possible contamination from surface waters leaching into the aquifer.		
	Water Quality Issues	High Total Dissolved Solids and Hardness. Limitations in supply availability.		
Source Infrastructure	**Type**	Mixing Tank		
	Description	Capacity: 200m^3 Raw water is pumped from the bores into the mixing tank. Excess water overflows into the nearby Carbin Creek.		
Treatment	Water Treatment Plant	Dajarra Water Treatment Plant		
	Design Capacity	150 kL/day (20 operational hours)		
	Multimedia Filters	Work in a two-duty configuration. Backwashing is done using feed water and is triggered by ither the backwash interval duration timer or on the differential pressure alarm (which ever comes earlier). Backwash sequences are followed by a rinse cycle to settle the media bed.		
	Cartridge Filters	2, 20”, 5-micron cartridge elements. Pressure transmitters from the Cartridge Filter outlet and MMF will trigger the differential pressure alarm to advise Water Operators when to clean out the filters.		
	Nanofiltration	Permeate conductivity meters monitor the permeate quality. If the high Conductivity warning is activated, the permeate will be diverted to the CIP tank. If the warning remains active for 300 seconds, then the Off-spec Alarm will generate and the WTP will be under fault. If the warning deactivates within 300 seconds then the Nanofiltration valve will divert the permeate to the calcite filters and treatment will continue as normal.		
	Calcite Filter	2 x 50% Calcite Filters.		

Component		Details
Disinfection	Type	Sodium Hypochlorite
	Details	The dosing pump is a variable speed and therefore, dosing flow will vary with changes in treated water flow. Chlorine Analyser installed in 2023. Free Chlorine residual can be monitored remotely through SCADA.
Distribution System	**Pipe Material**	**Potable Water: HDPE (Blue-stripe Pipe)**
	Age range	1 years @2024
	Approx. % of total length	100%
	Areas where potential long detention periods could be expected	None.
	Areas where low water pressure (e.g. < 12 m) could be expected during peak or other demand pds)	None.
Reservoirs	**Name**	**Dajarra Town Reservoir**
	Capacity	500m^3
	Roofed (Y/N)	Yes.
	Vermin-proof (Y/N)	Yes.
	Runoff directed off roof (Y/N)	Yes.

Figure 6: Dajarra Drinking Water Scheme.

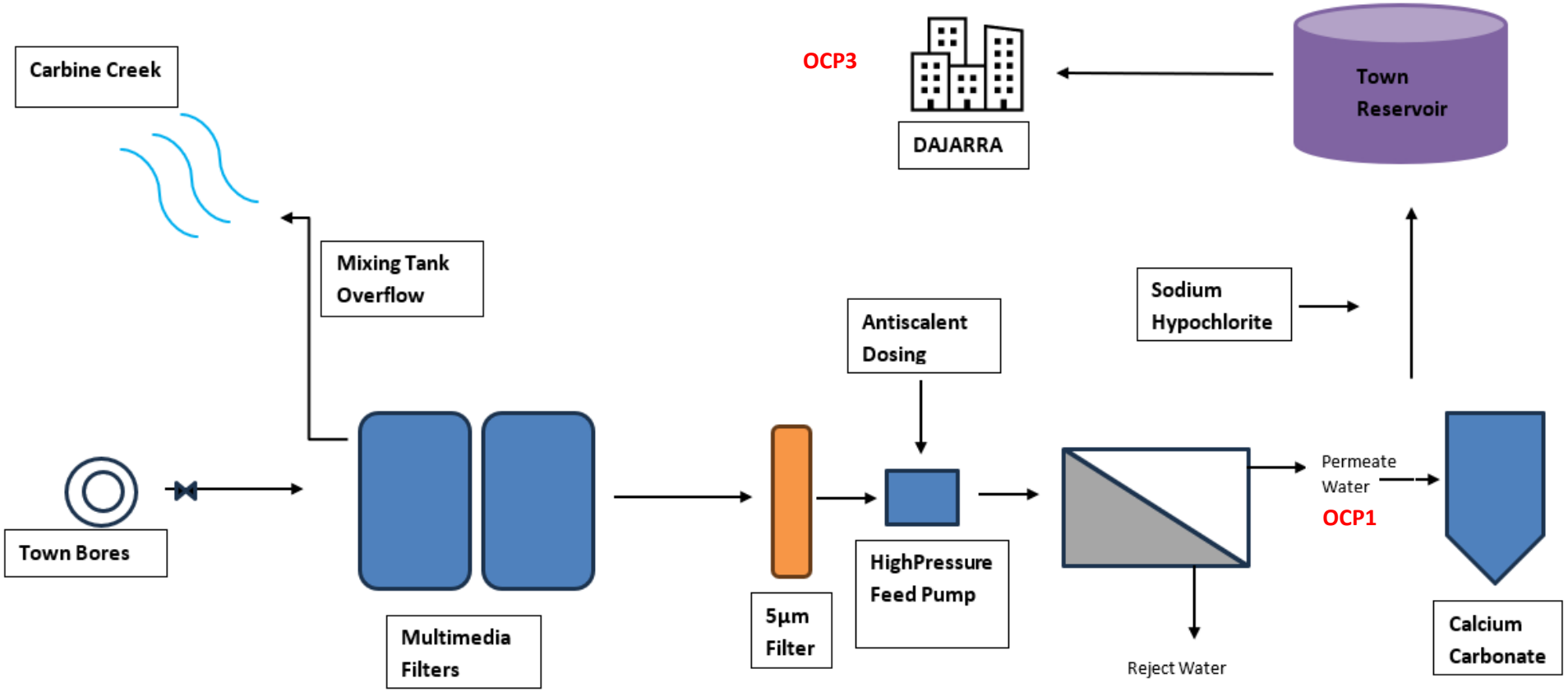

Figure 7: Dajarra Drinking Water Schematics.

5.0 CLONCURRY AND DAJARRA DRINKING WATER QUALITY

Council has adopted a Drinking Water Quality Policy which complements this Drinking Water Quality Management Plan.

The Drinking water Policy provides that Council ensures its actions and policies support the effective management of drinking water quality by:

- Ensuring Councils water functions are appropriately resourced;
- Providing adequate financial resources;
- Integrating the needs and expectations of consumers, stakeholders, regulators and employees into its planning to provide and maintain a safe water supply;
- managing water quality at all points along the delivery chain by using a risk-based approach in which potential threats to water quality are identified, assessed and mitigated;
- establishing and maintaining regular and effective drinking water quality monitoring and reporting mechanisms to provide relevant and timely information, that promotes confidence in the management of its water supply systems;
- developing appropriate contingency planning and incident response capabilities to manage incidents and other emergent events potentially affecting water quality;
- participating in appropriate research and development activities (including employee training) to ensure continued understanding of drinking water quality issues and performance;
- continually improving its practices by assessing performance against corporate commitments and stakeholder expectations; and
- openly communicating this policy to the community to encourage public awareness.

A review of historical water data for the schemes provides valuable information, assisting Council in understanding Cloncurry and Dajarra's source water characteristics and system performance over time and following specific events (i.e. heavy rainfall). This aids in the identification of hazards and to pinpoint aspects of the drinking water schemes that require improvement. Water quality data is also used to inform the Risk Management Improvement Programme.

One challenge for the Dajarra scheme is that water testing has only been consistently undertaken in the last two years and therefore, water quality data is limited. To combat this issue, Council intends to undertake a water quality investigation over the next few years to better understand the quality of the source and treated water (refer to RMIP item D1).

5.1 Cloncurry Drinking Water Quality

A summary of Cloncurry's drinking water quality from 2019- 2024 is provided in Tables 7- 10, with water quality data trended below (Figures 8- 49). All available water quality data from the last five years has been included in the summary. Historically, raw water data for Cloncurry has been monitored from the combined raw water tank within the WTP. This has resulted in some data gaps. Moving forward, Council intend to monitor their raw water sources separately as detailed in the Cloncurry verification and operational monitoring programmes in Tables 27 and 30 below.

Table 6: Cloncurry Combined Source Water Quality Summary (2019- 2021; External Verification Monitoring).

Analyte	Units	Summary of Results				Guideline Values			
		Samples Tested	Maximum Value	Mean Value	Minimum Values	Health	Exceedances	Aesthetic	Exceedances
Conductivity	µS/cm	4	797	511	130				
pH	pH Units	4	8.41	7.8	7.16			≥6.5 & ≤8.5	0
Total Hardness	mg/L	4	167	120.5	50			200	0
Total Dissolved Solids	mg/L	4	484	310.25	75			600	0
Total Dissolved Ions	mg/L	4	625	418	109				
True Colour	HU	4	10	8.5	8			15	0
Turbidity	NTU	4	48	21.25	2			5	3
Silica	mg/L	4	26	17.05	5.2			80	0
Sodium	mg/L	4	120	68.7	4.8			180	0
Potassium	mg/L	4	6.2	4.75	3.7				
Calcium	mg/L	4	34	29.25	16				
Magnesium	mg/L	4	40	11.55	2.2				
Chloride	mg/L	4	61	30.2	2.8			250	0
Fluoride	mg/L	4	0.69	0.49	0.08	1.5	0		
Nitrate	mg/L	4	0.69	0.42	0.26	50	0		
Sulphate	mg/L	4	52	25.15	0.6	500	0	250	0
Zinc	mg/L	4	0.06	0.06	0.06			3	0
Aluminium	mg/L	4	0.03	0.03	0.03			0.2	0
Total Iron	mg/L	4	0.01	0.01	0.01			0.3	0
Total Manganese	mg/L	4	0.002	0.0013	0.001	0.5	0	0.1	0
Boron	mg/L	4	0.06	0.053	0.05	4	0		
Copper	mg/L	4	0.085	0.027	0.004	2	0	1	0
Uranium	mg/L	10	0.012	0.004	0.0001	0.017	0		

Table 7: Cloncurry Individual Source Water Quality Summary (2024).

Analyte	Units	Summary of Results						Guideline Values			
		Samples Tested	Maximum Value	Mean Value	Minimum Values	Standard Deviation	95th Percentile	Health	Exceedances	Aesthetic	Exceedances
Mainwell											
pH	pH Units	14	7.77	7.19	6.73	0.318366	7.6985			≥6.5 & ≤8.5	0
Turbidity	NTU	14	48.9	25.43643	15.7	7.937864	37.265			5	14
Total Iron	mg/L	12	7.85	6.35	3.75	0.970395	7.465			0.3	12
Total Manganese	mg/L	12	3.04	2.384	0.685	0.579852	3.03615	0.5	12	0.1	12
Conductivity	µS/cm	14	427.7	337.7214	278.3	33.55446	395.005				
Well 1											
pH	pH Units	43	8.01	7.231628	6.73	0.347382	7.794			≥6.5 & ≤8.5	0
Turbidity	NTU	43	8.03	1.929	0.39	1.50854	4.4785			5	2
Total Iron	mg/L	43	6	0.588605	0	0.903818	0.96			0.3	30
Total Manganese	mg/L	42	1.093	0.630714	0.068	0.295578	1.068	0.5	25	0.1	40
Conductivity	µS/cm	42	3206	508.05	283.4	494.0678	1394.665				
Well 2											
pH	pH Units	36	8.01	7.259722	6.64	0.321667	7.8			≥6.5 & ≤8.5	0
Turbidity	NTU	36	4.4	1.87	0.77	0.879937	3.6425			5	0
Total Iron	mg/L	36	1.43	0.376111	0.19	0.279387	0.9425			0.3	12
Total Manganese	mg/L	36	1.347	0.535083	0.154	0.253222	0.975	0.5	16	0.1	36
Conductivity	µS/cm	36	585.8	343.3472	274.4	49.98266	376.35				
Bore 1											
pH	pH Units	5	7.3	7.14	6.9	0.141845	7.288			≥6.5 & ≤8.5	0
Turbidity	NTU	5	8.48	2.802	0.64	2.929822	7.332			5	1
Total Iron	mg/L	5	4.7	2.2	0.55	1.914231	4.636			0.3	5

Analyte	Units	Summary of Results						Guideline Values			
		Samples Tested	Maximum Value	Mean Value	Minimum Values	Standard Deviation	95th Percentile	Health	Exceedances	Aesthetic	Exceedances
Conductivity	µS/cm	4	557.7	399.45	332.8	91.9793	528.435				
Bore 2											
pH	pH Units	20	7.75	7.18	6.69	0.343118	7.7025			≥6.5 & ≤8.5	0
Turbidity	NTU	20	10	2.306	0.36	2.68859	7.473			5	3
Total Iron	mg/L	20	1.27	0.642	0.04	0.336372	1.0135			0.3	17
Total Manganese	mg/L	14	1.614	0.838714	0.03	0.444173	1.47425	0.5	11	0.1	12
Conductivity	µS/cm	19	1180	593.4526	319.1	174.8216	777.16				
Bore 4											
pH	pH Units	37	7.86	7.086757	6.64	0.310501	7.644			≥6.5 & ≤8.5	0
Turbidity	NTU	37	2.93	0.483243	0.08	0.657695	2.152			5	0
Total Iron	mg/L	36	0.74	0.054	0	0.150639	0.2225			0.3	2
Total Manganese	mg/L	36	1.27	0.118194	0	0.265131	0.628	0.5	5	0.1	7
Conductivity	µS/cm	37	1069	845.7811	388.6	150.8709	1047.6				
Bore 5											
pH	pH Units	12	7.78	7.255833	6.81	0.285933	7.637			≥6.5 & ≤8.5	0
Turbidity	NTU	12	0.6	0.304167	0.14	0.154243	0.5945			5	0
Total Iron	mg/L	11	0.92	0.114727	0.01	0.257233	0.53			0.3	1
Total Manganese	mg/L	7	0.036	0.014	0	0.014172	0.0345	0.5	0	0.1	0
Conductivity	µS/cm	10	1437	1031.47	141.7	446.6486	1430.7				

ADWG Aesthetic Exceedance

ADWG Health Exceedance

Table 8: Cloncurry Treated Water Quality Summary (2019- 2024; External Verification Results).

Analyte	Units	Summary of Results						Guideline Values			
		Samples Tested	Maximum Value	Mean Value	Minimum Values	Standard Deviation	95th Percentile	Health	Exceedances	Aesthetic	Exceedances
E.coli	MPN/100mL	1217	1	0.0008	0	0	0	1	1		
Total Coliforms	MPN/100mL	1217	200	0.19	0	0	0				
Conductivity	µS/cm	103	880	305.097	118	123.61	476				
pH	pH Units	103	8.24	7.59	6.69	0.36	8.13			≥6.5 & ≤8.5	0
Total Hardness	mg/L	103	130	76.26	42	16.51	101.9			200	0
Total Dissolved Ions	mg/L	103	666	235.19	95	91.62	352.4				
Total Dissolved Solids	mg/L	103	530	180.63	71	73.48	278			600	0
True Colour	HU	103	81	7.87	1	7.54	8			15	1
Turbidity	NTU	103	11	1.24	1	1.42	1			5	3
Silica	mg/L	103	32	13.88	5.8	4.14	19.9			80	0
Sodium	mg/L	103	140	33.42	2	22.43	64.5			180	0
Potassium	mg/L	103	4.9	4.12	3.5	0.31	4.7				
Calcium	mg/L	103	30	20.95	12	3.58	27				
Magnesium	mg/L	103	13	20.9	2	11.49	39.5				
Fluoride	mg/L	103	1.3	0.26	0.05	0.16	0.48	1.5	0		
Nitrate	mg/L	103	1.2	0.57	0.29	0.2	0.87	50	0		
Sulphate	mg/L	103	69	14	0.6	11.1	27	500	0	250	0
Zinc	mg/L	103	0.06	0.057	0.01	0.001	0.06			3	0
Aluminium	mg/L	103	0.05	0.032	0.03	0.005	0.05			0.2	0
Total Iron	mg/L	103	2.9	0.038	0.01	0.28	0.01			0.3	1
Total Manganese	mg/L	103	1.6	0.017	0.001	0.16	0.01	0.5	1	0.1	4
Boron	mg/L	103	0.08	0.03	0.02	0.009	0.04	4	0		

Analyte	Units	Summary of Results						Guideline Values			
		Samples Tested	Maximum Value	Mean Value	Minimum Values	Standard Deviation	95th Percentile	Health	Exceedances	Aesthetic	Exceedances
Copper	mg/L	103	0.054	0.001	0.0009	0.011	0.033	2	0	1	0
Uranium	mg/L	8	0.0001	0.0001	0.0001	0	0.001	0.017	0		
Trihalomethanes	mg/L	41	0.096	0.062	0.03	0.016	0.088	0.25	0		
ADWG Aesthetic Exceedance											
ADWG Health Exceedance											

Table 9: Cloncurry Water Treatment Plant Water Quality Summary (2021- 2024).

Analyte	Units	Summary of Results						Guideline Values			
		Samples Tested	Maximum Value	Mean Value	Minimum Values	Standard Deviation	95th Percentile	Health	Exceedances	Aesthetic	Exceedances
Mixed Raw Water											
Conductivity	µS/cm	1124	1124	351.5	78.8	234.34	895.84				
pH	pH Units	1124	8.9	7.64	6.28	0.24	8.12			≥6.5 & ≤8.5	2
True Colour	HU	1124	2135	9.51	0	64.15	22.85			15	142
Turbidity	NTU	1112	234	12.86	0.11	15.85	39.2			5	669
Total Iron	mg/L	1080	21.4	0.54	0	0.744	1.22			0.3	757
Total Manganese	mg/L	1123	2.37	0.534	0	0.45	1.38	0.5	487	0.1	896
Clear Water Tank											
Conductivity	µS/cm	1121	572	223.69	91.9	97.23	420.1				
pH	pH Units	1123	8.28	7.62	6.58	0.155	7.85			≥6.5 & ≤8.5	0
True Colour	HU	1127	12	0.23	0	1.05	1			15	0
Turbidity	NTU	1122	1.34	0.2	0.06	0.13	0.42			5	0
Total Iron	mg/L	1078	0.06	0	0	0.01	0.03			0.3	0
Total Manganese	mg/L	1127	0.18	0.004	0	0.014	0.032	0.5	0	0.1	5
Free Chlorine	mg/L	1123	7.88	2.19	0.8	0.356	2.7			<0.2, >5	1 (>5)
Town Reservoir											
Conductivity	µS/cm	1124	566.9	223.2	11.4	96.52	417.42				
pH	pH Units	1124	8.44	7.76	6.71	0.17	8			≥6.5 & ≤8.5	0
True Colour	HU	1129	14	0.17	0	0.94	1			15	0

Analyte	Units	Summary of Results						Guideline Values			
		Samples Tested	Maximum Value	Mean Value	Minimum Values	Standard Deviation	95th Percentile	Health	Exceedances	Aesthetic	Exceedances
Turbidity	NTU	1124	1.2	0.17	0.03	0.12	0.3			5	0
Total Iron	mg/L	1078	3	0.01	0	0.11	0.02			0.3	2
Total Manganese	mg/L	1129	0.145	0.004	0	0.014	0.029	0.5	0	0.1	5
Free Chlorine	mg/L	1124	3.55	1.99	0.09	0.28	2.4			<0.2, >5	1
ADWG Aesthetic Exceedance											
ADWG Health Exceedance											

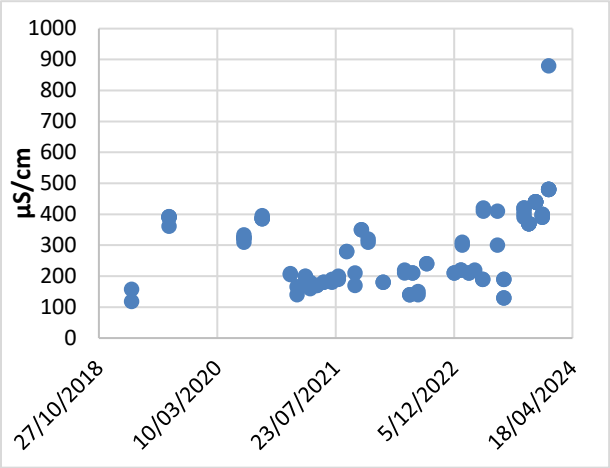

Figure 8: Cloncurry treated water quality monitoring trends for Conductivity.

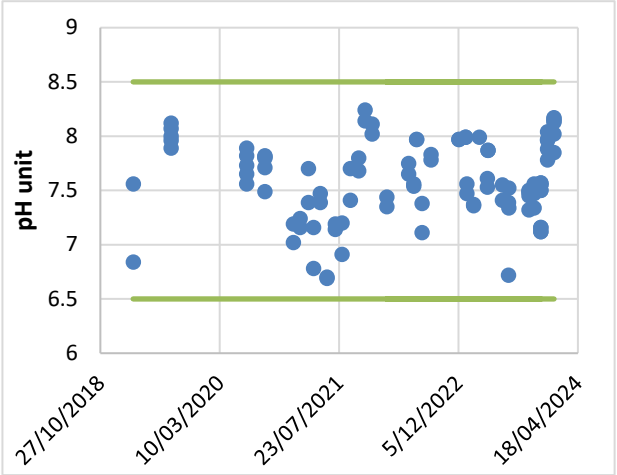

Figure 9: Cloncurry treated water quality monitoring trends for pH.

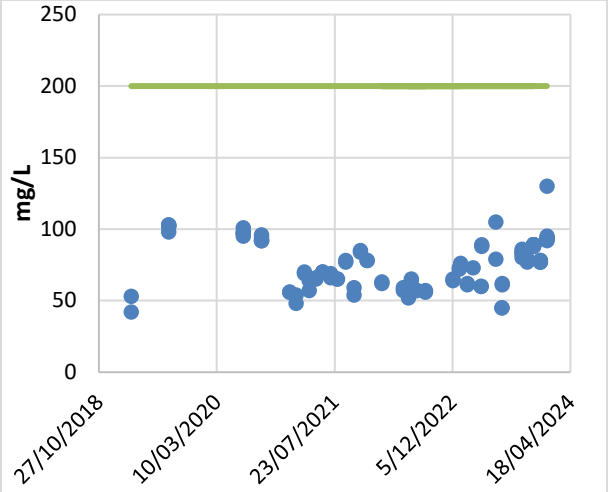

Figure 10: Cloncurry treated water quality monitoring trends for Total Hardness.

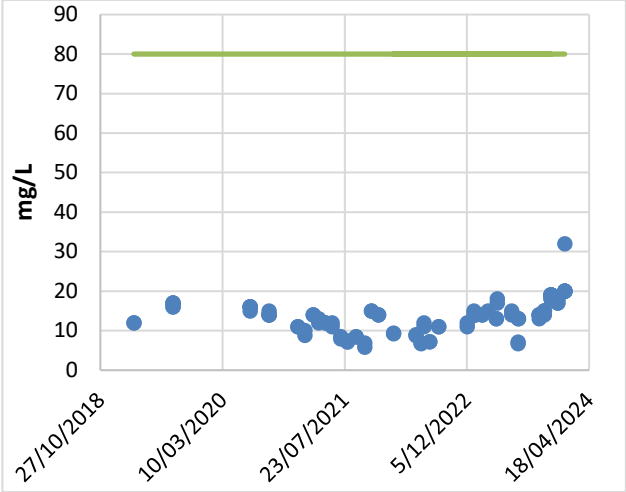

Figure 11: Cloncurry treated water quality monitoring trends for Silica.

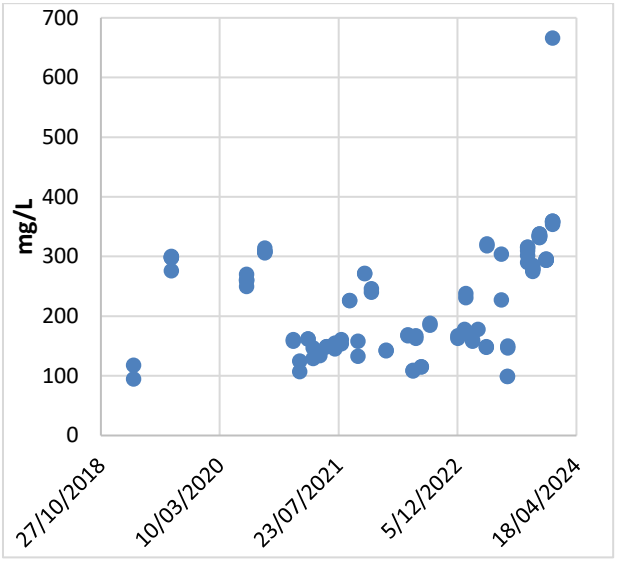

Figure 12: Cloncurry treated water quality monitoring trends for Total Dissolved Ions.

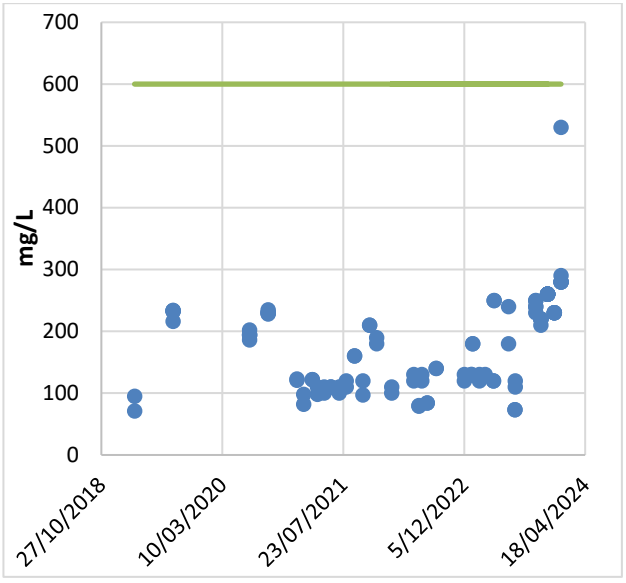

Figure 13: Cloncurry treated water quality monitoring trends for Total Dissolved Solids.

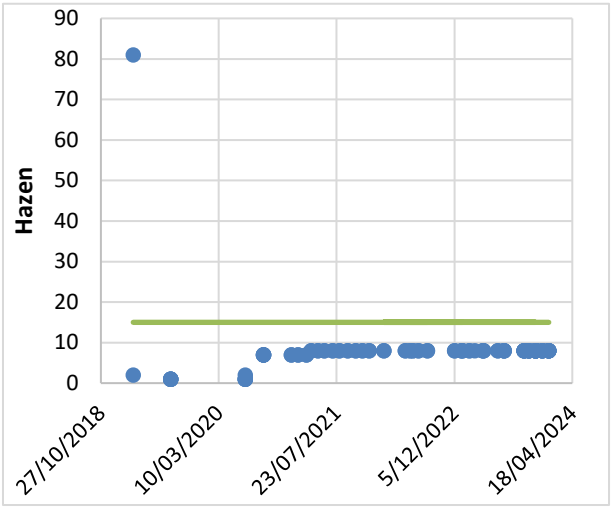

Figure 14: Cloncurry treated water quality monitoring trends for True Colour.

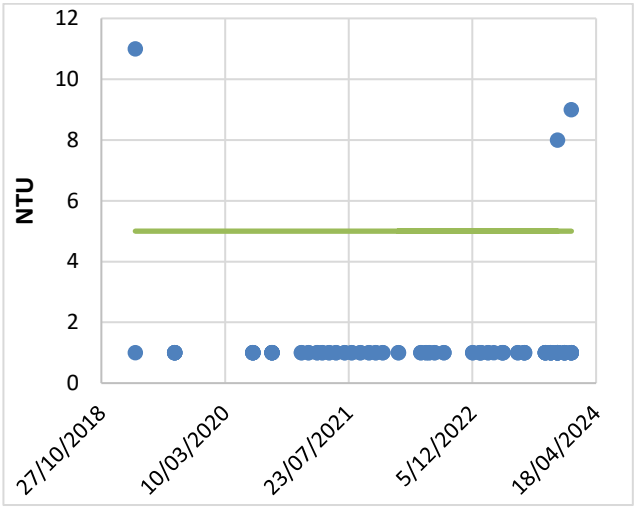

Figure 15: Cloncurry treated water quality monitoring trends for Turbidity.

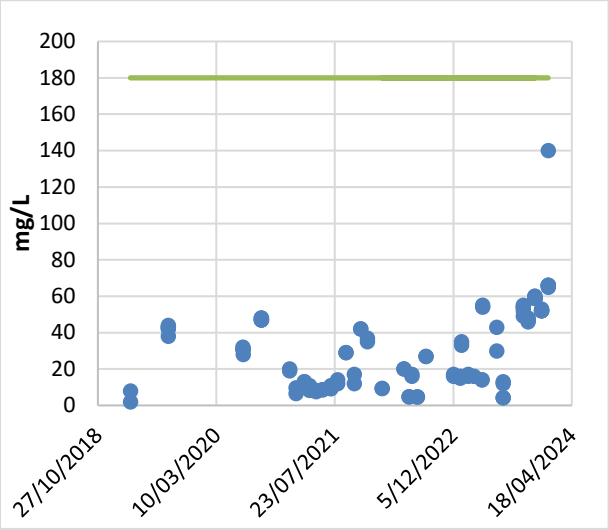

Figure 16: Cloncurry treated water quality monitoring trends for Sodium.

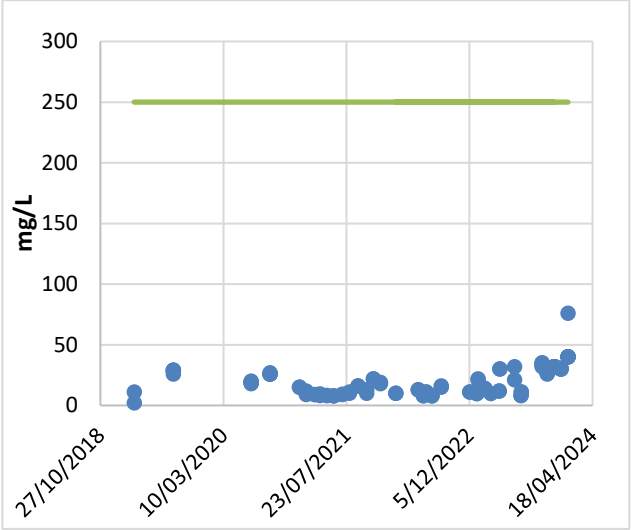

Figure 17: Cloncurry treated water quality monitoring trends for Chloride.

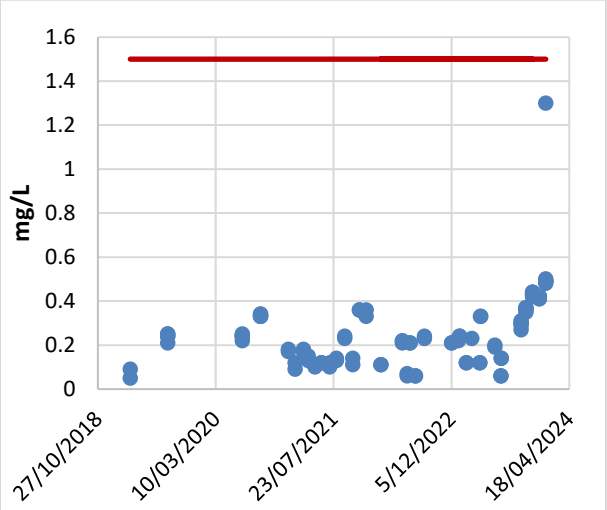

Figure 18: Cloncurry treated water quality monitoring trends for Fluoride.

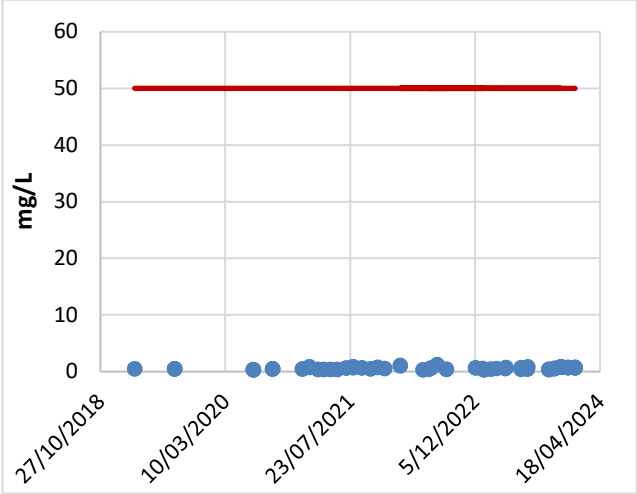

Figure 19: Cloncurry treated water quality monitoring trends for Nitrate.

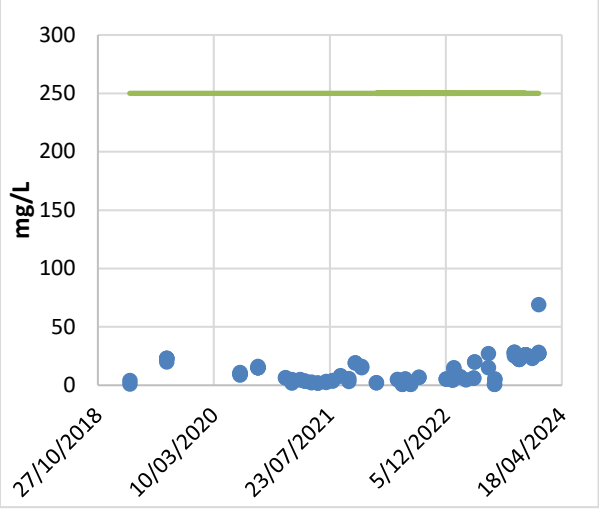

Figure 20: Cloncurry treated water quality monitoring trends for Sulphate.

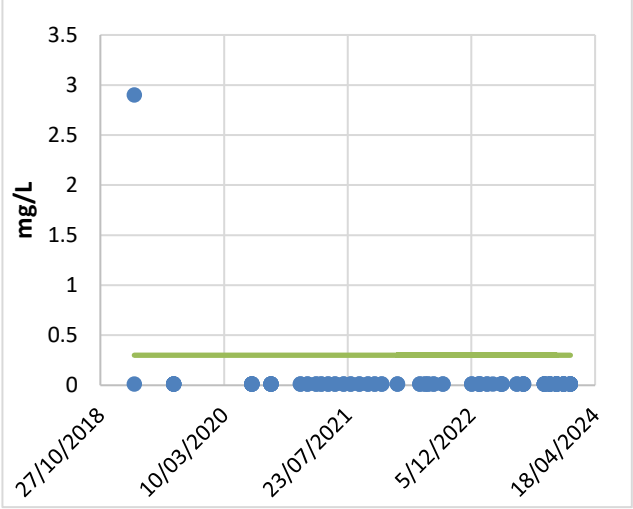

Figure 21L Cloncurry treated water quality monitoring trends for Total Iron.

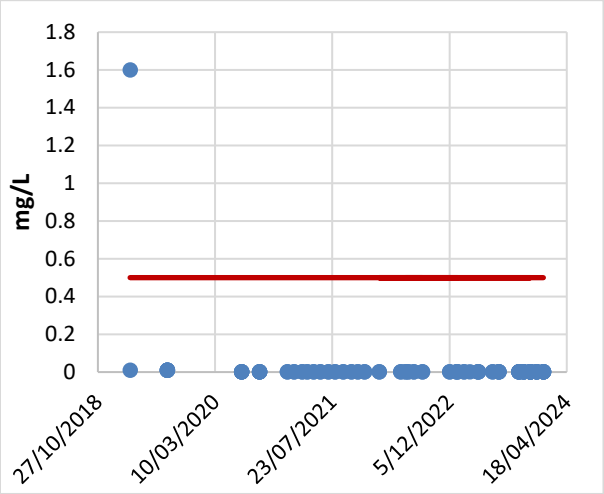

Figure 22: Cloncurry treated water quality monitoring trends for Total Manganese.

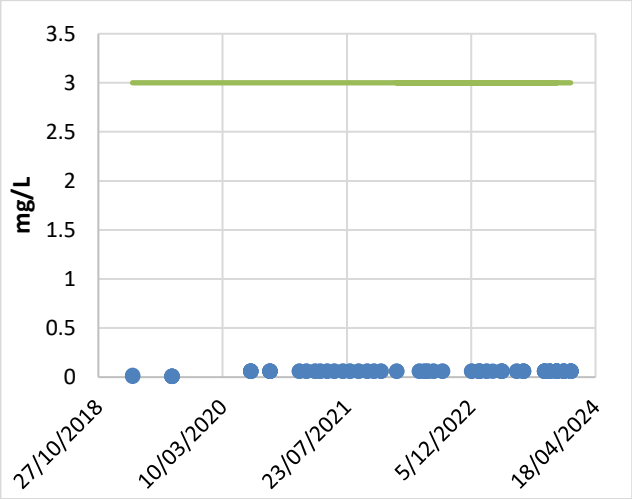

Figure 23: Cloncurry treated water quality monitoring trends for Zinc.

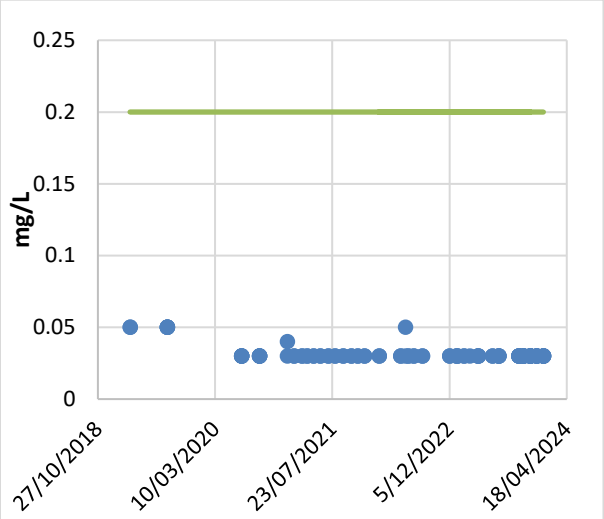

Figure 24: Cloncurry treated water quality monitoring trends for Aluminium.

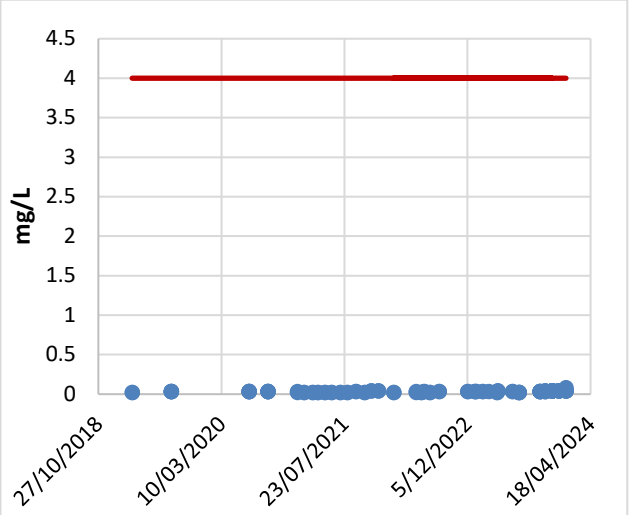

Figure 25: Cloncurry treated water quality monitoring trends for Boron.

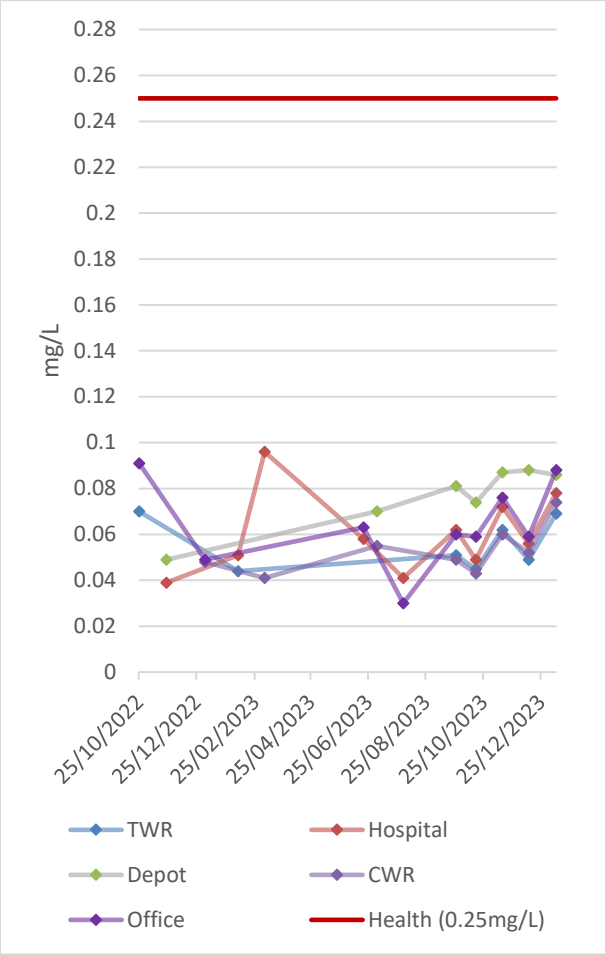

Figure 26: Cloncurry treated water quality monitoring trends for Trihalomethanes.

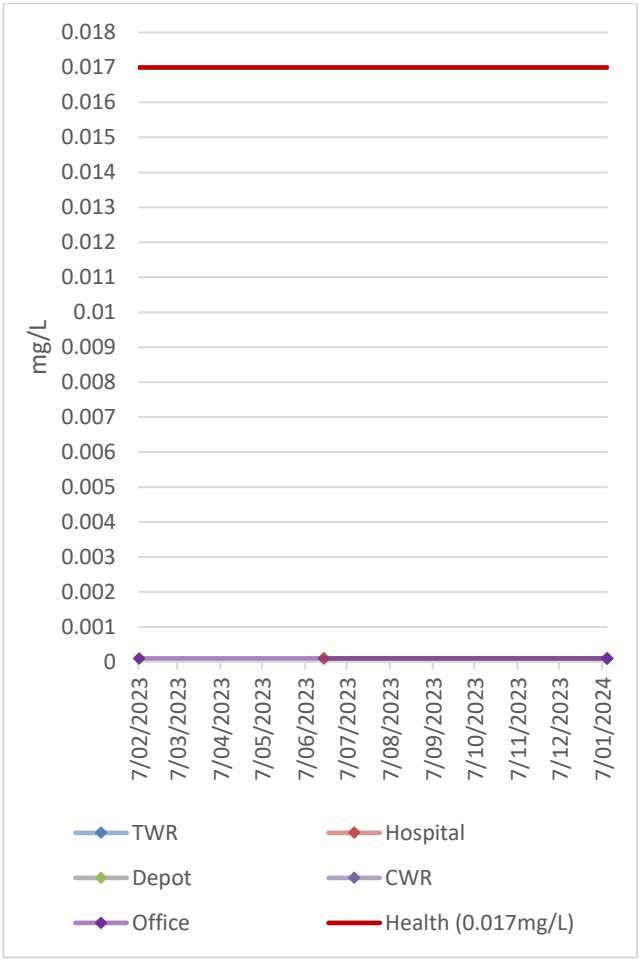

Figure 27: Cloncurry treated water quality monitoring trends for Uranium.

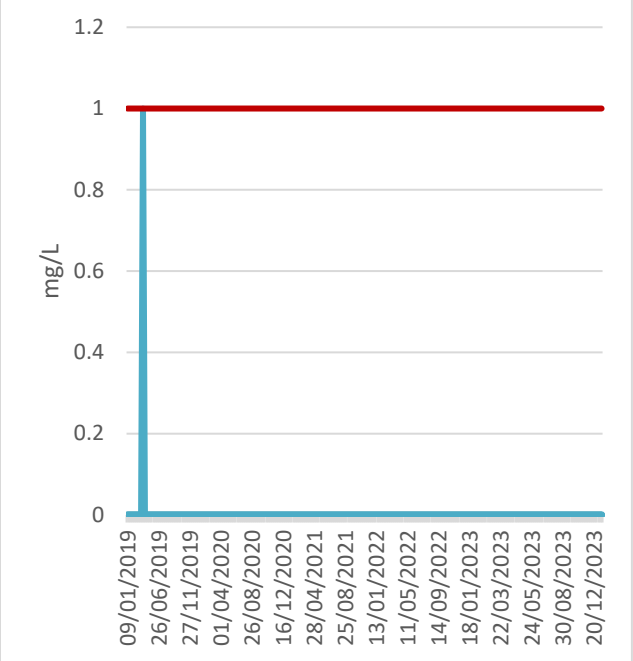

Figure 28: Cloncurry treated water quality monitoring trends for *E.coli*.

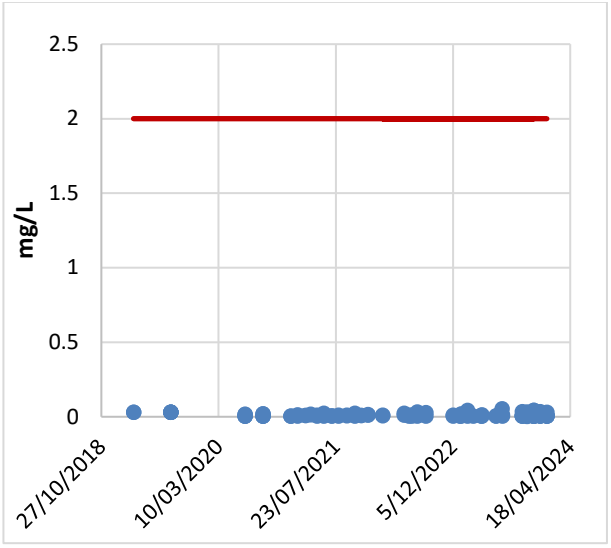

Figure 29: Cloncurry treated water quality monitoring trends for Copper.

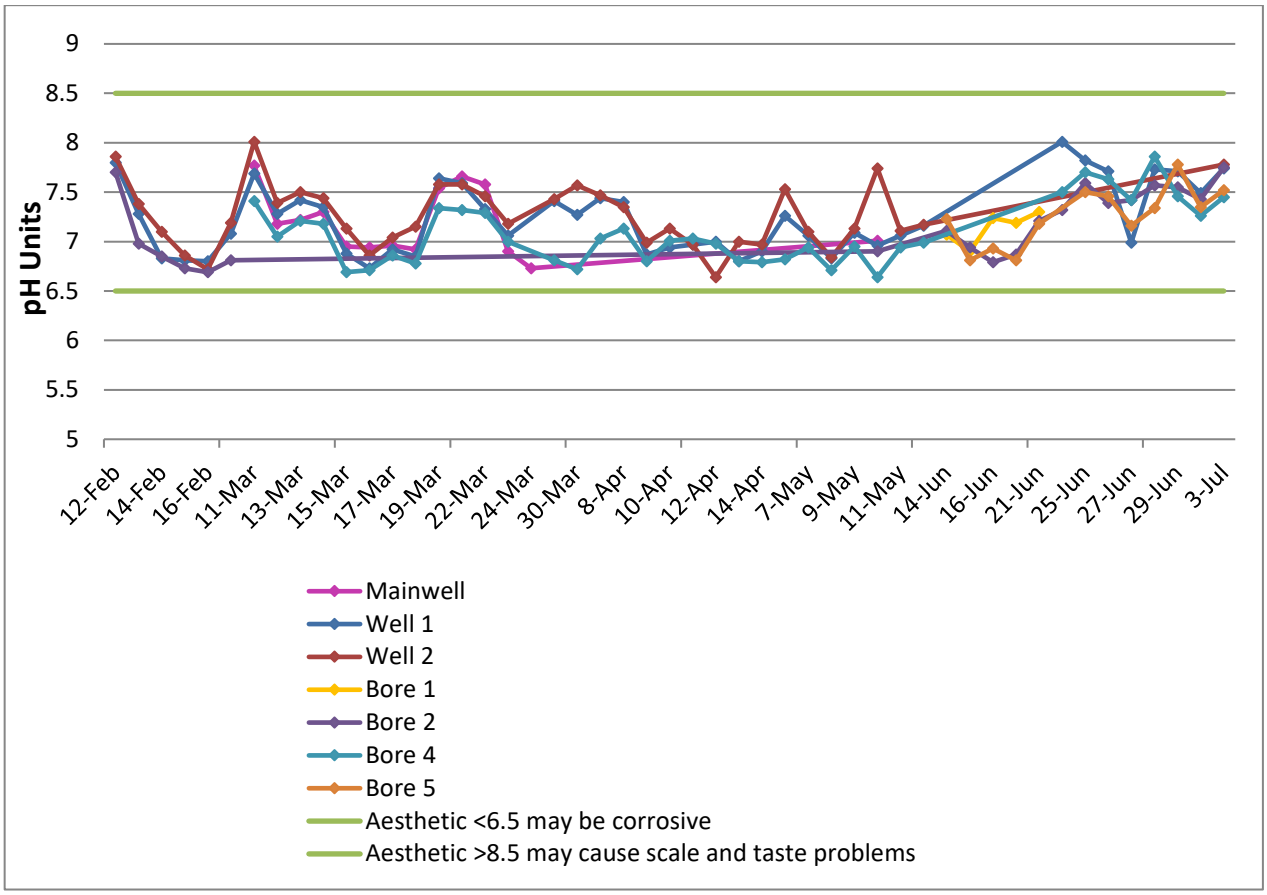

Figure 30: Cloncurry individual raw water trends for pH (2024).

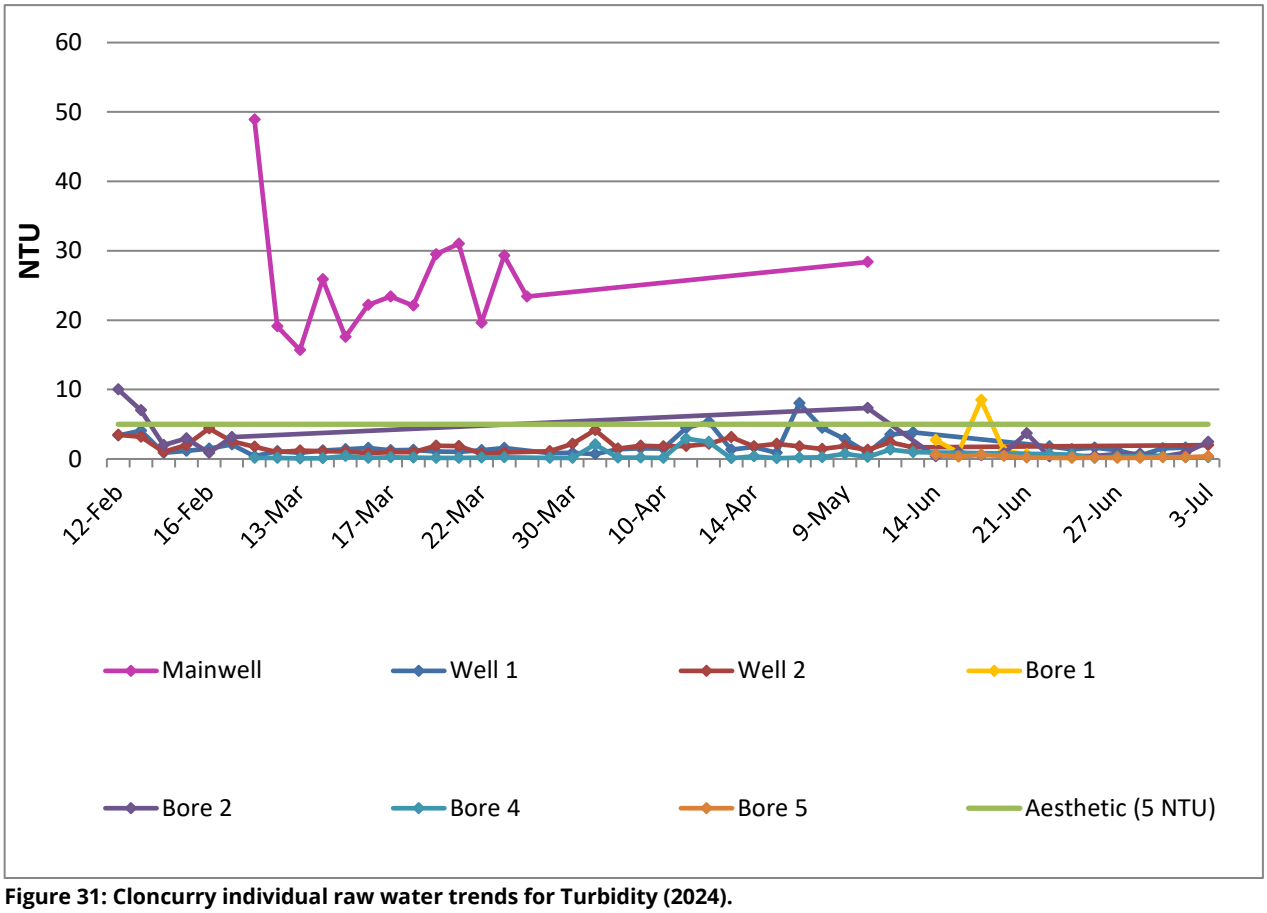

Figure 31: Cloncurry individual raw water trends for Turbidity (2024).

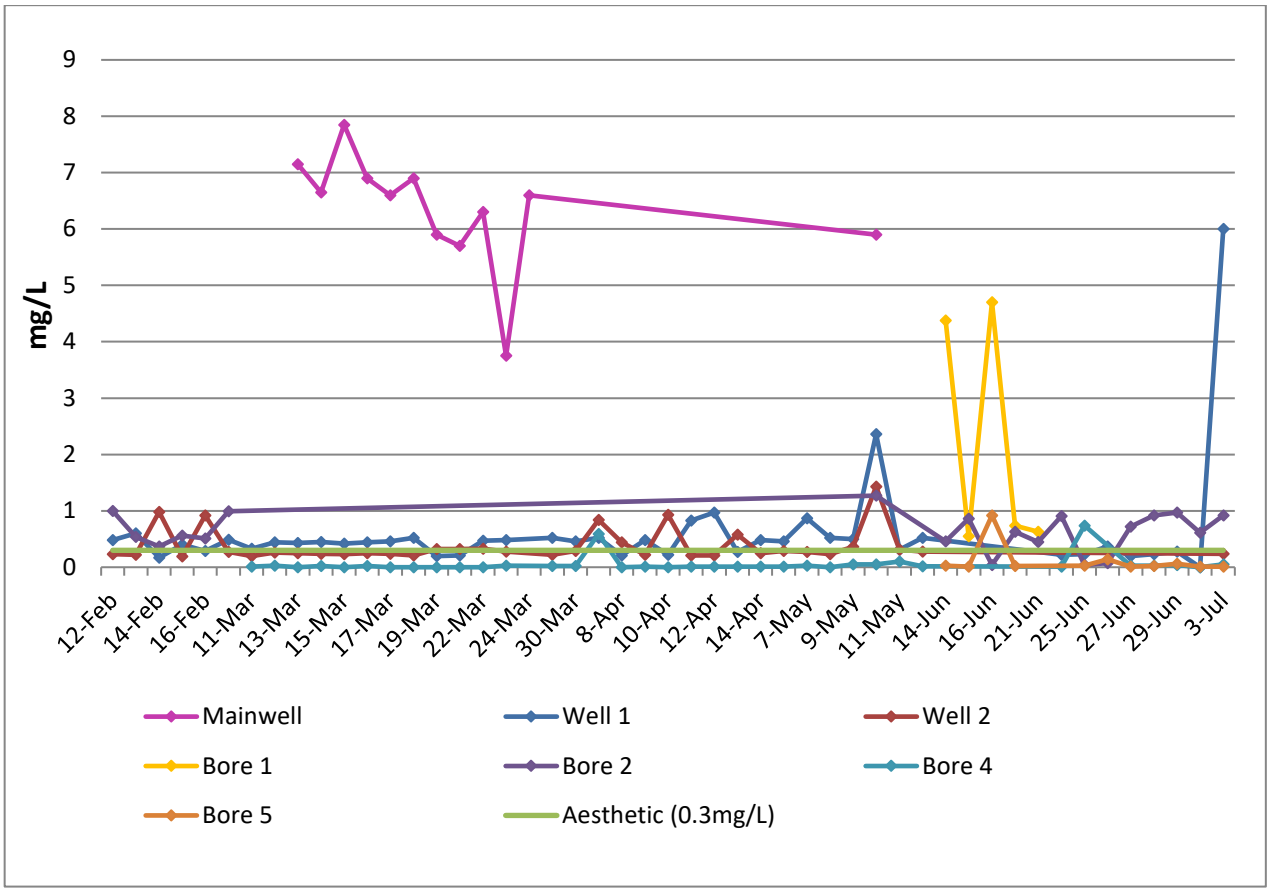

Figure 32: Cloncurry individual raw water trends for Total Iron (2024).

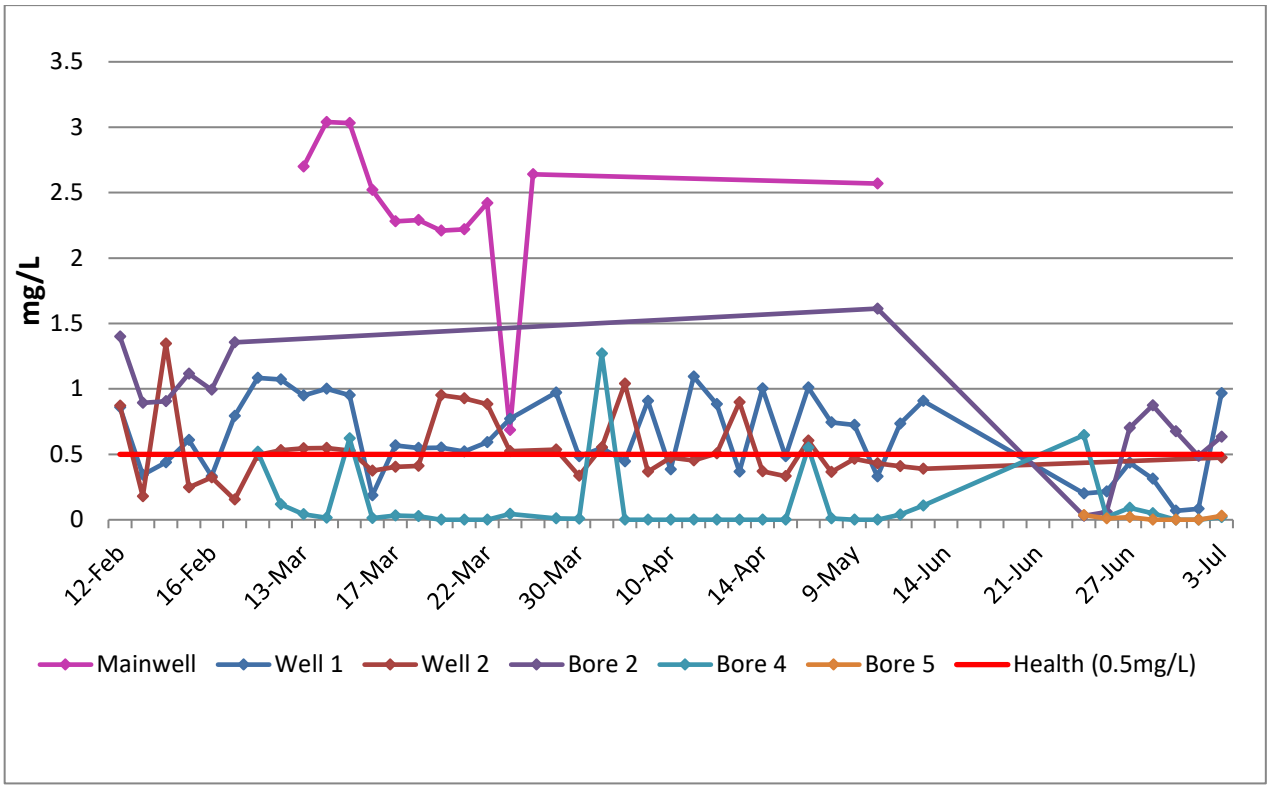

Figure 33: Cloncurry individual raw water trends for Total Manganese (2024).

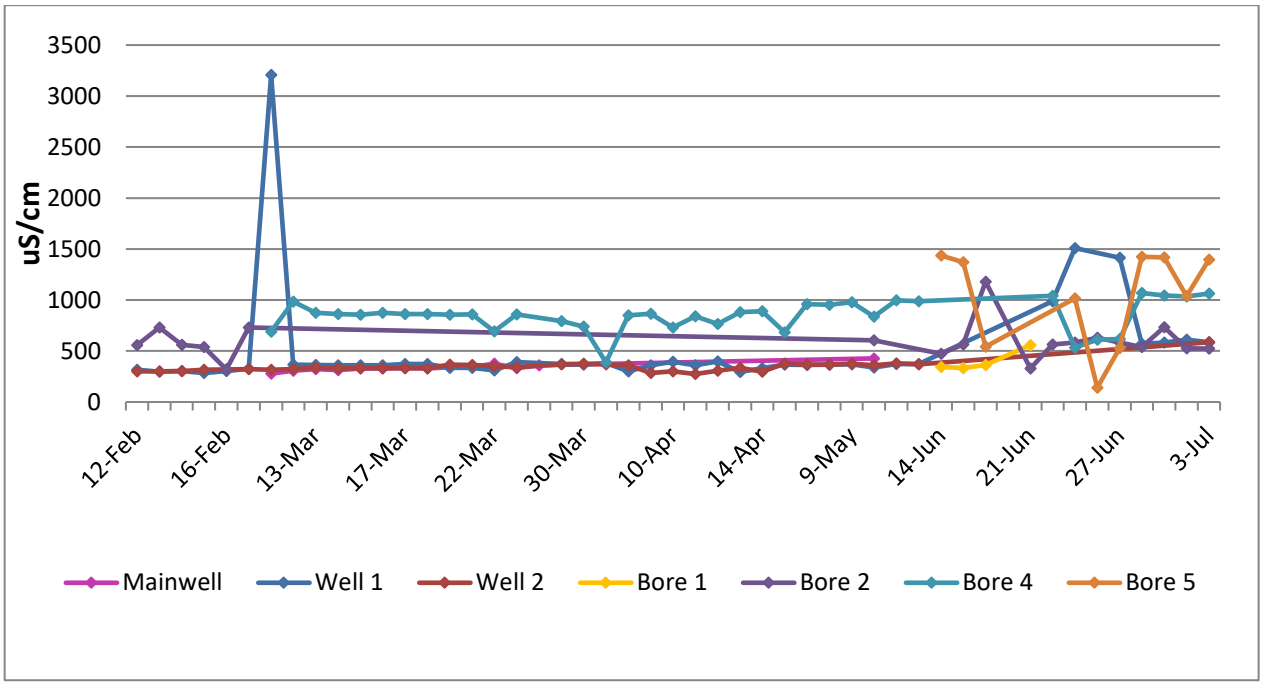

Figure 34: Cloncurry individual raw water trends for Conductivity (2024).

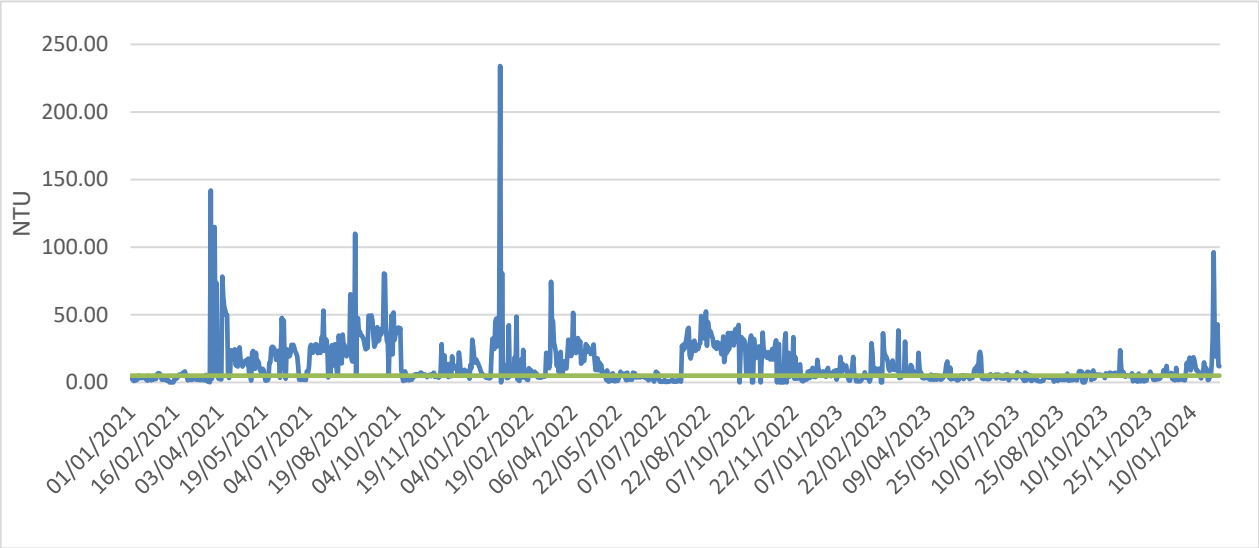

Figure 35: Cloncurry Mixed Raw Water Turbidity trends.

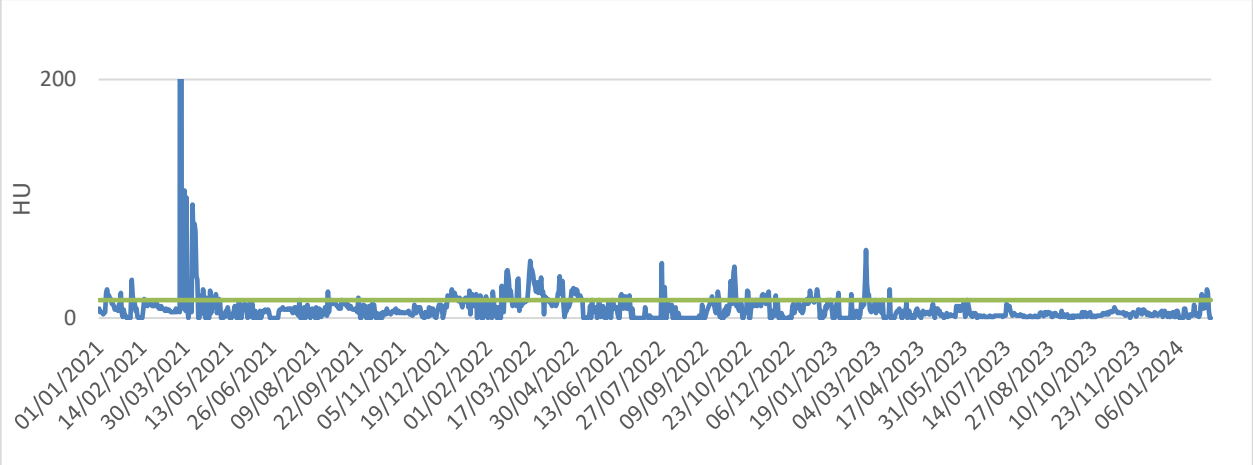

Figure 36: Cloncurry Mixed Raw Water True Colour trends.

Figure 37: Cloncurry Mixed Raw Water pH trends.

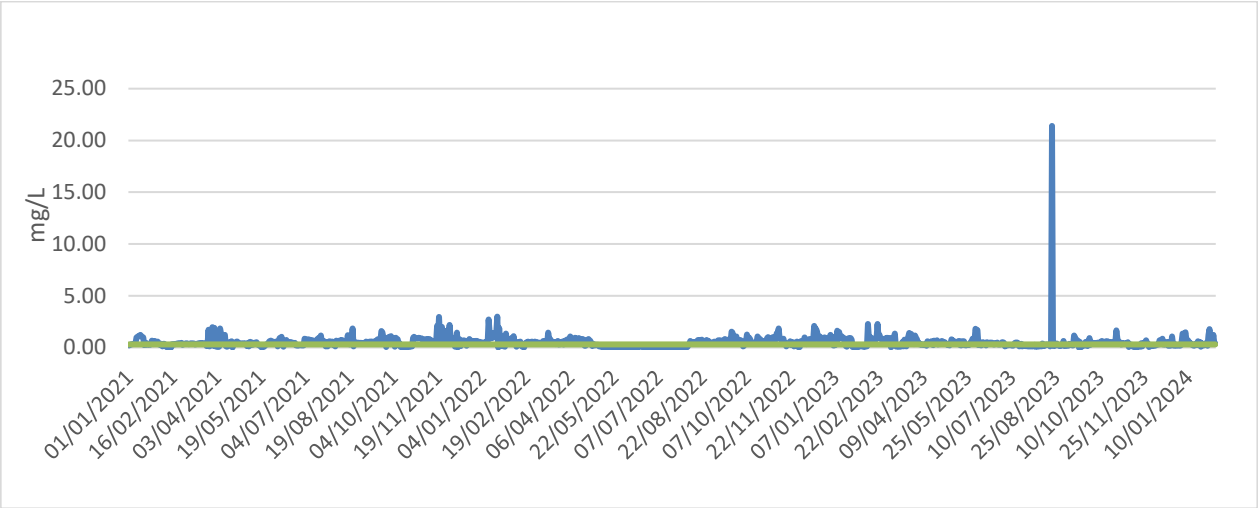

Figure 38: Cloncurry Mixed Raw Water Total Iron trends.

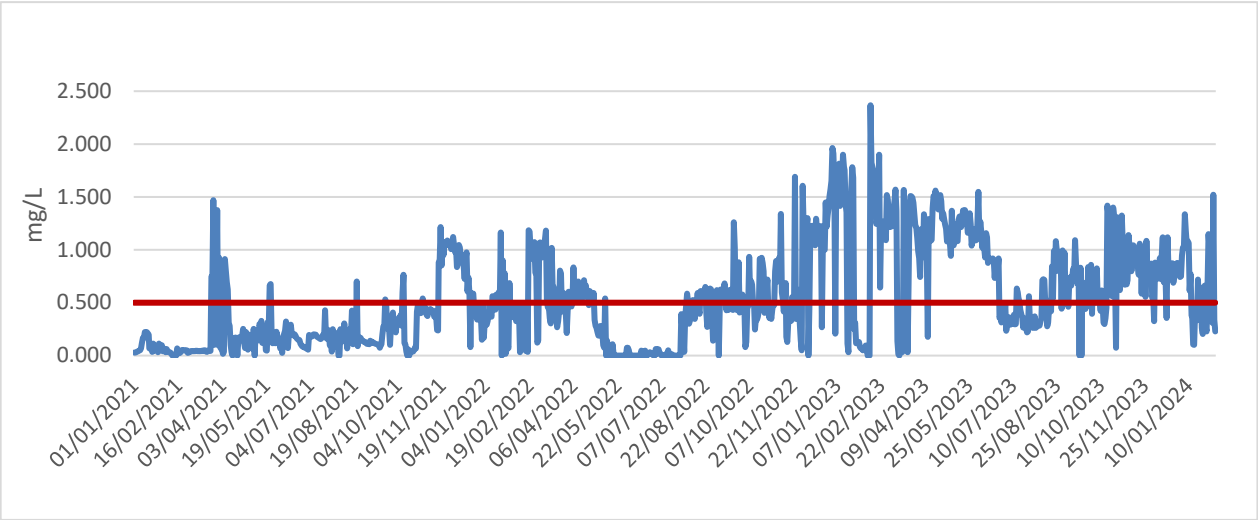

Figure 39: Cloncurry Mixed Raw Water Total Manganese trends.

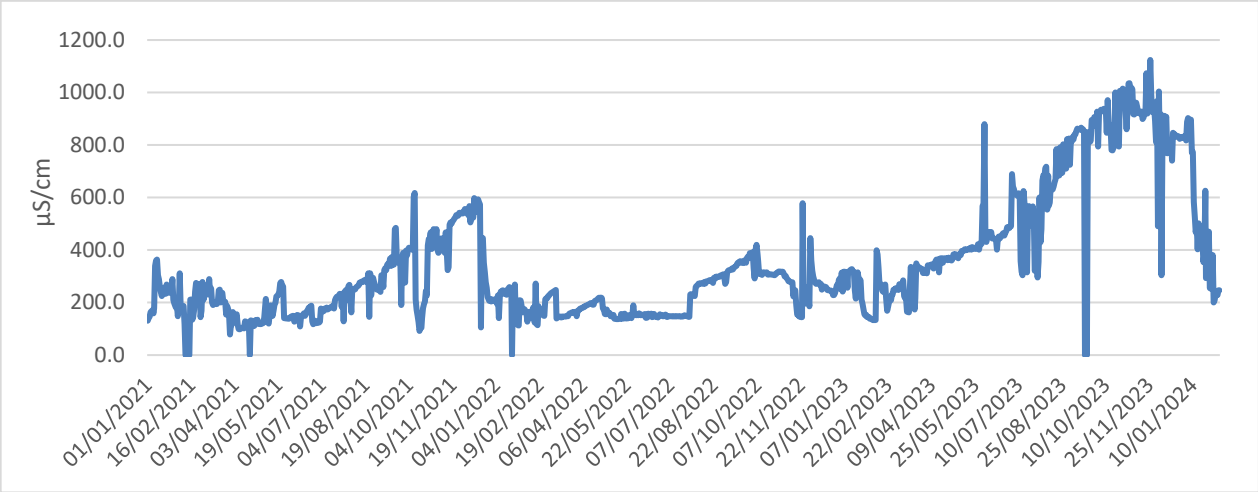

Figure 40: Cloncurry Mixed Raw Water Conductivity trends.

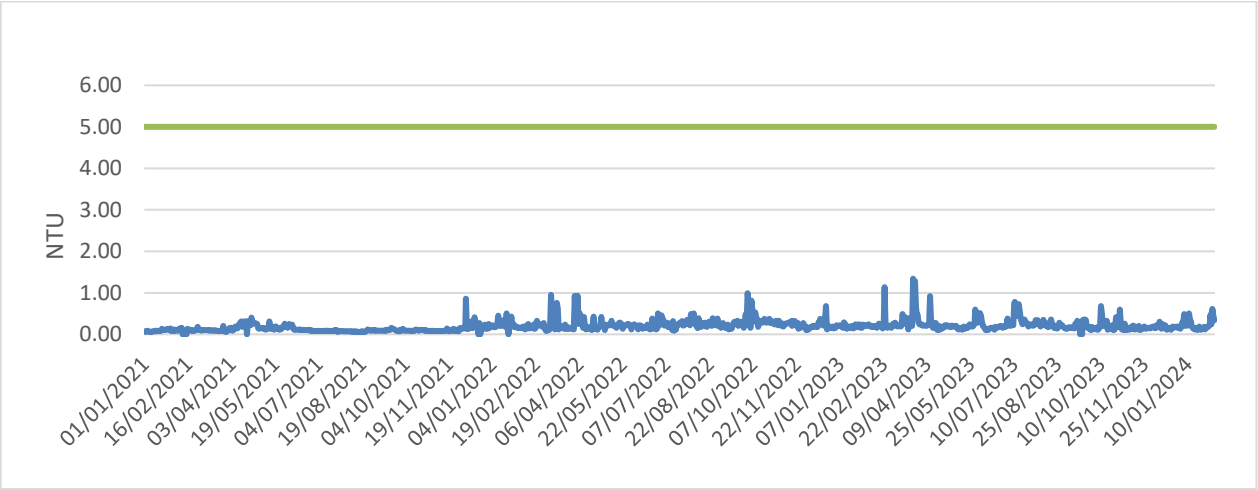

Figure 41: Cloncurry Clear Water Tank Turbidity trends.

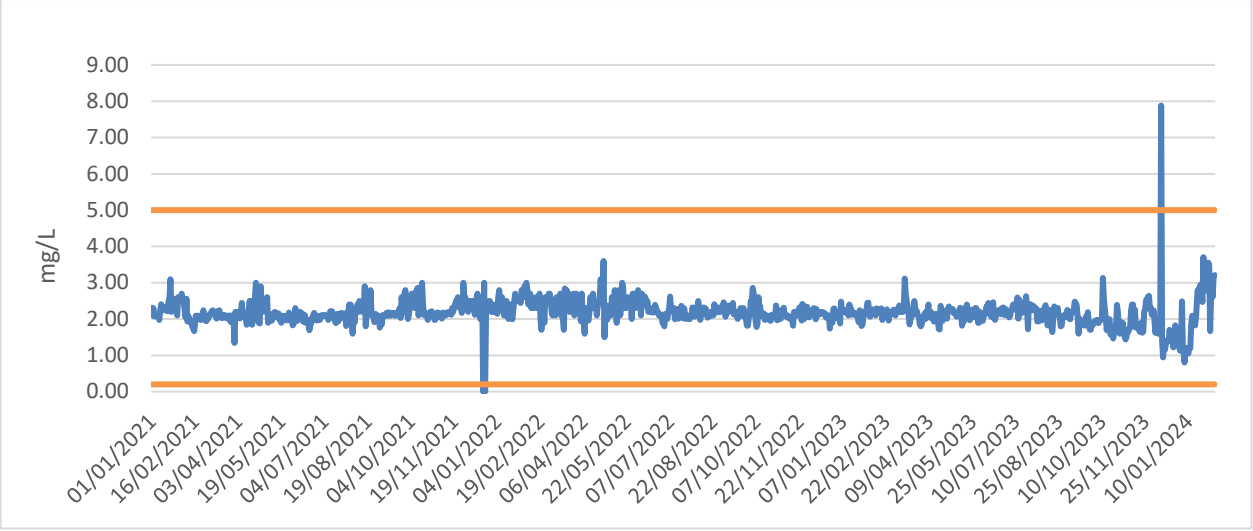

Figure 42: Cloncurry Clear Water Tank Free Chlorine trends.

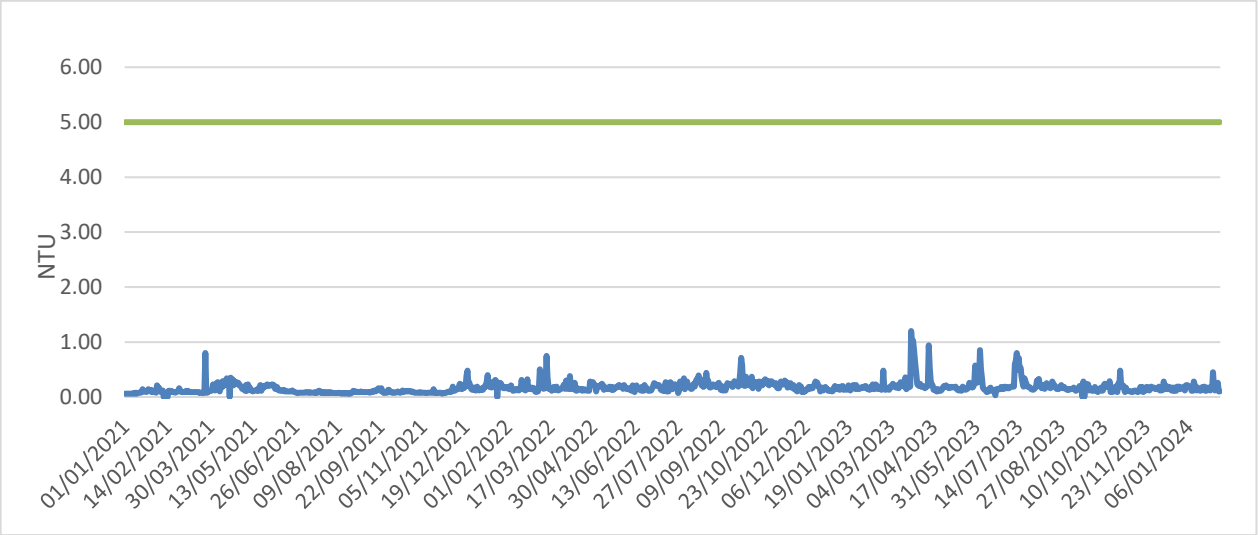

Figure 43: Cloncurry Town Reservoir Turbidity trends.

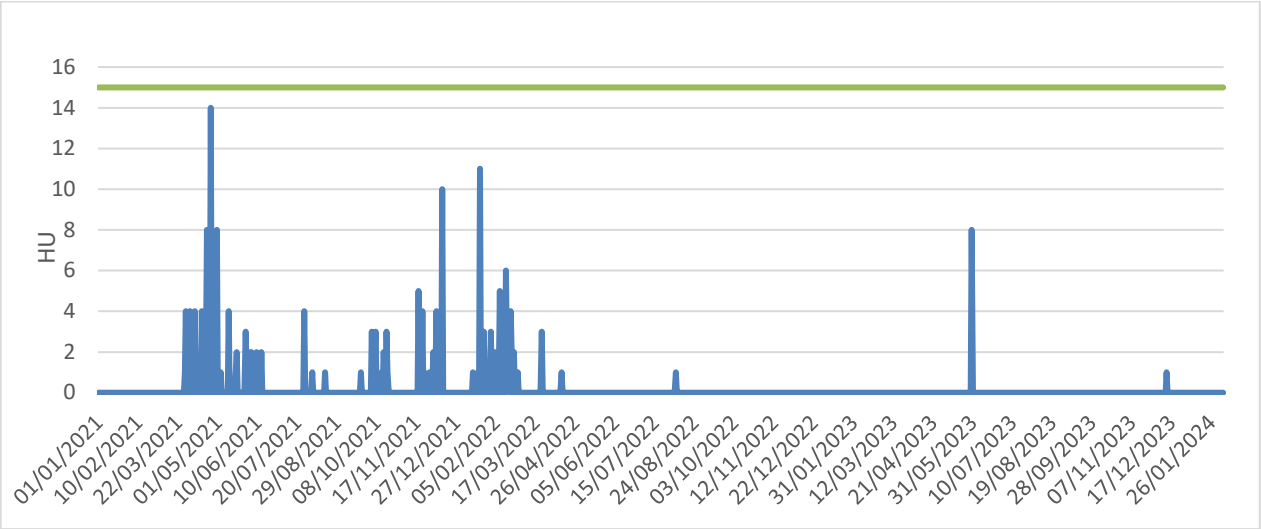

Figure 44: Cloncurry Town Reservoir True Colour trends.

Figure 45: Cloncurry Town Reservoir pH trends.

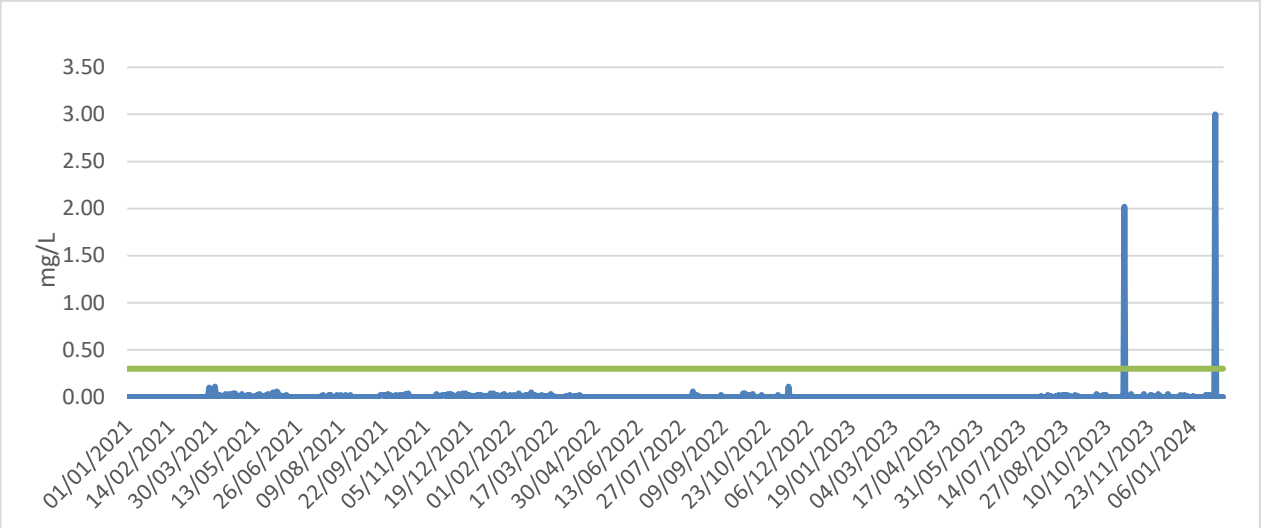

Figure 46: Cloncurry Town Reservoir Total Iron trends.

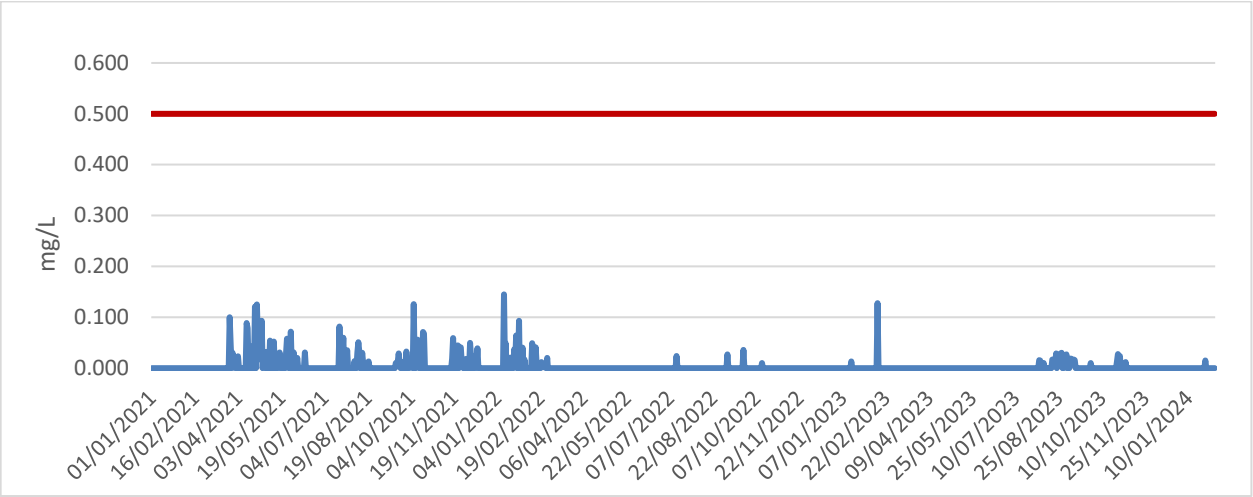

Figure 47: Cloncurry Town Reservoir Total Manganese trends.

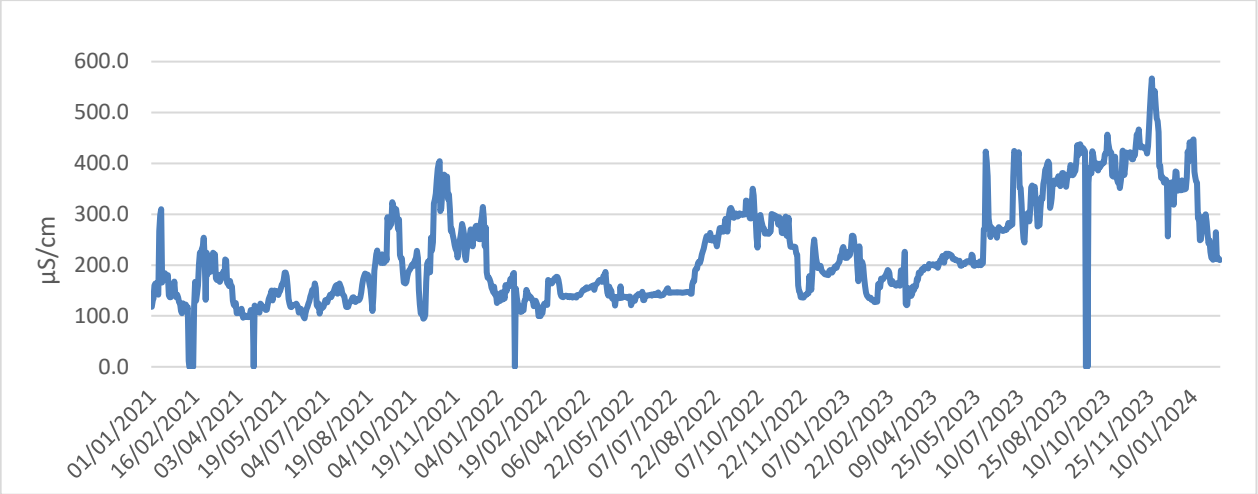

Figure 48: Cloncurry Town Reservoir Conductivity trends.

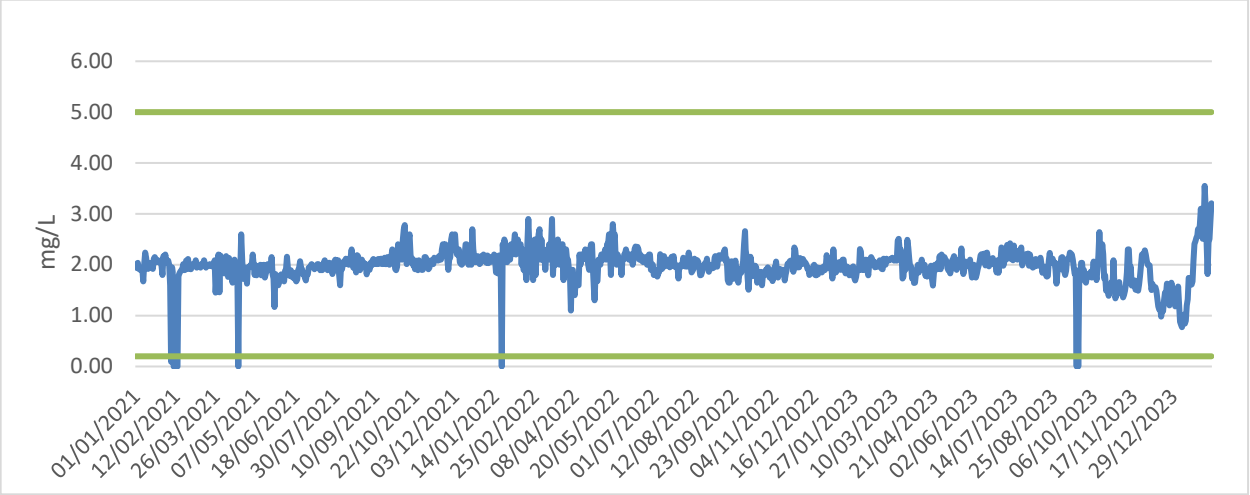

Figure 49: Cloncurry Town Reservoir Free Chlorine trends.

5.1.1 Cloncurry ADWG Exceedances

Combined source water monitoring for Cloncurry at the WTP shows regular exceedances of the ADWG values for True Colour, Turbidity, Total Iron and Total Manganese. True Colour, Turbidity and Total Iron are parameters with aesthetic ADWG values and therefore, exceedances of these parameters are not necessarily unsafe but may result in taste, odour and colour issues within the drinking water supply. Thus, it is within Council's best interest to ensure these aesthetic exceedances are managed during the water treatment process. In regards to the Toal Manganese exceedances, Manganese has been previously identified as a risk for the scheme, with source water concentrations regularly above the ADWG health limit of 0.5 mg/L. To combat this risk, Council doses the raw water supply with Potassium Permanganate to assist in the removal of Manganese.

The water treatment process is considered effective for the town's supply as data shows a reduction in True Colour, Turbidity, Total Iron and Total Manganese concentrations between the raw water and the treated water that is reticulated to the town (Figures 8- 49). While verification monitoring shows some ADWG exceedances for Turbidity, Total Iron, Total Manganese and True Colour in Cloncurry's distribution system. These exceedances are characterised by isolated events having occurred only a few times over the last five years.

Finally, there has been one detection of *E.coli* within Cloncurry's distribution system which occurred in March of 2019. This was an isolated incident which has not occurred since.

5.2 Dajarra Drinking Water Quality

Dajarra, being a relatively new potable scheme, has limited water quality data available. Table 11 below provides details on the combined raw water quality for the scheme using data from 2022.

Table 10: Dajarra Combined Source Water Quality 2022.

Parameter	Value	ADWG Values
Temperature (°C)	15 – 25	-
pH	7.7	>6.5, <8.5 (Aesthetic)
Turbidity (NTU)	3	5 NTU (Aesthetic)
Total Dissolved Solids (mg/L)	2,477	600 mg/L (Aesthetic)
Bicarbonate (mg/L as $CaCO_3$)	396	-
Carbonate (mg/L as $CaCO_3$)	2.32	-
Barium (mg/L)	0.11	2 mg/L (Health)
Sulphate (mg/L)	330	250mg/L (Aesthetic)
Chloride (mg/L)	956	250mg/L (Aesthetic)
Fluoride (mg/L)	0.3	1.5 mg/L (Health)
Bromide (mg/L)	4.1	
Bromine (mg/L)	2.9	
Manganese (mg/L)	<0.01	0.5 mg/L (Health), 0.1 mg/L (Aesthetic)
Iron (mg/L)	0.05	0.3 mg/L (Aesthetic)
Calcium (mg/L)	193	-
Magnesium (mg/L)	192	-
Silica (mg/L)	87	80mg/L (Aesthetic)
Sodium (mg/L)	320	180 mg/L (Aesthetic)
Gross Alpha (Bq/L)	1.39	0.5 Bq/L (Aesthetic)
Gross Beta (Bq/L)	0.6	0.5 Bq/L (Aesthetic)

This data shows ADWG aesthetic exceedances for Total Dissolved Solids, Sulphate, Chloride, Silica, Sodium, Gross Alpha and Gross Beta. However, it should be noted that this data was taken in the preliminary stages of water testing within the scheme with some water sourced from bores that are no longer being used as a source for potable water. The source water summary provided in Table 12 below which uses data from 2023- 24, provides a much more accurate representation of the current water quality of the scheme's source water.

A summary of Dajarra's treated water quality for 2023-24 is provided in Table 13. All water quality data is trended below (Figures 50- 91).

Table 11: Dajarra Source Water Quality Summary (2023- 2024).

Analyte	Units	Summary of Results				Guideline Values			
		Samples Tested	Maximum Value	Mean Value	Minimum Values	Health	Exceedances	Aesthetic	Exceedances
Conductivity	µS/cm	14	4200	2578.57	910				
pH	pH Units	14	7.67	7.38	7.16			≥6.5 & ≤8.5	0
Total Hardness	mg/L	14	1110	801.93	400			200	14
Total Dissolved Solids	mg/L	14	2300	1441.4	540			600	10
Total Dissolved Ions	mg/L	14	2360	1525.9	611				
True Colour	HU	14	8	8	8			15	0
Turbidity	NTU	14	1	1	1			5	0
Silica	mg/L	14	77	73.4	69			80	0
Sodium	mg/L	14	420	209.6	27			180	9
Potassium	mg/L	14	6.6	5.34	3.8				
Calcium	mg/L	14	170	123.86	68				
Magnesium	mg/L	14	170	120.57	56				
Chloride	mg/L	14	1000	508.89	130			250	10
Fluoride	mg/L	14	0.41	0.33	0.21	1.5	0		
Nitrate	mg/L	14	16	5.44	0.71	50	0		
Sulphate	mg/L	14	300	159.29	33	500	0	250	3
Zinc	mg/L	14	0.06	0.06	0.06			3	0
Aluminium	mg/L	14	0.03	0.03	0.03			0.2	0
Total Iron	mg/L	14	0.01	0.01	0.01			0.3	0
Total Manganese	mg/L	14	0.001	0.001	0.001	0.5	0	0.1	0
Boron	mg/L	14	0.19	0.115	0.04	4	0		
Copper	mg/L	14	0.029	0.008	0.003	2	0	1	0

Analyte	Units	Summary of Results				Guideline Values			
		Samples Tested	Maximum Value	Mean Value	Minimum Values	Health	Exceedances	Aesthetic	Exceedances
Uranium	mg/L	12	0.023	0.015	0.0041	0.017	7		
ADWG Aesthetic Exceedance									
ADWG Health Exceedance									

Table 12: Dajarra Treated Water Quality Summary (2023- 2024; External Verification Monitoring).

Analyte	Units	Summary of Results				Guideline Values			
		Samples Tested	Maximum Value	Mean Value	Minimum Values	Health	Exceedances	Aesthetic	Exceedances
E.coli	MPN/100mL	28	2	0.071	0	1	1		
Total Coliforms	MPN/100mL	28	140	7.86	0				
Conductivity	µS/cm	10	630	581	510				
pH	pH Units	10	7.16	6.89	6.72			≥6.5 & ≤8.5	0
Total Hardness	mg/L	10	63	55.7	44			200	0
Total Dissolved Solids	mg/L	10	330	294	260			600	0
Total Dissolved Ions	mg/L	10	320	304.2	265				
True Colour	HU	10	8	8	8			15	0
Turbidity	NTU	10	11	3	1			5	2
Silica	mg/L	10	14	12.5	12			80	0
Sodium	mg/L	10	92	86.5	78			180	0
Potassium	mg/L	10	2	1.92	1.8				
Calcium	mg/L	10	13	10.97	7.8				
Magnesium	mg/L	10	7.3	6.88	6				
Chloride	mg/L	10	160	145	130			250	0
Fluoride	mg/L	10	0.06	0.052	0.05	1.5	0		
Nitrate	mg/L	10	4.9	4.07	0.88	50	0		0
Sulphate	mg/L	10	3.6	3.35	2.9	500	0	250	0
Zinc	mg/L	10	2.2	0.48	0.06			3	0
Aluminium	mg/L	10	0.03	0.03	0.03			0.2	0
Total Iron	mg/L	10	0.01	0.01	0.01			0.3	0
Total Manganese	mg/L	10	0.13	0.0218	0.001	0.5	0	0.1	1

Analyte	Units	Summary of Results				Guideline Values			
		Samples Tested	Maximum Value	Mean Value	Minimum Values	Health	Exceedances	Aesthetic	Exceedances
Boron	mg/L	10	0.15	0.124	0.11	4	0		
Copper	mg/L	10	0.27	0.048	0.003	2	0		
Uranium	mg/L	12	0.017	0.0017	0.0002	0.017	0		
Trihalomethanes	mg/L	6	0.004	0.004	0.004	0.25	0		
ADWG Aesthetic Exceedance									
ADWG Health Exceedance									

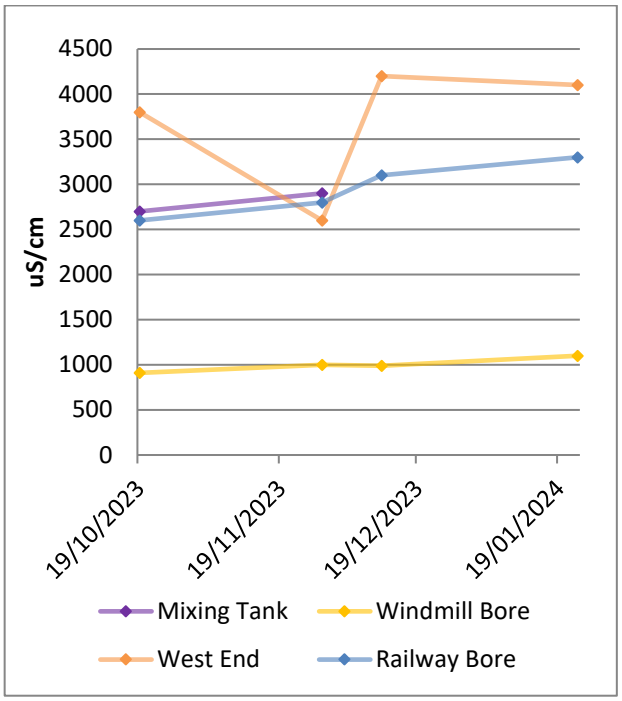

Figure 50: Dajarra source water monitoring trends for Conductivity.

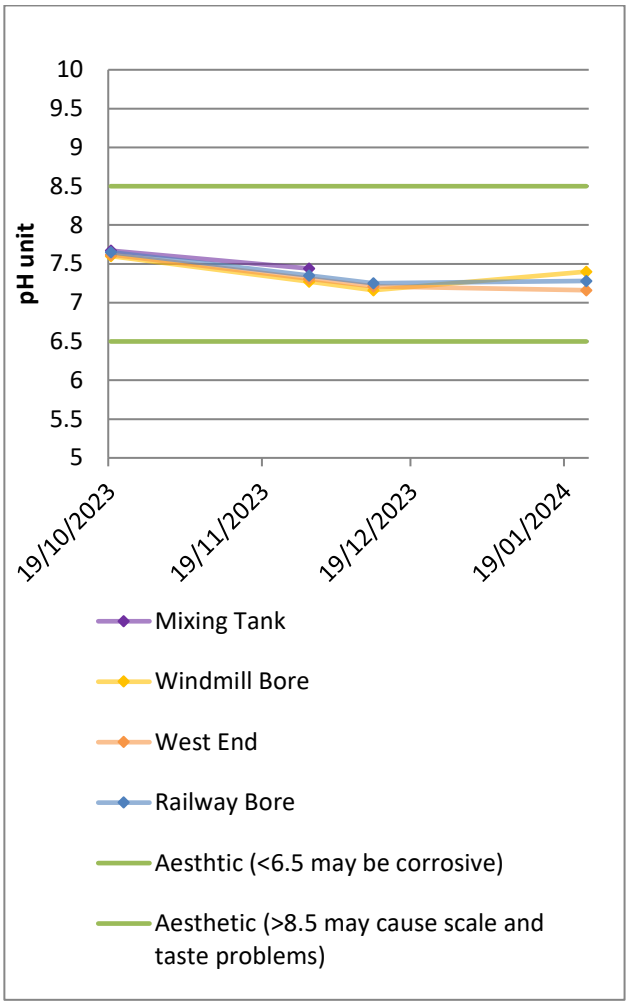

Figure 51: Dajarra source water monitoring trends for pH.

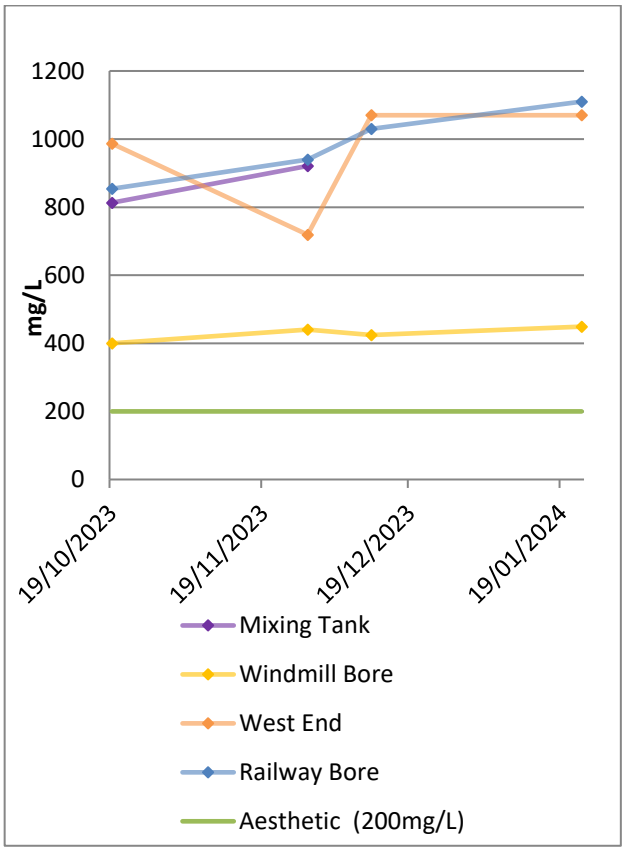

Figure 52: Dajarra source water monitoring trends for Total Hardness.

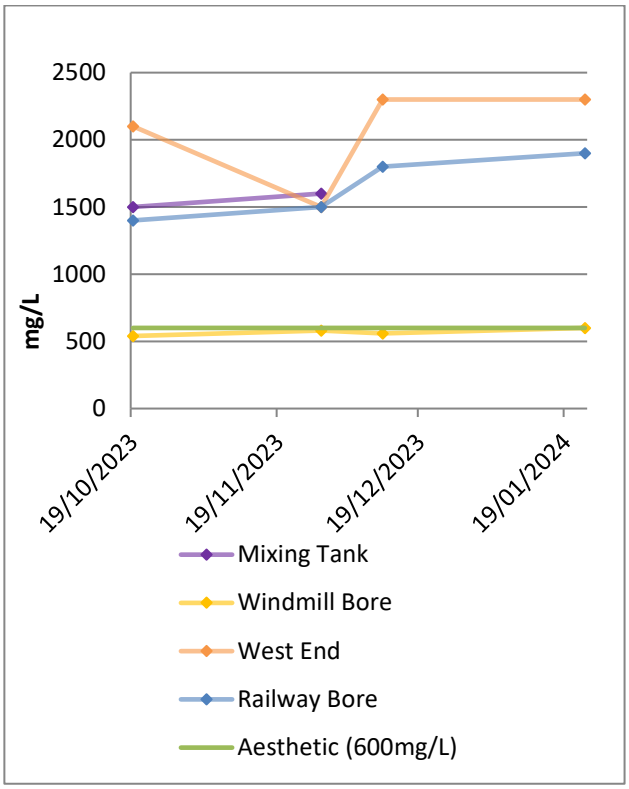

Figure 53: Dajarra source water monitoring trends for Total Dissolved Solids.

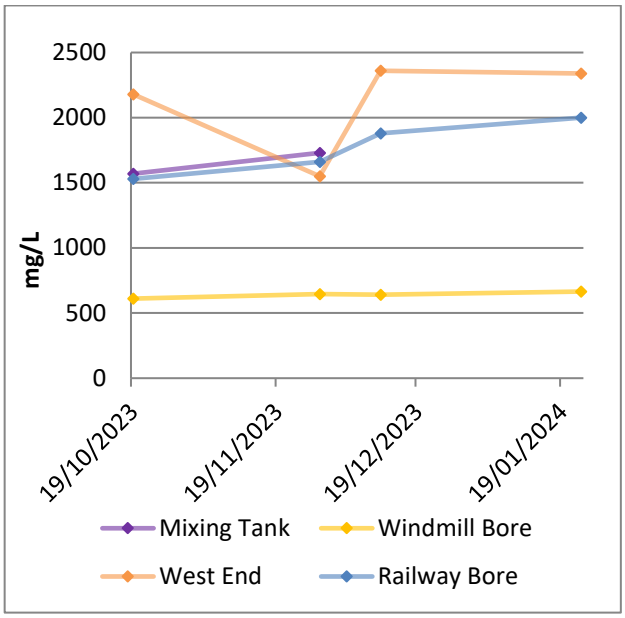

Figure 54: Dajarra source water monitoring trends for Total Dissolved Ions.

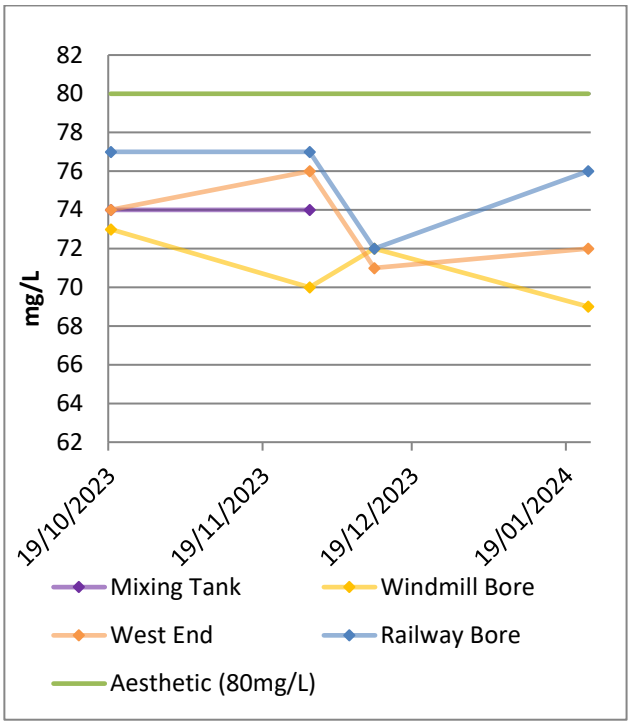

Figure 55: Dajarra source water monitoring trends for Silica.

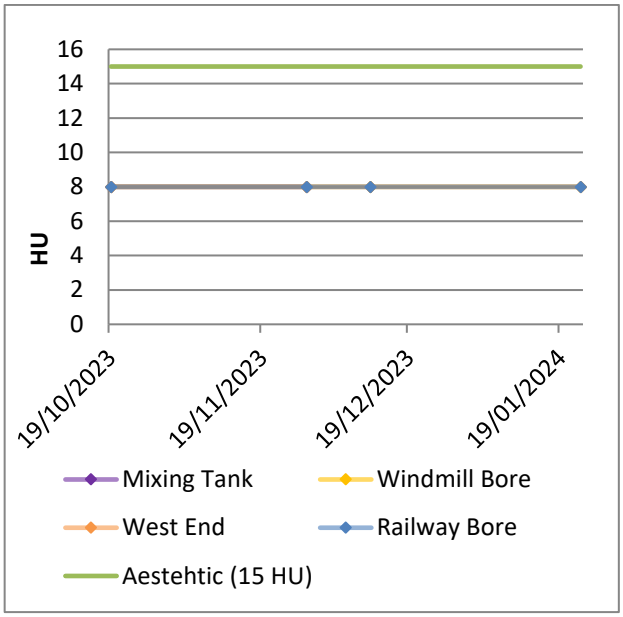

Figure 56: Dajarra source water monitoring trends for True Colour.

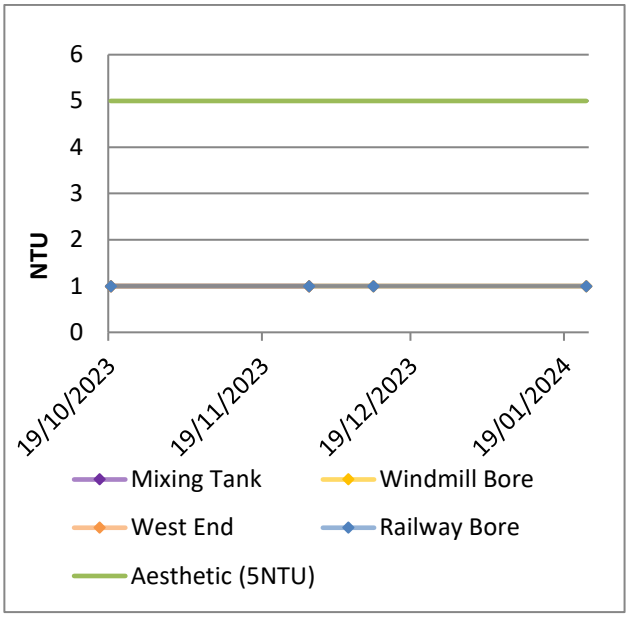

Figure 57: Dajarra source water monitoring trends for Turbidity.

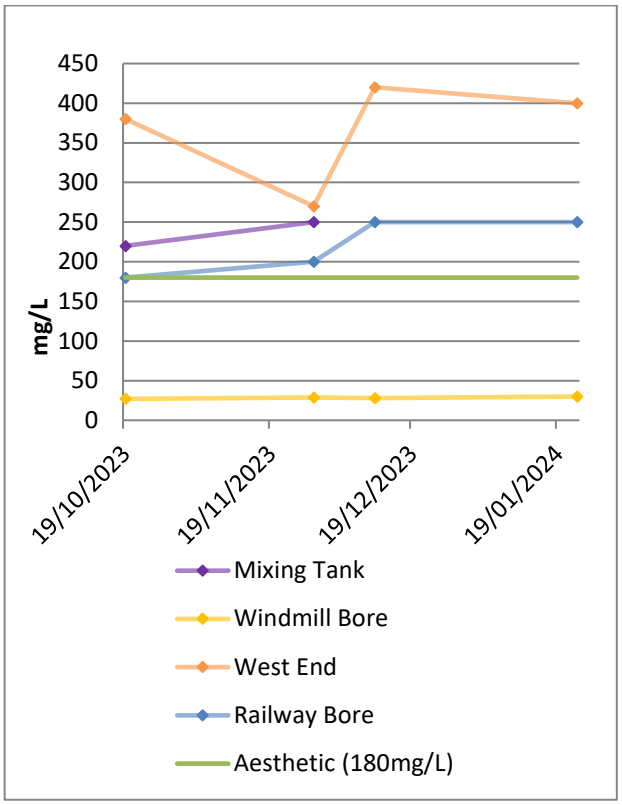

Figure 58: Dajarra source water monitoring trends for Sodium.

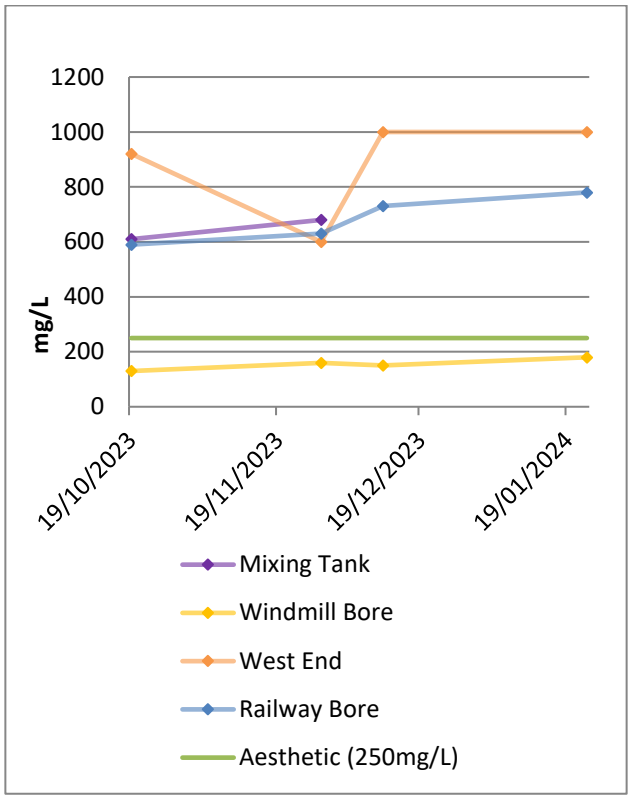

Figure 59: Dajarra source water monitoring trends for Chloride.

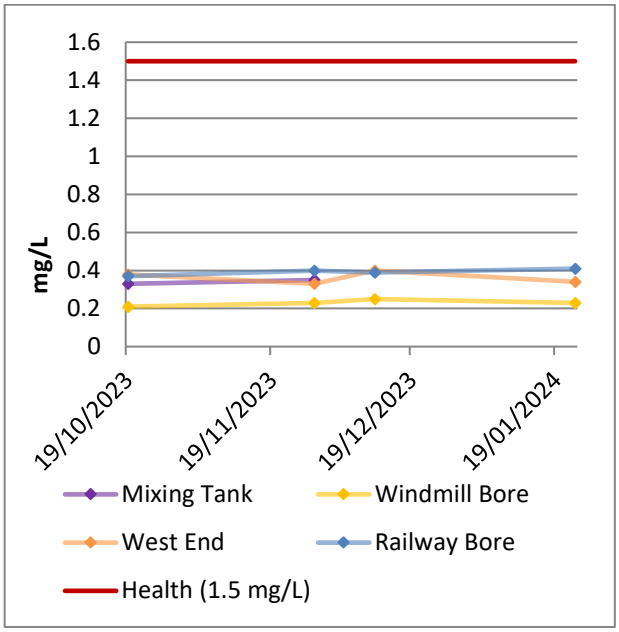

Figure 60: Dajarra source water monitoring trends for Fluoride.

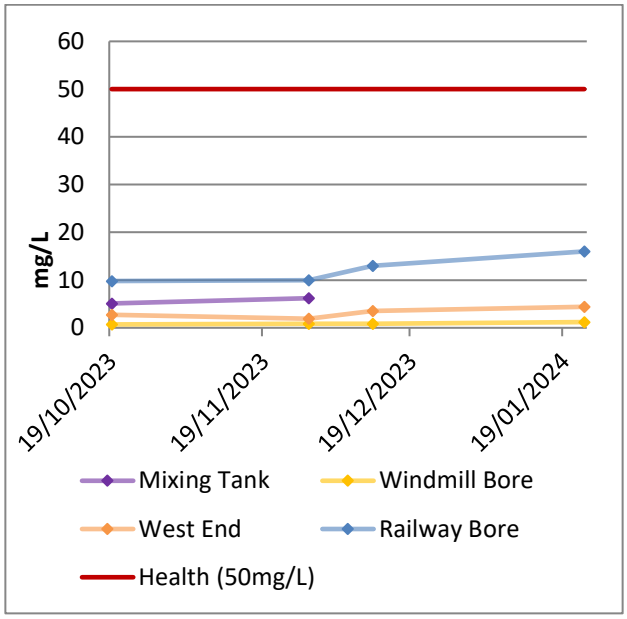

Figure 61: Dajarra source water monitoring trends for Nitrate.

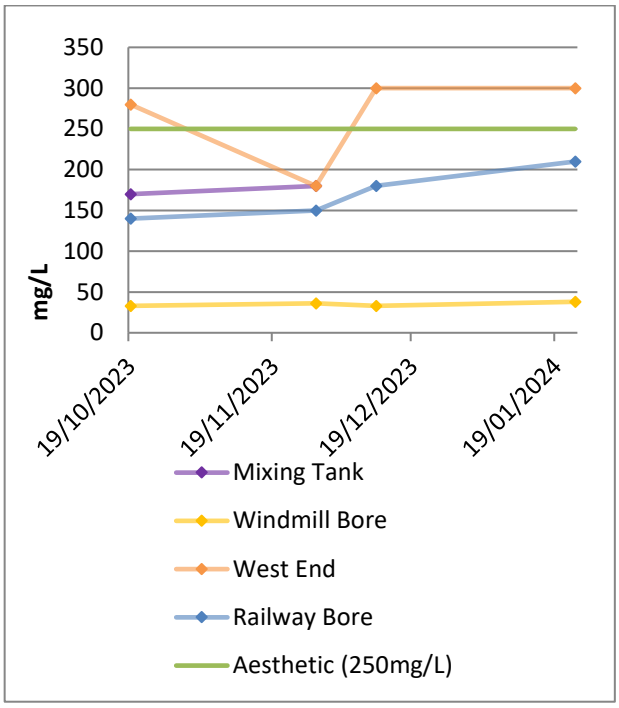

Figure 62: Dajarra source water monitoring trends for Sulphate.

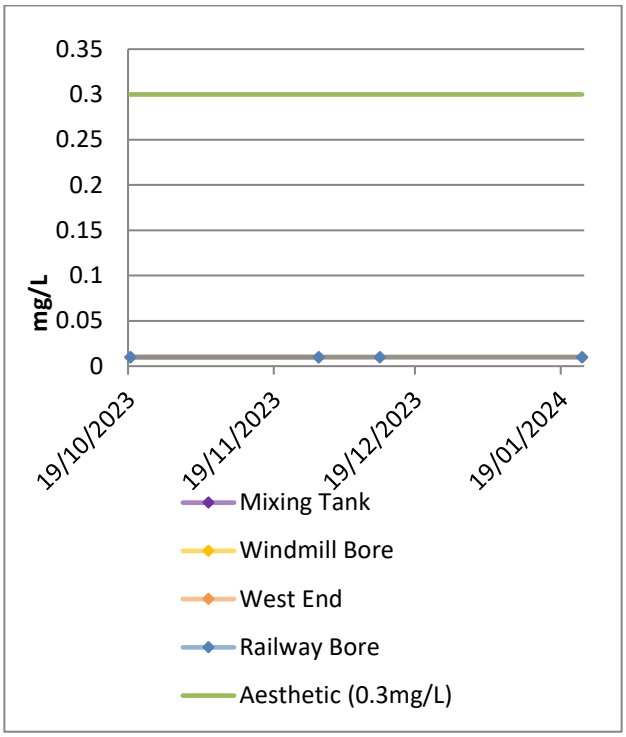

Figure 63: Dajarra source water monitoring trends for Total Iron.

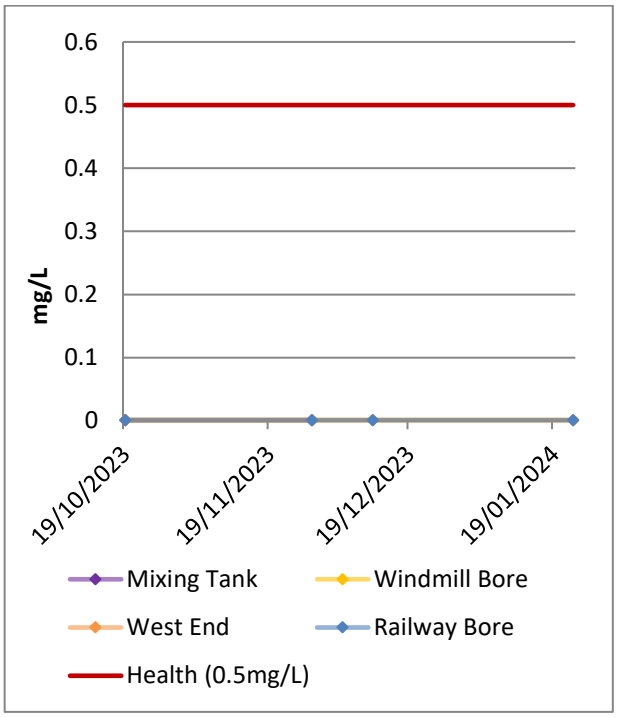

Figure 64: Dajarra source water monitoring trends for Total Manganese.

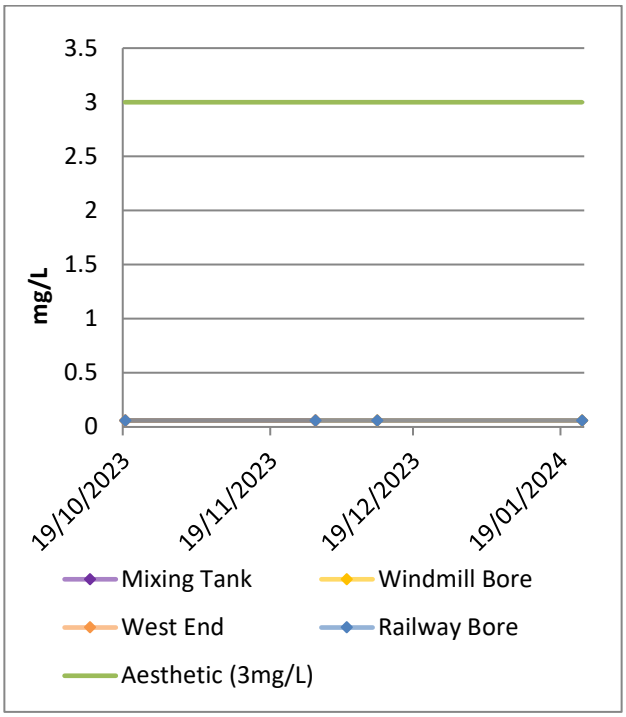

Figure 65: Dajarra source water monitoring trends for Zinc.

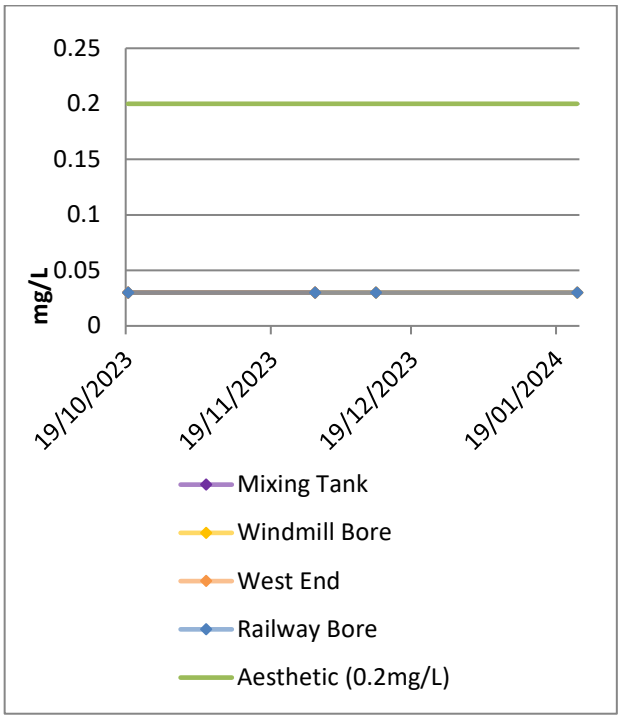

Figure 66: Dajarra source water monitoring trends for Aluminium.

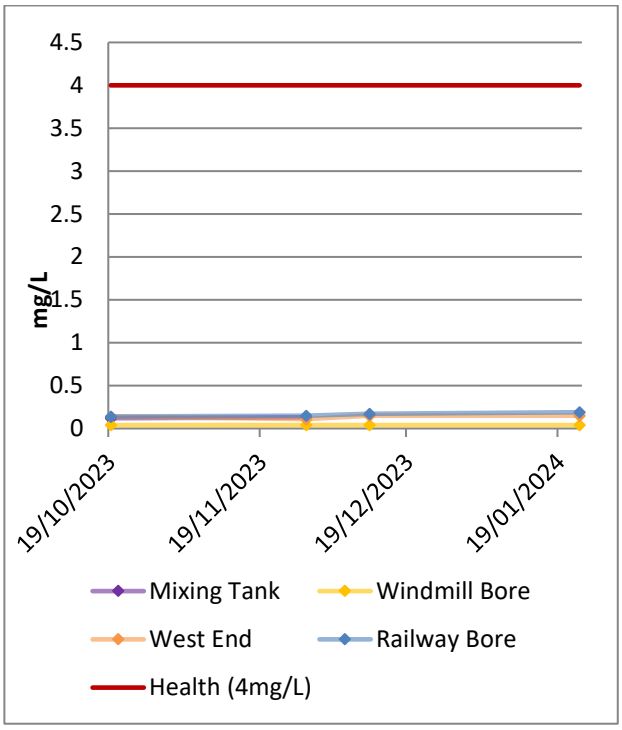

Figure 67: Dajarra source water monitoring trends for Boron.

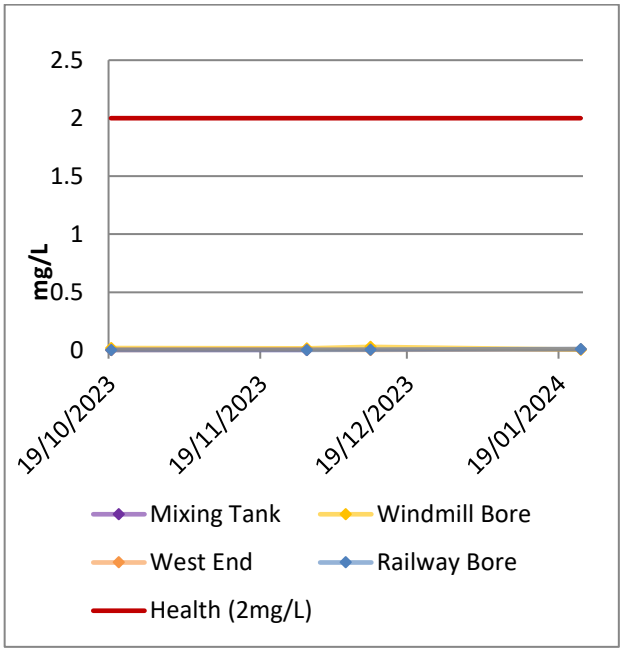

Figure 68: Dajarra source water monitoring trends for Copper.

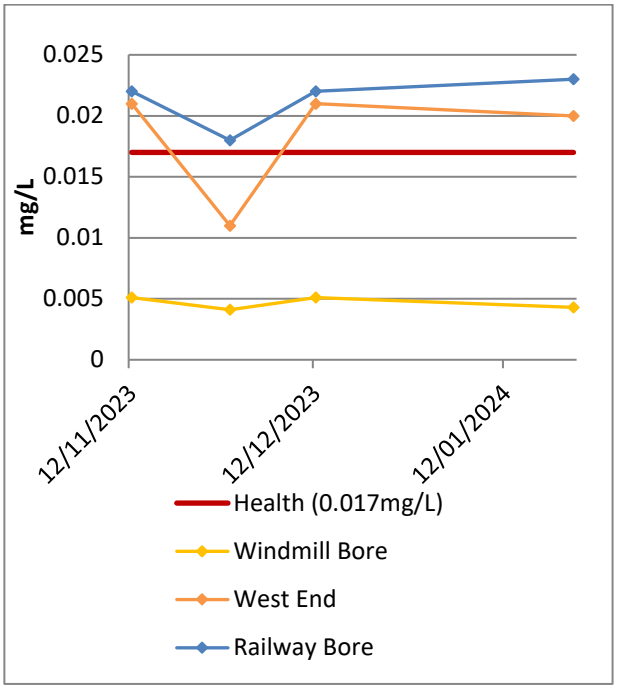

Figure 69: Dajarra source water monitoring trends for Uranium.

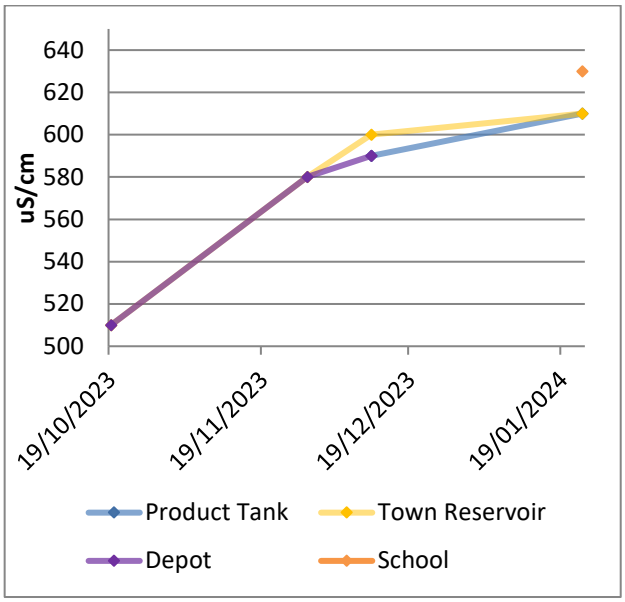

Figure 70: Dajarra treated water monitoring trends for Conductivity.

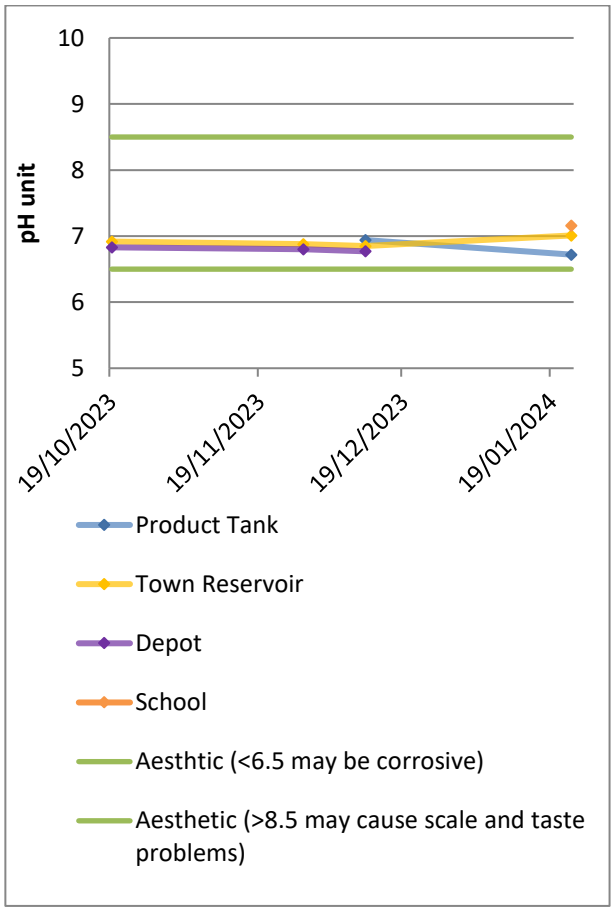

Figure 71: Dajarra treated water monitoring trends for pH.

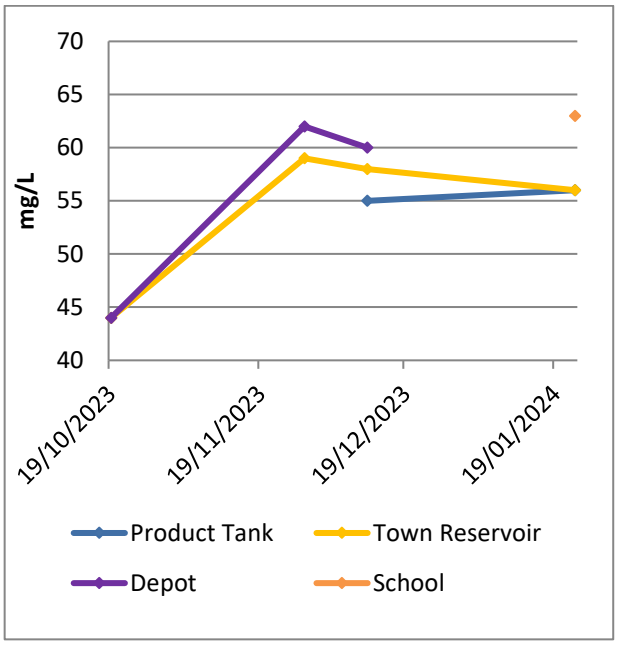

Figure 72: Dajarra treated water monitoring trends for Total Hardness.

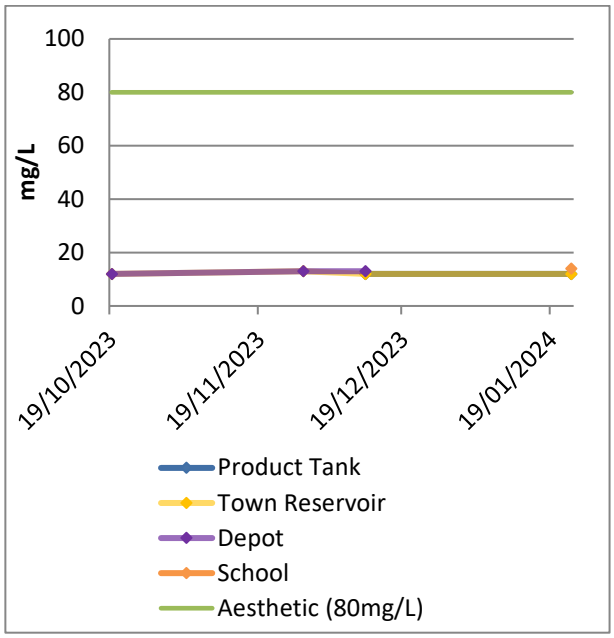

Figure 73: Dajarra treated water monitoring trends for Silica.

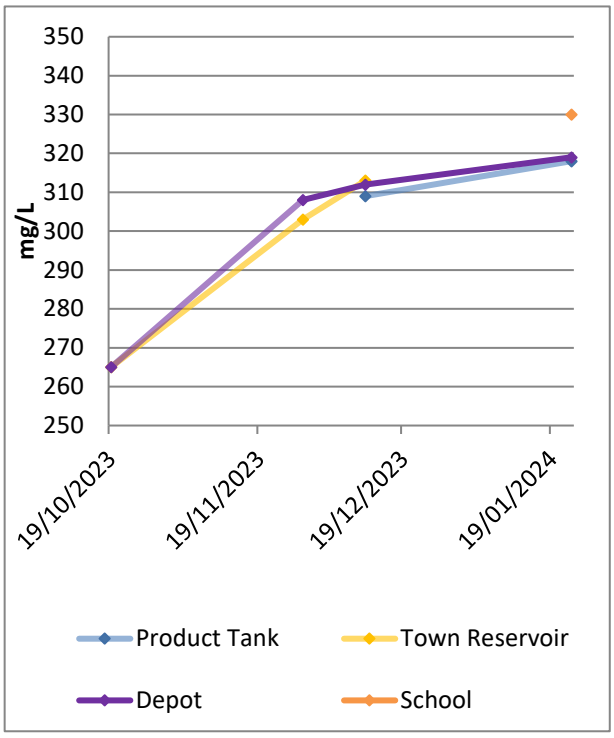

Figure 74: Dajarra treated water monitoring trends for Total Dissolved Ions.

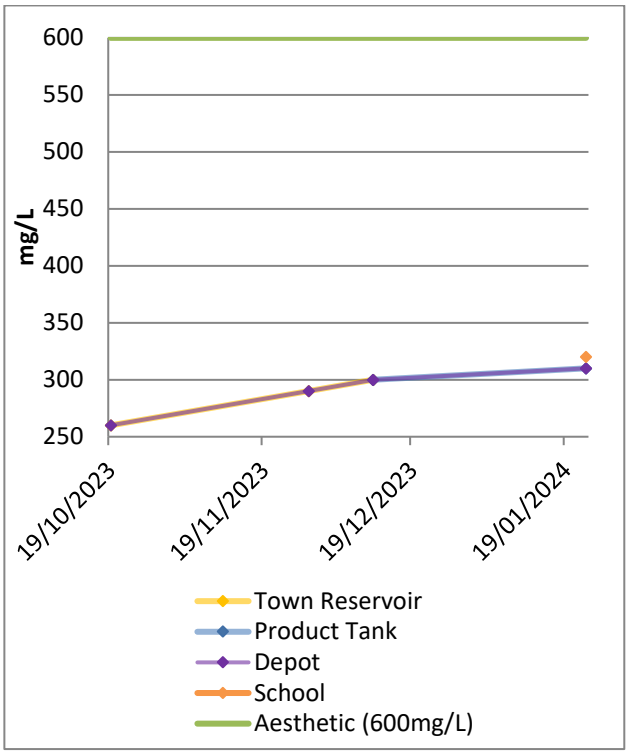

Figure 75: Dajarra treated water monitoring trends for Total Dissolved Solids.

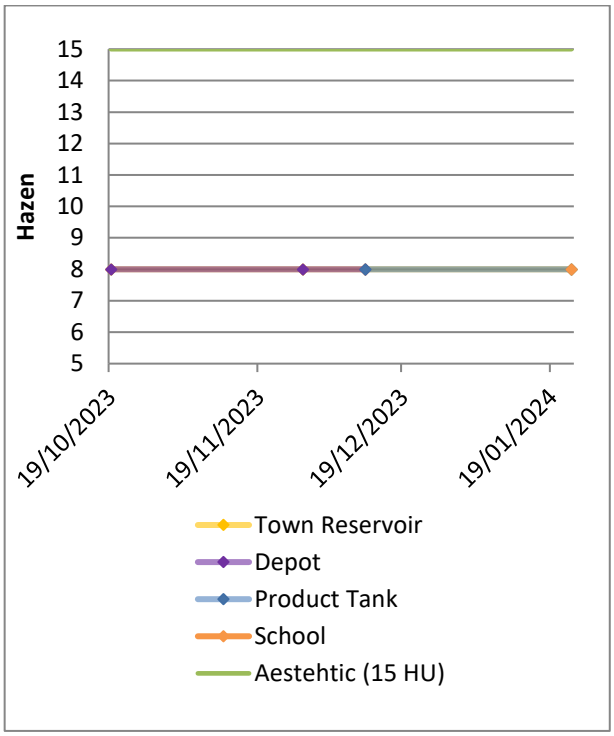

Figure 76: Dajarra treated water monitoring trends for True Colour.

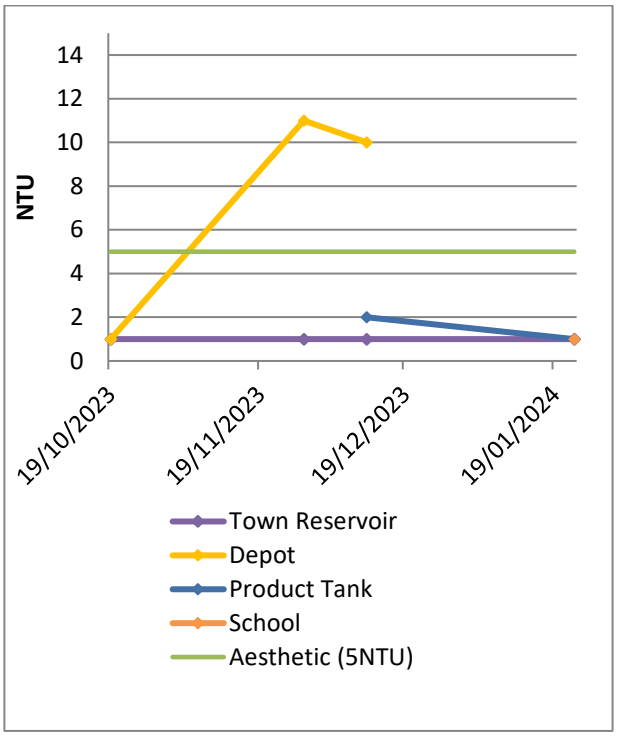

Figure 77: Dajarra treated water monitoring trends for Turbidity.

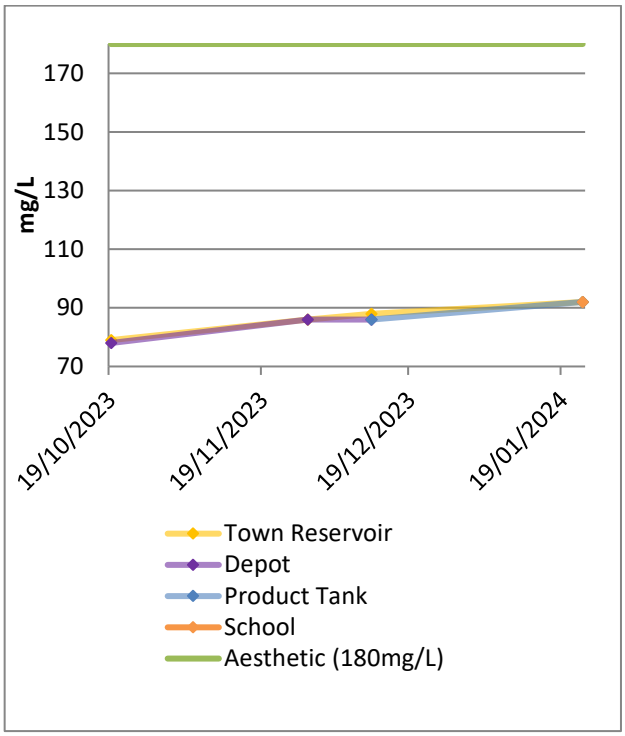

Figure 78: Dajarra treated water monitoring trends for Sodium.

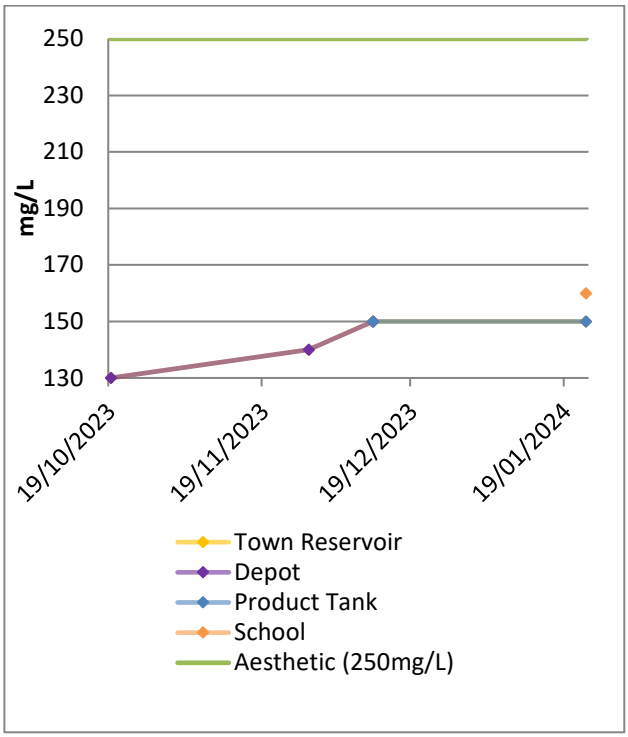

Figure 79: Dajarra treated water monitoring trends for Chloride.

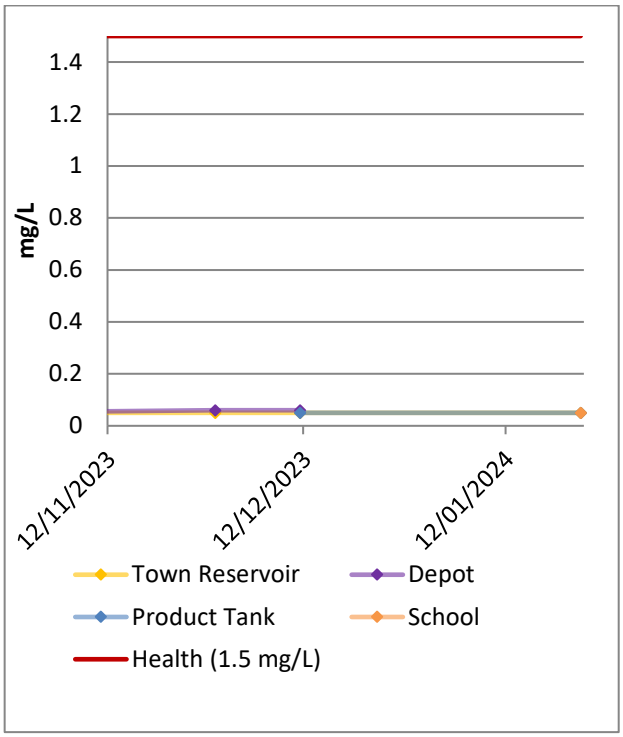

Figure 80: Dajarra treated water monitoring trends for Fluoride.

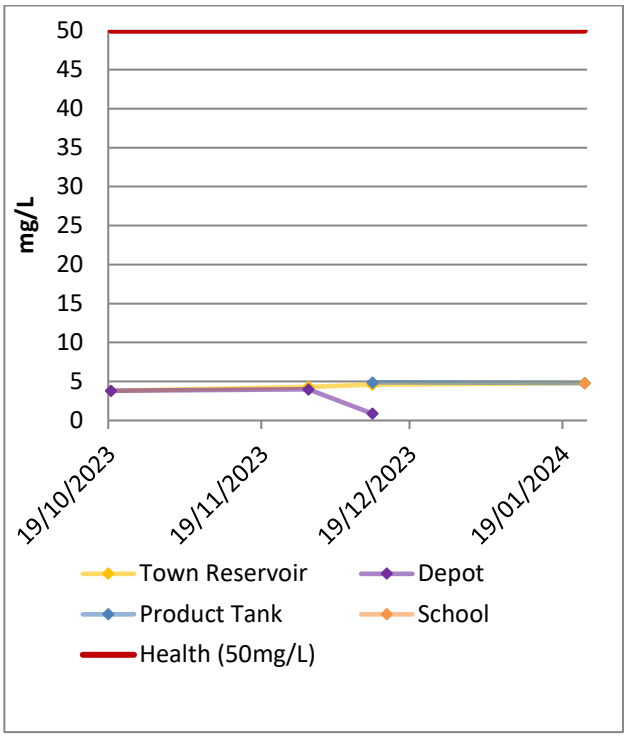

Figure 81: Dajarra treated water monitoring trends for Nitrate.

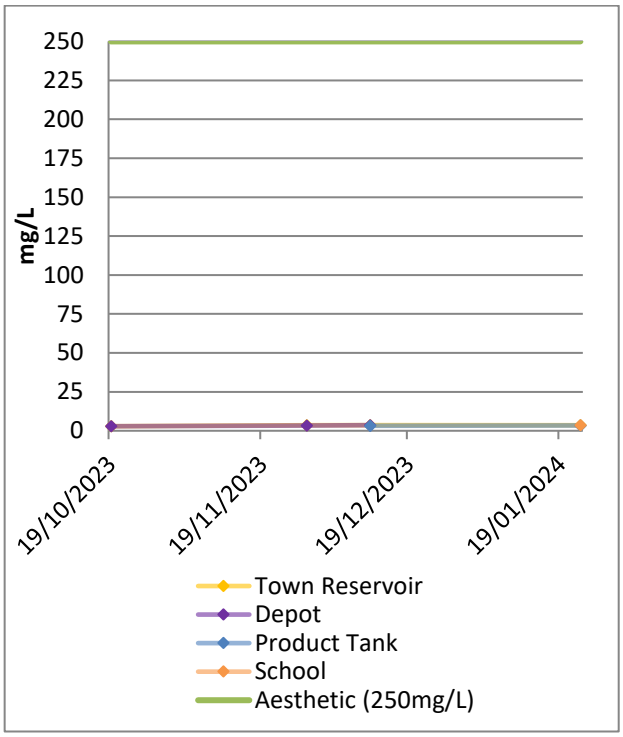

Figure 82: Dajarra treated water monitoring trends for Sulphate.

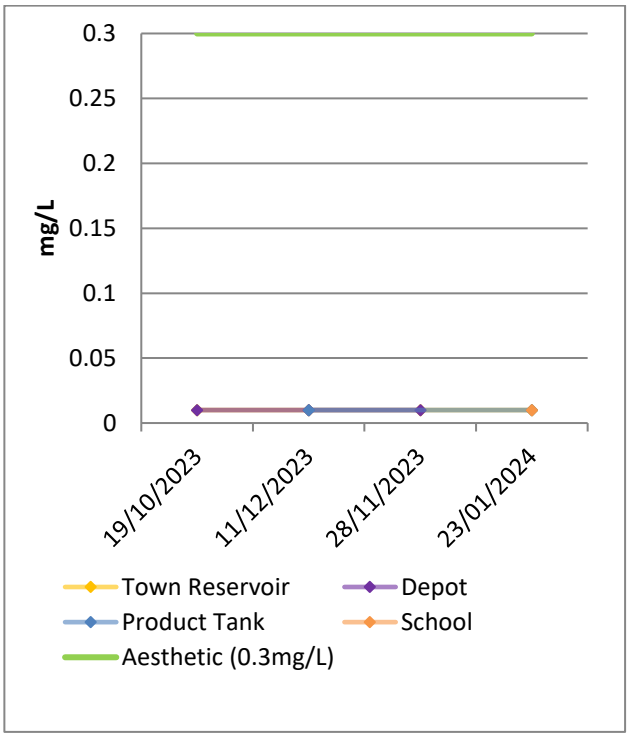

Figure 83: Dajarra treated water monitoring trends for Total Iron.

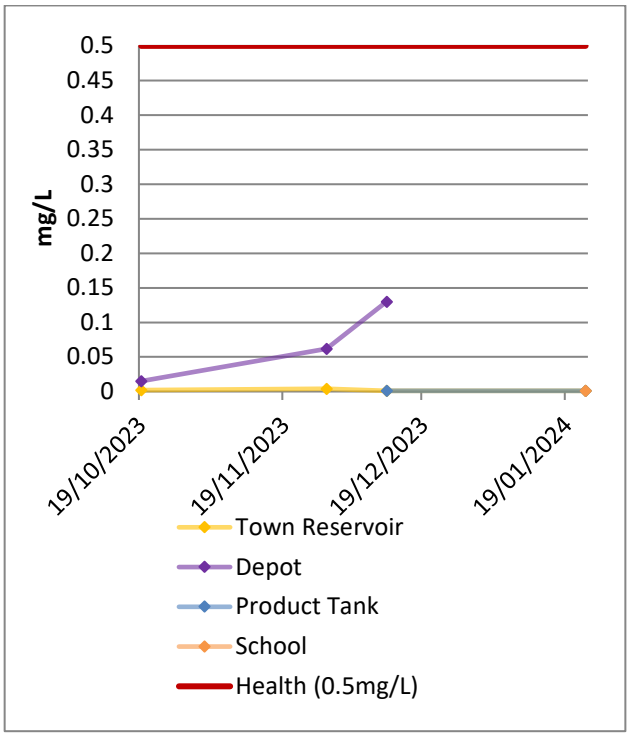

Figure 84: Dajarra treated water monitoring trends for Total Manganese.

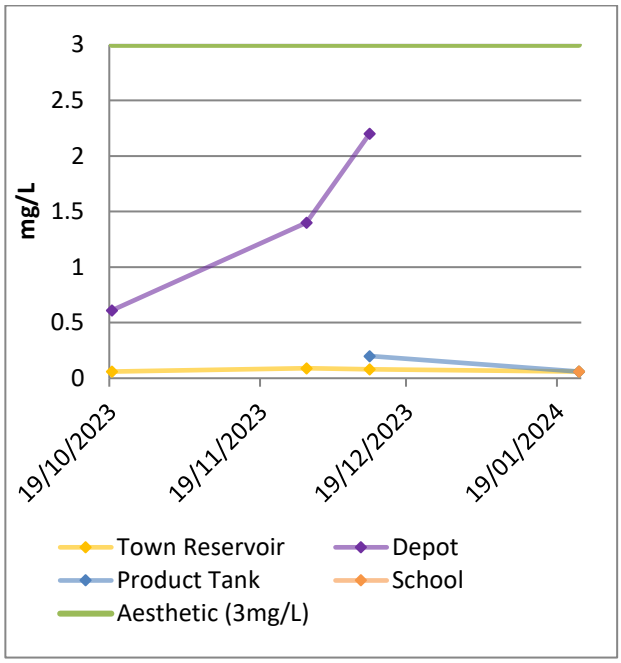

Figure 85: Dajarra treated water monitoring trends for Zinc.

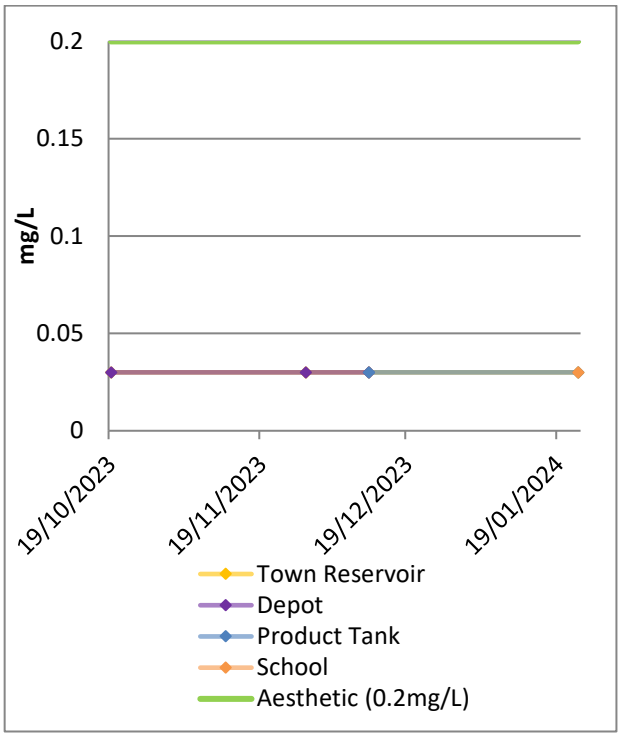

Figure 86: Dajarra treated water monitoring trends for Aluminium.

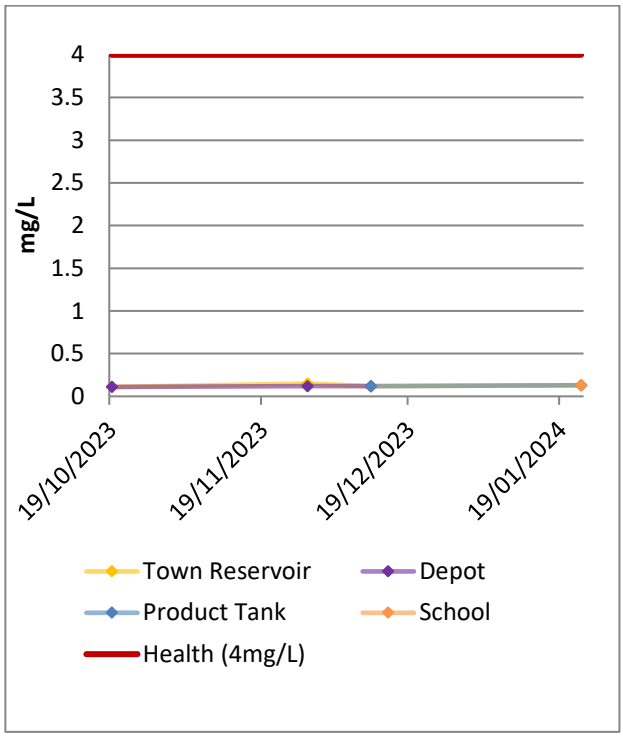

Figure 87: Dajarra treated water monitoring trends for Boron.

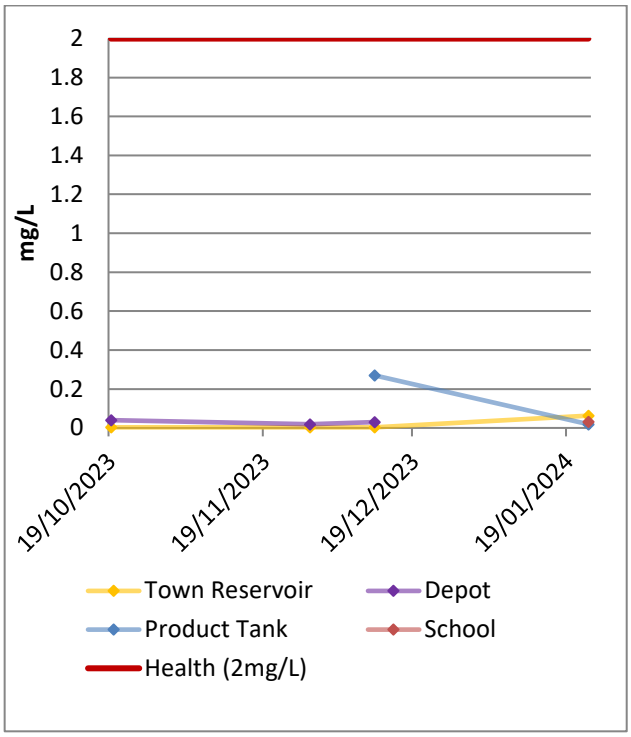

Figure 88: Dajarra treated water monitoring trends for Copper.

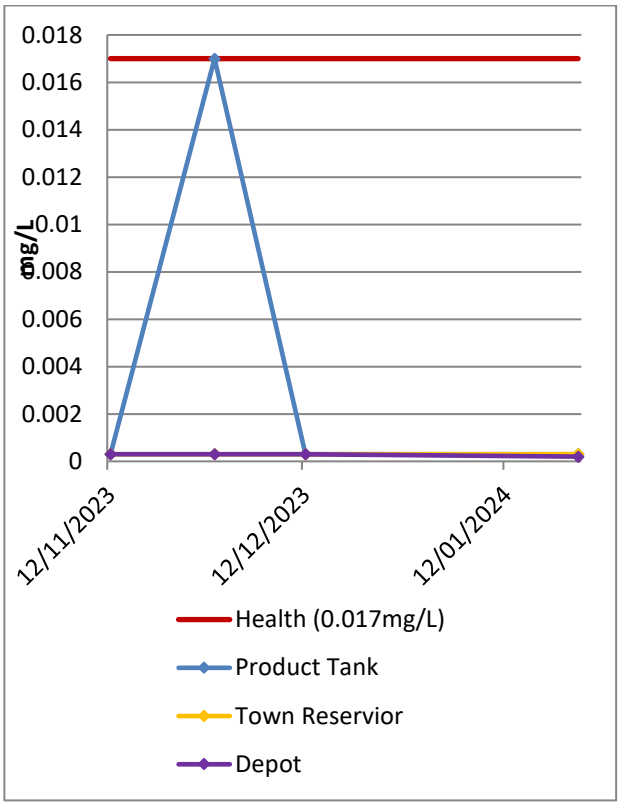

Figure 89: Dajarra treated water monitoring trends for Uranium.

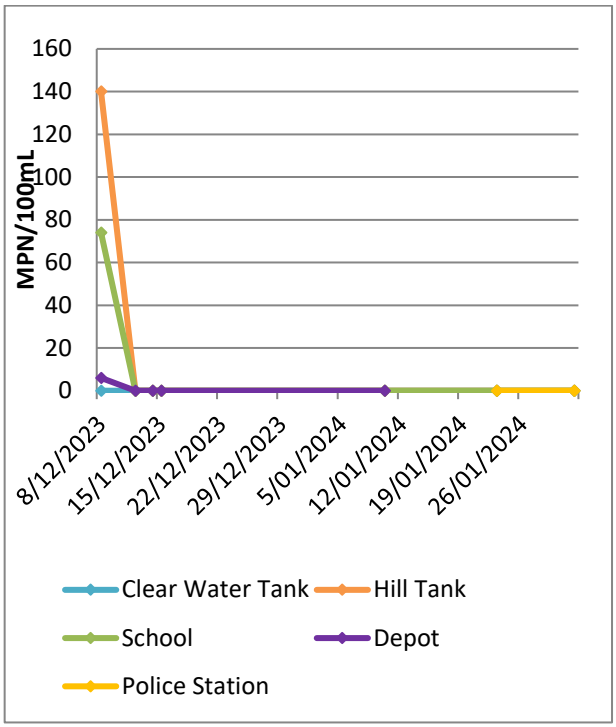

Figure 90: Dajarra treated water monitoring trends for Total Coliforms.

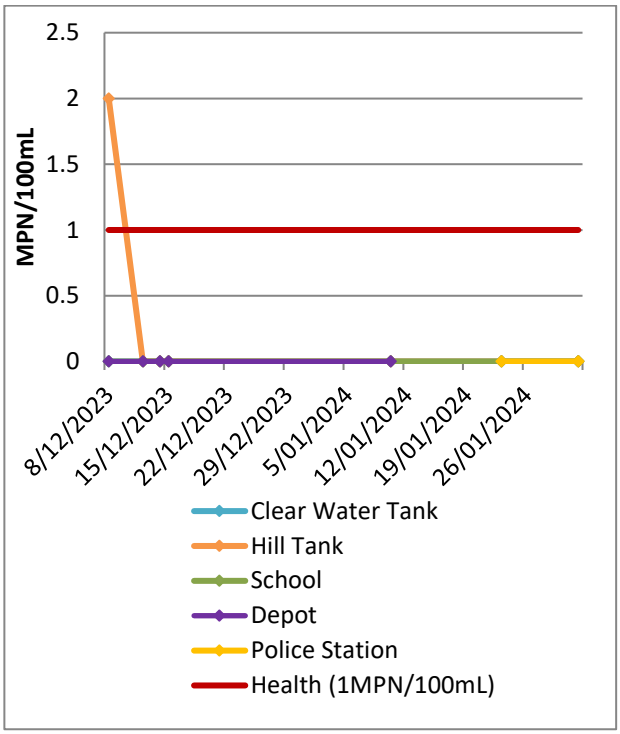

Figure 91: Dajarra treated water monitoring trends for *E.coli*.

5.2.1 Dajarra ADWG Exceedances

Due to the limited amount of water quality data available for the scheme, it is hard to paint an accurate picture of the scheme's water quality. ADWG aesthetic exceedances have been identified in Dajarra's source water for Sodium, Sulphate, Total Hardness and Total Dissolved Solids. In general, exceedances for these parameters are not associated with health concerns and do not necessarily make the water unsafe to drink, however, they can be associated with taste issues. However, these aesthetic exceedances are dealt with during the water treatment process with no aesthetic exceedances reported for these parameters in Dajarra's treated water.

In Dajarra's treated water, there has been two aesthetic exceedances for Turbidity. Identified within the distribution system, these exceedances appear to be outliers and likely stemmed from mains breaks. Elevated Turbidity above the ADWG aesthetic is not necessarily unsafe in drinking water, however, it can cause inefficient disinfection and subsequent pathogenic ingress into a scheme and therefore, should be avoided.

Finally, there has been one ADWG health exceedance for *E.coli* reported within the scheme. This exceedance occurred in December 2023. Subsequent weekly monitoring which occurred after the incident has identified no further *E.coli* detections within the scheme.

5.3 Cloncurry and Dajarra Complaints

The process and performance targets for complaints in regard to drinking water quality for the two schemes is outlined in the Cloncurry Shire Council Asset Management Plan and Water Supply and Customer Service Standards. Details of the general complaints process adopted by Council can also be accessed on the Cloncurry Shire Council website: https://www.cloncurry.qld.gov.au/complaints.

Customer complaints can be made in the following ways:

- In person at the Cloncurry Council Administration Office during working hours (8:30am – 5pm, Monday – Friday).
- By email to council@cloncurry.qld.gov.au
- By phone (07) 4742 4100
- In writing, addressed to Shared Services Manager at Cloncurry Shire Council, P.O Box 3, Cloncurry QLD 4824.

CSC aims to take all complaints very seriously. Once lodged, complaints are sent to relevant Manager of the division best suited for the investigation. Individuals will be contacted within 10 business days regarding the outcome of their complaints, the investigation process and the actions taken to respond to the complaint. If it takes more than 10 business days to receive a reply (i.e. for complex issues), individuals will be informed of progress as it is made. All complaints are confidential and information will not be disclosed to anyone outside of Council.

Lastly, due to the population size of the two towns, it is not uncommon for complaints to be made in-person, directly to the Manager who would be responsible for the investigation/fixing the issue.

6.0 HAZARD IDENTIFICATION AND RISK ASSESSMENT

The hazard identification and risk assessment for Cloncurry Shire Council's DWQMP was undertaken using the risk methodology detailed in the Departmental guideline. The Cloncurry and Dajarra Risk Assessments outlined in Tables 20 and 22 details the mitigated and unmitigated hazard assessment for each scheme which includes:

- Identified hazards or hazardous events;
- Hazard or hazardous event sources;
- An assessment of the unmitigated maximum risk level, determined by considering the consequence and likelihood of each hazard or hazardous event occurring in the absence of any controls;
- Existing preventative measures implemented to counteract each hazard or hazardous event to reduce the maximum unmitigated risk level;
- A re-assessed residual risk level which details the final risk level of a hazard or hazardous event that is applicable when the appropriate mitigation measures have been implemented. The residual risk is determined using the same methodology as the initial maximum risk assessment; however, changes to the assessed likelihood should result in an overall lower risk level.

As the Cloncurry and Dajarra drinking water schemes are not considered to be similar, separate Risk Assessments have been conducted for each scheme. The latest Risk Assessment workshop was held by Council in 2022 as detailed in Sections 5.1 below. The Risk Assessment for each scheme was reviewed in February 2024 and amended as necessary. Moving forward, Council intends to review the Risk Assessment every 2 years, to coincide with the DWQMP Regular Reviews. All amendments will be referred to the Director of Environment and Infrastructure for input, review and acceptance of the new Risk Assessment with Risk Assessment workshops held as required.

Finally, where there was insufficient data or information to complete a reliable risk assessment, this was highlighted as an uncertainty to be discussed further in the Risk Management Improvement Program (Section 7).

6.1 Risk Assessment Methodology

In assessing the risk score of each hazard or hazardous event, the first step is to determine the consequence. Consequence categories used are outlined in Table14 below.

Table 13: Consequence Descriptors.

Consequence	Descriptors
Insignificant	Negligible injury or health effects, isolated complaints related to aesthetic parameters. Little to no disruption to the normal operation of the scheme.
Minor	Negligible injury or health effects, widespread complaints related to aesthetic parameters.
Moderate	Potential acute health impact or potential chronic health impact.
Major	Acute health impact, no declared outbreak expected.
Catastrophic	Declared outbreak expected with an acute health impact. One or more fatalities or large number of hospitalisations.

Once the consequences were identified, the likelihood of each consequence occurring was determined using the Likelihood categories outlined in Table 15 below.

Table 14: Likelihood Descriptors.

Likelihood	Descriptors
Almost Certain	Expected to occur in most circumstances - hazard is considered to be present on a daily to weekly basis.
Likely	Could occur at some time - occurs more often than once per month and up to once per week.
Possible	Might occur at some time - occurs more often than once per year and up to once a month.
Unlikely	Could occur at some time - unlikely but may occur once every 1- 5 years.
Rare	Hazard is expected to arise in exceptional circumstances; <1 occurrence every 5 years.

The risk scores were then assessed using the likelihood and consequence matrix provided in Table 16 below. The risk score was calculated by the intercept of likelihood and consequence.

Table 15: Risk Matrix used for the Cloncurry and Dajarra Risk Assessments.

	Consequence				
Likelihood	**Insignificant**	**Minor**	**Moderate**	**Major**	**Catastrophic**
Almost Certain	Medium- 6	High- 10	High- 15	Extreme- 20	Extreme- 25
Likely	Medium- 5	Medium- 8	High- 12	High- 16	Extreme- 20
Possible	Low- 3	Medium- 6	Medium- 9	High- 12	High- 15
Unlikely	Low- 2	Low- 4	Medium- 6	Medium- 8	High- 10
Rare	Low- 1	Low- 2	Low- 3	Medium- 5	Medium- 6

Finally, uncertainty was assessed using the definitions outlined in Table 17 below. Assessing uncertainty provides an indication of the need to undertake further work or gather more data to ensure that the risk assessment is accurate and reliable.

Table 16: Uncertainty Definitions used for the Hazard and Hazardous Events Assessment.

Level of Uncertainty	Definition
Certain	There is 5 years of continuous monitoring data, which has been trended and assessed, with at least daily monitoring; or the processes involved are thoroughly understood.
Confident	There is 5 years of continuous monitoring data, which has been collated and assessed, with at least weekly monitoring or monitoring for the duration of seasonal events; or there is a good understanding of the processes involved.
Reliable	There is at least a year of continuous monitoring data available, which has been assessed; or there is reasonable understanding of the processes involved.
Estimate	There is limited monitoring data available; or there is limited understanding of the processes involved.
Uncertain	There is limited or no monitoring data available; or the processes are not well understood, and the processes are based on best estimates.

The Risk Assessment methodology is first used to obtain an unmitigated risk level for each hazard or hazardous event. It is then repeated to obtain the final mitigated risk level for each hazard or hazardous event.

The acceptable risk level in relation to public health depends very much on the Likelihood and Consequence descriptors used for the assessment. For the criteria used by CSC, all risk levels identified as Medium or less are considered acceptable risks for the schemes.

In some cases, actions have been taken to reduce low level risks, while other acceptable medium or high level risks have been left unmitigated. These decisions are based on two factors:

- the magnitude of the risk, and
- the cost and difficulty of actions required to reduce the risk.

Finally, all unacceptable risks identified in the Risk Assessment are used to inform the Risk Management Improvement Programme, outlined in 5.2 below.

6.2 Cloncurry Drinking Water Scheme Risk Assessment

The first Risk Assessment for the Cloncurry scheme was conducted in 2012. Table 18 below outlines the subsequent Risk Assessment revisions and updates that have occurred since its initial inception.

Table 17: Cloncurry Risk Assessment revision details.

Revision	Date	Reviewed By	Details
1.0	26/03/2015	Tasleem Hasan	Supersedes the 2012 Risk Assessment Report.
1.1	17/05/2017	Tasleem Hasan	DWQMP Review. Added PAC and pre-Chlorination hazards. Checked preventative measures are current.
2.0	06/06/2017	Megan Anderson	Final, version 2.0 (submitted to DEWS).
2.1	08/09/2017	Megan Anderson	Final, version 2.1 (incorporating DEWS feedback).
3.0	30/12/2020	Scott Prenzler	Following DWQMP Review Workshop.
4	06/12/2021	Rodney Williams	Following DWQMP Review Workshop.
5	06/12/2022	Saati Diveker	Dajarra status updated in DWQMP.
6	13/02/2024	Isabeau Gavel	Review.

The team from CSC that participated in the most recent 2022 Risk Assessment workshop is outlined in Table 19 below.

Table 18: Cloncurry Risk Assessment Workshop 2022 Team.

Name	Organisation	Position
Chris Johnstone	Cloncurry Shire Council	Director of Infrastructure & Environment
Saati Divekar	Cloncurry Shire Council	Manager of Infrastructure
Jesse McEniery	Cloncurry Shire Council	WHS Advisor
Carson Yang	Cloncurry Shire Council	Project Engineer
Steve Larson	Cloncurry Shire Council	Water Treatment Plant Operator

The final Risk Assessment for Cloncurry (reviewed in February 2024) is provided in Table 20 below.

Table 19: Cloncurry Drinking Water Scheme Risk Assessment.

Hazard/ Hazardous Event	Hazard Source	Unmitigated			Primary Preventative Measure	Other Preventative Measures	Mitigated			Uncertainty	Documented Procedures	Comments	RMIP Item
		Likelihood	Consequence	Risk Level			Likelihood	Consequence	Risk Level				
Source Water													
Bacteria/virus	Camping/human activities/swimming in source water	Almost Certain	Catastrophic	Extreme – 25	Full water treatment at WTP	Operational and Verification monitoring	Rare	Catastrophic	Medium – 6	Reliable		Disinfection is effective.	
Protozoa (Naeglaria, Legionella, *pseudomonas*)		Almost Certain	Catastrophic	Extreme – 25	Full water treatment at WTP		Rare	Catastrophic	Medium – 6	Confident		Source water can go above 25°C but disinfection is effective.	
Protozoa (Crypto/Giardia)		Almost Certain	Catastrophic	Extreme – 25	Full water treatment at WTP		Rare	Catastrophic	Medium – 6	Reliable		WTP filters have been upgraded, treated water Turbidity average of 0.17 reflecting effective filtration during treatment process (data from 2021-24). Online monitoring.	
Bacteria/virus	Unrestricted livestock or wild animal access to source water	Almost Certain	Catastrophic	Extreme – 25	Full water treatment at WTP	Operational and Verification monitoring	Rare	Catastrophic	Medium – 6	Reliable		Source water can go above 25°C but disinfection is effective for bacteria/viruses, Naegleria, Legionella & *pseudomonas*. Unrealistic to fence entire catchments for the Cloncurry River and Julius Lake. Chinaman Creek Dam is fenced at one end. WTP filters have been upgraded, treated water Turbidity average of 0.17 reflecting effective filtration during treatment process (data from 2021-24). Online monitoring.	
Protozoa (Naeglaria, Legionella, *pseudomonas*)		Almost Certain	Catastrophic	Extreme – 25	Full water treatment at WTP		Rare	Catastrophic	Medium – 6	Confident			
Protozoa (Crypto/Giardia)		Almost Certain	Catastrophic	Extreme – 25	Full water treatment at WTP		Rare	Catastrophic	Medium – 6	Reliable			
Bacteria/virus	Flood/storm event	Likely	Catastrophic	Extreme – 20	Full water treatment at WTP	Operational and Verification monitoring	Rare	Catastrophic	Medium – 6	Confident		Disinfection is effective.	
Hydrocarbons	Chemical spill in source water	Unlikely	Moderate	Medium – 6	Full water treatment at WTP	Disaster Management Plan	Rare	Moderate	Low – 3	Reliable		Council would be made aware of major incidents.	
Pesticides		Unlikely	Moderate	Medium – 6			Rare	Moderate	Low – 3	Reliable		Cropping is not a major agricultural driver in the region, reducing spraying/pesticide use in the catchments.	
Heavy metals	Contamination points within catchment (mines, industrial sites, dip yards)	Possible	Moderate	Medium – 9	Full water treatment at WTP		Rare	Moderate	Low – 3	Reliable			
Cyanobacteria	Nutrient build-up leading to algal blooms	Unlikely	Minor	Low – 4	Full water treatment at WTP	PAC dosing.	Rare	Minor	Low – 3	Reliable		Lake Julius is susceptible to BGA. Chinaman Creek Dam also susceptible, limited records of such events but	

Hazard/ Hazardous Event	Hazard Source	Unmitigated			Primary Preventative Measure	Other Preventative Measures	Mitigated			Uncertainty	Documented Procedures	Comments	RMIP Item
		Likelihood	Consequence	Risk Level			Likelihood	Consequence	Risk Level				
												recent history shows no BGA outbreaks.	
Taste and Odour	Algal blooms	Unlikely	Minor	Low – 4	Full water treatment at WTP		Rare	Minor	Low - 1	Reliable		No recent algal blooms.	
Cyanobacterial toxins	Algal blooms	Unlikely	Major	High - 12	Regular turnover of water supply in Turkey nest form SunWater.	Full water treatment at WTP - oxidation is effective for majority of toxins	Rare	Major	Medium – 5	Reliable		No recent algal blooms recorded in Cloncurry. If the raw water supplied by SunWater is not turned over there is a possibility of BGA.	
Iron	Natural geology of source water	Almost Certain	Minor	High – 10	Full water treatment at WTP		Rare	Minor	Low – 2	Confident		Elevated concentrations during flood events. Average Fe concentration in combined source water sits around 0.54 mg/L above the ADWG aesthetic guideline. Treated water Fe average is 0.01mg/L so treatment is effective (data from 2021-24).	
Manganese	Natural geology of source water	Almost Certain	Major	Extreme – 20	Full water treatment at WTP		Rare	Major	Medium – 5	Confident		Elevated concentrations during flood events. Average Mn concentration in combined source water sits around 0.53 mg/L sitting just on the ADWG health value but can get to over 1 mg/L. Treated water Mn average is 0.004mg/L so treatment is effective (data from 2021-24).	
True Colour	Natural geology of source water	Almost Certain	Minor	High – 10	Full water treatment at WTP		Rare	Minor	Low – 2	Confident		Average for True Colour in combined source water is 9.5 HU but can get over 20 HU (above the ADWG aesthetic value). Treated water average is 1.8 HU. Exceedances caused by elevated Fe/Mn and so are addressed with these issues.	
Taste & Odour issues (Chinaman Creek Dam)	Natural geology of source water	Almost Certain	Minor	High – 10	Chinaman Dam currently not in use for raw water (kept online as a back-up option for emergencies)		Rare	Minor	Low – 2	Confident			
Loss of water supply	Drought/bushfire	Unlikely	Catastrophic	High – 10	Drought Management Plan		Rare	Catastrophic	Medium – 6	Reliable			
Loss of water supply	Raw water pump failure (Cloncurry River)	Unlikely	Major	Medium – 8	Water can be sourced from Lake Julius	Duty standby pumps are protected from floods	Rare	Major	Medium – 6	Reliable		2x pumps which are the same age. Spares are available, as detailed in the critical spares list.	**C5 Main Wells Project**

Hazard/ Hazardous Event	Hazard Source	Unmitigated			Primary Preventative Measure	Other Preventative Measures	Mitigated			Uncertainty	Documented Procedures	Comments	RMIP Item
		Likelihood	Consequence	Risk Level			Likelihood	Consequence	Risk Level				
Loss of water supply	Raw water pump failure (NWQWP)	Unlikely	Major	Medium – 8	Water can be sourced from Cloncurry River.	Monitoring reservoir storage levels, inlet flow rates and effective communication with SunWater.	Unlikely	Major	Medium – 8	Estimate		Julius Lake pump failed twice in 2021. SunWater pump is not connected to CSC's generator, nor is there a back-up supply in case of outage.	**C5 Main Wells Project**
Loss of water supply	River Well collapse/pump failure	Unlikely	Major	Medium – 8	Lake Julius can be used for source water if Well supply fails.	Back-up power supply available for well pumps in case of power outages and spare pumps available.	Rare	Major	Medium – 6	Estimate		River Wells were upgraded in 2023.	**C5 Main Wells Project**
Turbidity	Changing river conditions	Likely	Moderate	High – 12	Full water treatment at WTP		Rare	Moderate	Low - 3	Reliable		The Cloncurry River runs Turbid for 3 months of the year. When the Leichhardt River runs there is some Turbidity increase in Lake Julius. The average Turbidity of the combined raw water is 12.86NTU, the WTP effectively manages this with an average for treated water of 0.17 NTU (data from 2021- 24).	
Turbidity	Lake Rollover (Chinaman Creek Dam)	Rare	Major	Medium – 5	Chinaman Creek Dam source water no longer used		Rare	Major	Medium – 5	Confident		Cool autumn nights cause the top layer in the lake to cool down faster than the lower layer, resulting in the water "rolling over" and stirring up sediment.	
Turbidity	Chinaman Creek Dam raw water pumps	Likely	Major	High – 16	Chinaman Creek Dam source water no longer used		Rare	Major	Medium – 5	Confident		Potential for the extraction of highly Turbid water if the harvest pumps and town supply pumps run concurrently.	
Water Treatment Plant													
Turbidity	Failure of coagulant dosing equipment or under dosing.	Likely	Major	High – 16	Filtration	Coagulation	Rare	Major	Medium – 5	Reliable	Daily testing of clarified water – after plant has settled.	Turbidity of filters is generally <0.3 NTU, alarm set in SCADA to alert at 0.3 NTU and shut-down at 0.5 NTU. No alerts or shut-downs have occurred since installed. High pH in raw water could cause the coagulation to fail.	
Protozoa (Crypto/Giardia)		Likely	Catastrophic	Extreme – 20	Filtration	Coagulation	Rare	Catastrophic	Medium – 6	Reliable			
Aluminium	Overdosing of coagulant	Possible	Minor	Medium – 6	Clarification	Filtration	Rare	Minor	Low – 2	Confident		Verification monitoring since 2019 shows no Aluminium exceedances.	
Manganese	Potassium Permanganate underdose	Possible	Major	High – 12	Dosing pumps are regularly calibrated	Daily manual sampling for Manganese. ORP online monitoring.	Unlikely	Major	Medium – 8	Reliable	Mn CCP.	Some dosing issues recorded in early 2017 but monitoring data from 2019-2024 shows treated water Mn concentrations below the ADWG health value.	
Taste and Odour	PAC underdose	Rare	Minor	Low – 2	PAC dosing not used since Chinaman Creek		Rare	Minor	Low – 2	Confident			

Hazard/ Hazardous Event	Hazard Source	Unmitigated			Primary Preventative Measure	Other Preventative Measures	Mitigated			Uncertainty	Documented Procedures	Comments	RMIP Item
		Likelihood	Consequence	Risk Level			Likelihood	Consequence	Risk Level				
					Dam was made dormant								
Protozoa (Crypto/Giardia)	Increased pathogen load due to recycling of supernatant	Likely	Catastrophic	Extreme – 20	Filtration/ Coagulation	Online SCADA system monitoring.	Rare	Catastrophic	Medium – 6	Reliable	Documented Procedure on use of reclaimed water.	Returned water can at times become >10% of total plant flow – this has not impacted upon WTP's ability to treat water.	
Protozoa (Crypto/Giardia)	Media Filters filter breakthrough	Possible	Catastrophic	High – 15	Filtration/ Coagulation		Rare	Catastrophic	Medium – 6	Reliable	CCP2	Backwash on head loss, Turbidity and time lapse.	
Turbidity	Media Filters filter breakthrough	Possible	Major	High – 12	Filtration/ Coagulation	Online filter Turbidity monitoring and grab samples taken from individual filters	Rare	Catastrophic	Medium – 6	Reliable	Jar Testing conducted as required. CCP2	WTP has been upgrades with new media filters. Turbidity of filters is generally <0.3 NTU, alarm set in SCADA to alert at 0.3 NTU and shut-down at 0.5 NTU. No alerts or shut-downs have occurred since installed.	
Disinfection													
Bacteria/virus	Chlorine dosing equipment failure	Possible	Catastrophic	High – 15	Disinfection	Target Chlorine dose of 1.5 mg/L. Duty stand-by pumps. Auto changeover of Chlorine Gas bottle. SCADA alarms sent to operator on faults and residual targets.	Rare	Catastrophic	Medium – 6	Reliable	Plant Manual Daily and online Free Chlorine residual monitoring. CCP3	Likelihood reduced to unlikely due to historic data analysis which demonstrates good control.	
Bacteria/virus	High Turbidity impacting disinfection effectiveness	Almost Certain	Catastrophic	Extreme – 25	Filtration	Disinfection	Rare	Catastrophic	Medium – 6	Confident		Turbidity is typically below 1 NTU with online SCADA monitoring and automatic shut-downs if CCP is exceeded.	
Chlorine	Chlorine overdose	Unlikely	Moderate	Medium – 6	Automated dosing system, practically impossible to overdose unless there are multiple system failures	Target Chlorine dose of 1.5 mg/L.	Rare	Moderate	Low – 3	Reliable	CCP3	Manual testing taken daily Free No historical evidence of Chlorine residual exceeding 5mg/L.	
Disinfection by-products	Trihalomethanes/ Chlorate	Likely	Moderate	High – 12	Coagulation/Filtration	Target Chlorine dose of 2.5 mg/L.	Rare	Moderate	Low – 3	Reliable		THM monitoring since 2022 has identified no exceedances.	
Bacteria/virus	Inadequate Chlorine contact time	Almost Certain	Catastrophic	Extreme – 25	Clear Water Tank and Reservoir provide contact time.	Disinfection	Rare	Catastrophic	Medium – 6	Confident	CCP3	Chlorinate set point is aimed at 2.5 mg/L. At the minimum volume (520 kL) and an average Free Chlorine residual of 2.35mg/L (based on historical data), the Ct at design flow is 16.5mg.min/L.	**C2 Clear Water Tank Maintenance**

Hazard/ Hazardous Event	Hazard Source	Unmitigated			Primary Preventative Measure	Other Preventative Measures	Mitigated			Uncertainty	Documented Procedures	Comments	RMIP Item
		Likelihood	Consequence	Risk Level			Likelihood	Consequence	Risk Level				
Bacteria/virus	Chlorine dosing equipment failure (Airport Booster system)	Possible	Catastrophic	High – 15	Disinfection	Operational monitoring Routine inspections	Rare	Catastrophic	Medium – 6	Estimate	Operational monitoring for Free Chlorine CCP3		**C4 – Chlorine booster investigation**
Chlorine	Chlorine overdose (Airport Booster system)	Unlikely	Moderate	Medium – 6	Automated dosing system with a target does of 1.5 mg/L.	Operational monitoring Routine inspections	Rare	Moderate	Low – 3	Estimate	Operational monitoring for Free Chlorine CCP3		**C4 – Chlorine booster investigation**
Reservoirs													
Bacteria/virus	Animal access to Reservoir	Likely	Catastrophic	Extreme – 20	Disinfection - Free Chlorine residual is maintained in reservoir	Sealed, secure and vermin proof reservoir. Reservoir is sealed and secure.	Rare	Catastrophic	Medium – 6	Reliable			
Protozoa (Crypto/Giardia)	Animal access to Reservoir	Possible	Catastrophic	High – 15	Full water treatment at WTP including filtration to maintain Turbidity at <0.3 NTU.	Routine inspection programme. Sealed, secure and vermin proof reservoir.	Rare	Catastrophic	Medium – 6	Reliable		Unlikely for protozoa to contaminate reservoir.	
All hazards	Unauthorised human access to Reservoir	Likely	Catastrophic	Extreme – 20	Security fencing and locked access gates/hatches	Disinfection. Routine inspection programme.	Rare	Catastrophic	Medium – 6	Reliable		No history of issues, small town, suspicious behaviour around reservoir would likely be noticed.	
Bacteria/virus	Water stagnation in reservoir	Possible	Catastrophic	High – 15	High water usage in town	Weekly operational monitoring for Free Chlorine	Rare	Catastrophic	Medium – 6	Confident			
Turbidity	Scouring of sediment	Unlikely	Major	Medium – 8	Disinfection – free Chlorine residual maintained in reservoir	Reservoir maintained at 80% capacity	Rare	Major	Medium – 5	Estimate		No previous issues identified. Reservoir has not been cleaned or inspected by divers, Council investigating this.	
Distribution System													
Protozoa (naegleria)	Colonisation of the reticulation with opportunistic pathogens	Possible	Major	High – 12	Disinfection – Free Chlorine residual is usually >1 mg/L		Rare	Major	Medium – 5	Reliable			
Bacteria/virus	Cross-contamination, back-flow	Possible	Catastrophic	High – 15	Disinfection	RPZ valves to prevent backflow.	Rare	Catastrophic	Medium – 6	Confident	Pressure leakage monitoring. Verification monitoring.	Positive pressure maintained in distribution system. Separate tools for water and sewer works. No cross-connection issues.	
Protozoa (Crypto/Giardia)		Possible	Catastrophic	High – 15	Backflow meter register	RPZ valves to prevent backflow.	Rare	Catastrophic	Medium – 6	Confident			
Bacteria/virus	Pipe bursts or leaks	Likely	Catastrophic	Extreme – 20	Residual disinfection	Operators trained in correct hygiene practices.	Rare	Catastrophic	Medium – 6	Reliable	Mains breaks and Repair Procedure.	Aging infrastructure, however, no issues to date.	**C3 Ageing Infrastructure**
Turbidity	Build-up of sediments or slimes	Possible	Moderate	Medium – 9	Routine flushing	Residual disinfection	Rare	Moderate	Low – 3	Confident		Monthly flushing at dead end locations, 6-monthly flushing for all other mains.	

Hazard/ Hazardous Event	Hazard Source	Unmitigated			Primary Preventative Measure	Other Preventative Measures	Mitigated			Uncertainty	Documented Procedures	Comments	RMIP Item
		Likelihood	Consequence	Risk Level			Likelihood	Consequence	Risk Level				
Bacteria/virus	Stagnation/ dead ends	Likely	Catastrophic	Extreme – 20	Routine flushing	Residual disinfection	Rare	Catastrophic	Medium – 6	Confident		Hospital and Airport are on dead ends, Chlorine is still detectable at these locations. Monthly flushing at dead end locations.	**C4 Low Free Chlorine Residual at Airport**
Whole of System													
Bacteria/virus	Incorrect operation of valves	Possible	Catastrophic	High – 15	Working day visual inspection of valves.	All manholes are locked. Valves keys have been removed to prevent unauthorised access.	Rare	Catastrophic	Medium – 6				
Loss of water supply	Power failure	Possible	Catastrophic	High – 15	Back-up generator available for WTP and pump stations	Battery back-up power for SCADA system. Routine visual inspections.	Rare	Catastrophic	Medium – 6	Confident		Power failure messages received via. phone. No incident of failure to supply so likelihood reduced to rare. WTP needs to be manually started.	**C1 SCADA Upgrades** **C5 Main Wells Project**
Loss of water supply	Inadequate equipment back-up options (e.g. duty/standby)	Possible	Catastrophic	High – 15	Council keep spare pumps and parts on hand to deal with sudden maintenance issues		Rare	Catastrophic	Medium – 6	Estimtae		No issues to date.	**C1 SCADA Upgrades**
Loss of water supply	Storm	Unlikely	Major	Medium - 8	Infrastructure protected from debris	Regular visual inspections of infrastructure	Rare	Major	Medium – 5	Reliable	Disaster Management Plan	To date, major storms have not caused issues for the scheme.	
Loss of water supply	Flood	Unlikely	Major	Medium - 8	Infrastructure located above historic flood levels	Regular visual inspections of infrastructure	Rare	Major	Medium – 5	Reliable	Disaster Management Plan	To date, floods have not caused issues for the scheme.	
Loss of water supply	Fire	Unlikely	Major	Medium - 8	Infrastructure is free from flammable debris	Regular visual inspections of infrastructure	Rare	Major	Medium – 5	Reliable	Disaster Management Plan	To date, fires have not caused issues for the scheme.	
Loss of water supply	Cyclone	Unlikely	Major	Medium - 8	Infrastructure protected from debris	Regular visual inspections of infrastructure	Rare	Major	Medium – 5	Reliable	Disaster Management Plan	To date, cyclones have not caused issues for the scheme.	
All hazards	Inadequate operators/lack of staff training and inability to find suitable operators	Possible	Catastrophic	High - 15	Water operators available	In-house training.	Rare	Catastrophic	Medium – 6	Reliable		Historically there has been a high turnover of staff. Salary structure by Council has been increased to fill positions. New positions in the water sector are being created. In-house training programme has commenced resulting in some stable positions to ensure the DWQMP is correctly implemented.	**C1 SCADA Upgrades**
All hazards	Sabotage	Possible	Catastrophic	High - 15	WTP building is locked with security fencing.	Working day visual inspection of security fencing and locks.	Rare	Catastrophic	Medium – 6	Reliable		No history of issues, small town, suspicious behaviour around WTP would likely be noticed.	
Cyber security breach	Breach of Council's internal system causing access to	Possible	Major	High – 12	Restricted administration privileges including	Multi-factor authentication for all users. Back-up systems in place.	Rare	Major	Medium – 5	Uncertain		No issues to date.	

Hazard/ Hazardous Event	Hazard Source	Unmitigated			Primary Preventative Measure	Other Preventative Measures	Mitigated			Uncertainty	Documented Procedures	Comments	RMIP Item
		Likelihood	Consequence	Risk Level			Likelihood	Consequence	Risk Level				
	restricted information and/or control of WTP				firewalls and access by username / password								

6.3 Dajarra Drinking Water Scheme Risk Assessment

An initial Risk Assessment workshop was conducted for the Dajarra scheme in 2023 as part of Council's action plan to make the scheme potable. The team from CSC that participated in this Risk Assessment workshop is outlined in Table 21 below.

Table 20: Dajarra Risk Assessment Workshop Team.

Name	Organisation	Position
Chris Johnstone	Cloncurry Shire Council	Director of Infrastructure & Environment
Saati Divekar	Cloncurry Shire Council	Manager of Infrastructure
Carson Yang	Cloncurry Shire Council	Project Engineer
Steve Larson	Cloncurry Shire Council	Water Treatment Plant Operator

The final Risk Assessment for Dajarra (reviewed in February 2024) is provided in Table 22 below.

Table 21: Dajarra Drinking Water Scheme Risk Assessment.

Hazard/ Hazardous Event	Hazard Source	Unmitigated			Primary Preventative Measure	Other Preventative Measures	Mitigated			Uncertainty	Documented Procedures	Comments	RMIP Item
		Likelihood	Consequence	Risk Level			Likelihood	Consequence	Risk Level				
Source Water													
Bacteria/virus	Contamination of Artesian aquifer through borehead	Possible	Catastrophic	High – 15	Full water treatment at WTP		Unlikely	Catastrophic	High – 10	Uncertain		1x *E.coli* detection in December 2023. Need more data to show that risk is being managed.	**D2 – *E.coli* monitoring investigation.**
Protozoa (Naeglaria, Legionella, *pseudomonas*)		Possible	Catastrophic	High – 15	Full water treatment at WTP		Unlikely	Catastrophic	High – 10	Uncertain		Water in the raw water tank can reach above 20°C. Need more data to show that risk is being managed.	**D3 –Monitoring of WTP to determine if treatment adequately reduces the risk for opportunistic pathogens within the scheme.**
Protozoa (Crypto/Giardia)		Possible	Catastrophic	High – 15	Full water treatment at WTP including filtration		Unlikely	Catastrophic	High – 10	Uncertain		Need more data to show that risk is being managed.	**D3 –Monitoring of WTP to determine if treatment adequately reduces the risk for opportunistic pathogens within the scheme.**
Bacteria/virus	Leaching of sewer system into the Aquifer	Possible	Catastrophic	High – 15	Full water treatment at WTP		Unlikely	Catastrophic	High – 10	Uncertain		Need more data to show that risk is being managed.	**D2 – *E.coli* monitoring investigation.**
Cyanotoxins		Unlikely	Minor	Low – 4	Full water treatment at WTP	Regular inspections and chemical cleaning of each tank.	Rare	Minor	Low – 2	Confident		No issues recorded in recent history.	
Bacteria/virus	Contamination of source water through incorrect hygiene practices during maintenance, repair, commissioning of source water infrastructure	Possible	Catastrophic	High – 15	Residual disinfection.	Staff trained to exercise correct hygiene practices.	Rare	Catastrophic	Medium – 6	Confident			
Hydrocarbons	Chemical spill leaching into source water	Unlikely	Moderate	Medium – 6	Full water treatment at WTP	Disaster Management Plan	Rare	Moderate	Low – 3	Estimate		Council would be made aware of major incidents.	
Pharmaceuticals	Leaching into source water	Unlikely	Major	Medium – 8	Full water treatment at WTP	Routine inspection of bores	Rare	Major	Medium – 5	Estimate		No verification monitoring data available.	
Heavy metals	Leaching into source water	Possible	Moderate	Medium – 9	Full water treatment at WTP	Verification monitoring for Heavy Metals	Rare	Moderate	Low – 3	Estimate		Minimal verification monitoring data available.	**D1 Verification monitoring investigation**

Hazard/ Hazardous Event	Hazard Source	Unmitigated			Primary Preventative Measure	Other Preventative Measures	Mitigated			Uncertainty	Documented Procedures	Comments	RMIP Item
		Likelihood	Consequence	Risk Level			Likelihood	Consequence	Risk Level				
Radiological activity	Natural geology of source water	Likely	Major	High – 16	Full water treatment at WTP	Verification monitoring	Likely	Major	High – 16	Estimate		Minimal verification monitoring data available, previous data shows Uranium, Gross Alpha/Beta exceedances.	**D1 Verification monitoring investigation**
Loss of water supply	Bore failure	Possible	Major	High – 12	Multiple bores available for use	Visual inspections of bores	Rare	Major	Medium – 5	Reliable	Low level alarm for Mix Tank (raw water)	Bore failure has been known within the scheme. Bore assessment completed 2023.	
Loss of water supply	Bore pump failure	Possible	Major	High – 12	Multiple bores available for use	Critical spares available on-site. Water restrictions in place for special circumstances.	Rare	Major	Medium – 5	Reliable	Low level alarm for Mix Tank (raw water).	Bore assessment completed 2023.	
Water Treatment Plant													
Conductivity	Membrane Breach	Likely	Moderate	High – 12	OSMOFLO remote Control Centre and SCADA telemetry		Possible	Moderate	Medium – 9	Reliable		2nd stage NF membranes replaced in Jan 2022 due to fouling and breakthrough issue potentially caused by adding Sodium Hypochlorite to the raw water tank.	
Protozoa (Crypto/Giardia)	Media Filters filter breakthrough	Possible	Catastrophic	High – 15	Filtration/ Coagulation		Rare	Catastrophic	Medium – 6	Reliable	CCP2		
Turbidity	Media Filters filter breakthrough	Possible	Major	High – 12	Filtration/ Coagulation	Online filter Turbidity monitoring and grab samples taken from individual filters	Rare	Major	Medium – 5	Reliable	Jar Testing conducted as required. CCP2		
Disinfection													
Bacteria/virus	Chlorine dosing equipment failure	Possible	Catastrophic	High – 15	Disinfection	SCADA alarms sent to operator on faults and residual targets.	Unlikely	Catastrophic	High – 10	Uncertain	CCP3	Online Free Chlorine residual monitoring. Need more data to show that risk is being managed.	**D5 – Free Chlorine Residual monitoring investigation**
Bacteria/virus	High Turbidity impacting disinfection effectiveness	Almost Certain	Catastrophic	Extreme – 25	Filtration	Disinfection	Unlikely	Catastrophic	High – 10	Uncertain		Need more data to show that risk is being managed.	**D5 – Free Chlorine Residual monitoring investigation**
Chlorine	Chlorine overdose	Unlikely	Moderate	Medium – 6	Automated dosing system.	Target Chlorine dose of 1.5 mg/L.	Unlikely	Moderate	Medium – 6	Reliable	CCP3	Need more data to show that risk is being managed.	
Disinfection by-products	Trihalomethanes/ Chlorate	Possible	Major	High – 12	Coagulation/Filtration	Disinfection.	Possible	Major	High – 12	Estimate		1x round of THM monitoring in December 2023 identified no exceedances.	**D4 – Verification monitoring investigation**
Chlorate	Sodium Hypochlorite breakdown	Possible	Major	High – 12	Chemical specifications & store management		Possible	Major	High – 12	Estimate		No data for Chlorate.	**D4 – Verification monitoring investigation**

Hazard/ Hazardous Event	Hazard Source	Unmitigated			Primary Preventative Measure	Other Preventative Measures	Mitigated			Uncertainty	Documented Procedures	Comments	RMIP Item
		Likelihood	Consequence	Risk Level			Likelihood	Consequence	Risk Level				
Bacteria/virus	Inadequate Chlorine contact time	Almost Certain	Catastrophic	Extreme – 25	Clear Water Tank and Reservoir provide contact time.	Disinfection	Unlikely	Catastrophic	High – 10	Confident	CCP3	Need more data to show that risk is being managed. Chlorinate set point is aimed at 2.5 mg/L. At the minimum volume (520 kL) and an average Free Chlorine residual of 2.35mg/L (based on historical data), the Ct at design flow is 16.5mg.min/L.	**D5 – Free Chlorine Residual monitoring investigation**
Bacteria/virus	Pathogenic ingress to product Tank	Almost Certain	Catastrophic	Extreme – 25	Disinfection		Unlikely	Catastrophic	High – 10	Uncertain		Need more data to show that risk is being managed.	**D2 – *E.coli* monitoring investigation.**
Bacteria/virus	Pathogenic ingress via. pipeline from Product Tank to Reservoir	Almost Certain	Catastrophic	Extreme – 25	Disinfection		Unlikely	Catastrophic	High – 10	Uncertain		Need more data to show that risk is being managed.	**D2 – *E.coli* monitoring investigation.**
Reservoirs													
Bacteria/virus	Animal access to Reservoir	Likely	Catastrophic	Extreme – 20	Disinfection - Free Chlorine residual is maintained in reservoir	Sealed, secure and vermin proof reservoir. Routine inspection programme.	Unlikely	Catastrophic	High – 10	Uncertain		Need more data to show that risk is being managed.	**D2 – *E.coli* monitoring investigation.**
Protozoa (Crypto/Giardia)	Animal access to Reservoir	Possible	Catastrophic	High – 15	Full water treatment at WTP including filtration	Routine inspection programme. Sealed, secure and vermin proof reservoir.	Unlikely	Catastrophic	High – 10	Uncertain		Need more data to show that risk is being managed. Unlikely for protozoa to contaminate reservoir.	**D3 –Monitoring of WTP to determine if treatment adequately reduces the risk for opportunistic pathogens within the scheme.**
All hazards	Unauthorised human access to Reservoir	Likely	Catastrophic	Extreme – 20	Security fencing and locked access gates/hatches	Disinfection. Routine inspection programme.	Rare	Catastrophic	Medium – 6	Uncertain		No history of issues, small town, suspicious behaviour around reservoir would likely be noticed.	
Bacteria/virus	Water stagnation in reservoir	Possible	Catastrophic	High – 15	High water usage in town		Unlikely	Catastrophic	High – 10	Uncertain		Need more data to show that risk is being managed.	**D2 – *E.coli* monitoring investigation.** **D5 – Free Chlorine Residual monitoring investigation**
Distribution System													
Protozoa (naegleria)	Colonisation of the reticulation with opportunistic pathogens	Possible	Major	High – 12	Disinfection.		Unlikely	Major	Medium – 8	Uncertain		Need more data to show that risk is being managed.	

Hazard/ Hazardous Event	Hazard Source	Unmitigated			Primary Preventative Measure	Other Preventative Measures	Mitigated			Uncertainty	Documented Procedures	Comments	RMIP Item
		Likelihood	Consequence	Risk Level			Likelihood	Consequence	Risk Level				
Bacteria/virus Protozoa (Crypto/Giardia)	Cross-contamination, back-flow	Possible	Catastrophic	High – 15	RPZ valves to prevent backflow.	Disinfection	Rare	Catastrophic	Medium – 6	Confident	Pressure leakage monitoring. Verification monitoring.	Positive pressure maintained in distribution system. Separate tools for water and sewer works. No cross-connection issues.	
		Possible	Catastrophic	High – 15	RPZ valves to prevent backflow.	Replacement of ageing mains.	Rare	Catastrophic	Medium – 6	Confident			
Bacteria/virus	Pipe bursts or leaks	Likely	Catastrophic	Extreme – 20	Residual disinfection.	Installation of new reticulated mains in 2023.	Rare.	Catastrophic	Medium – 6	Confident			
Bacteria/virus	Stagnation/ dead ends	Likely	Catastrophic	Extreme – 20	Routine flushing of dead ends – monthly intervals	Residual disinfection	Unlikely	Catastrophic	High – 10	Uncertain		Need more data to show that risk is being managed.	**D2 – *E.coli* monitoring investigation.** **D5 – Free Chlorine Residual monitoring investigation**
Whole of System													
Bacteria/virus	Incorrect operation of valves	Possible	Catastrophic	High – 15	All manholes are locked. Valves keys have been removed to prevent unauthorised access.	Regular visual inspections by water operators. Residual disinfection	Rare	Catastrophic	Medium – 6	Confident		Regular SCADA checks by OSMOFLO remote control centre staff.	
Loss of water supply	Power failure	Likely	Catastrophic	Extreme – 20	Generator back-up at the WTP and bore pump stations. Battery back-up power for SCADA.	Visual inspections – Dajarra water operators are experienced at managing issues power outages. Council work with OSMOFLO to provide a quick response time to each critical event.	Rare	Catastrophic	Medium – 6	Reliable		During the summer wet season, power outages are frequent. Upgrade in March 22 increased production capability to enable the system to “bounce back” more quickly. Well understood and rehearsed Water Restrictions Policy. On-site generators are maintained and regularly tested. Reservoir storage increased in 2023.	
Loss of water supply	Inadequate equipment back-up options (e.g. duty/standby)	Possible	Catastrophic	High – 15	Council keep spare pumps and parts on hand to deal with sudden maintenance issues		Rare	Catastrophic	Medium – 6	Estimtae		No issues to date.	
Loss of water supply	Storm	Unlikely	Major	Medium - 8	Infrastructure protected from debris	Regular visual inspections of infrastructure	Rare	Major	Medium – 5	Reliable	Disaster Management Plan	To date, major storms have not caused issues for the scheme.	
Loss of water supply	Flood	Unlikely	Major	Medium - 8	Infrastructure located above historic flood levels	Regular visual inspections of infrastructure	Rare	Major	Medium – 5	Reliable	Disaster Management Plan	To date, floods have not caused issues for the scheme.	
Loss of water supply	Fire	Unlikely	Major	Medium - 8	Infrastructure is free from flammable debris	Regular visual inspections of infrastructure	Rare	Major	Medium – 5	Reliable	Disaster Management Plan	To date, fires have not caused issues for the scheme.	
Loss of water supply	Cyclone	Unlikely	Major	Medium - 8	Infrastructure protected from debris	Regular visual inspections of infrastructure	Rare	Major	Medium – 5	Reliable	Disaster Management Plan	To date, cyclones have not caused issues for the scheme.	

Hazard/ Hazardous Event	Hazard Source	Unmitigated			Primary Preventative Measure	Other Preventative Measures	Mitigated			Uncertainty	Documented Procedures	Comments	RMIP Item
		Likelihood	Consequence	Risk Level			Likelihood	Consequence	Risk Level				
All hazards	Inadequate operators/lack of staff training and inability to find suitable operators	Possible	Catastrophic	High - 15	Water operators available.	SCADA allows for remote monitoring and assistance – service agreement with OSMOFLO ensures ready access to water treatment professional and quarterly site visits	Rare	Catastrophic	Medium – 6	Reliable		Historically there has been a high turnover of staff. Salary structure by Council has been increased to fill positions. New positions in the water sector are being created. In-house training programme has commenced resulting in some stable positions to ensure the DWQMP is correctly implemented.	
All hazards	Sabotage	Possible	Catastrophic	High - 15	WTP building is locked with security fencing.	Visual inspection of security fencing and locks.	Rare	Catastrophic	Medium – 6	Reliable		No history of issues, small town, suspicious behaviour around WTP would likely be noticed.	
Cyber security breach	Breach of Council's internal system causing access to restricted information and/or control of WTP	Possible	Major	High – 12	Restricted administration privileges including firewalls and access by username/password	Multi-factor authentication for all users. Back-up systems in place.	Rare	Major	Medium – 5	Uncertain		No issues to date.	

7.0 RISK MANAGEMENT IMPROVEMENT PROGRAMME

CSC's Risk Management Improvement Programme for both the Cloncurry and Dajarra schemes is provided in Table 23 below. The RMIP was reviewed and amended in February 2024 via. consultation with CSC. Moving forward, Council intends to review all completion target dates at 6-monthly intervals to ensure that the processes are in place for items to be completed within their forecast timeframes. The target dates for all RMIP items were determined via. consultation with Council staff responsible for the respective items.

Table 22: Cloncurry and Dajarra Risk Management Improvement Programme.

Ref.	Hazard/Hazardous Event	Description	Improvement Item/s	Priority	Target Date/s	Progress	Responsibility
C1	Equipment failure	The current SCADA & Telemetry system in Cloncurry is New Zealand specific (not Australian mainstream product specific). This causes services and upgrades to be expensive and not very geographically accessible.	1. Use an Australian based Contractor to upgrade the system and provide service and maintenance assistance. 2. Delivery of the SCADA integration programme: integration of Cloncurry sewerage and drinking water and the Dajarra drinking water supply systems into one uniform SCADA screen system to enable the centralisation of plant operation and the implementation of an open protocol SCADA system that uses Australian mainstream products.	High	April 2024	**Actioned:** Audit conducted on existing SCADA system: 8/2022 Detailed scope identified: 11/2022 Preparation of tender documents: 03/2023 Tendering and joint procurement with other regional Councils: 06/2023 Conceptual design: 07/2023 Detailed design: 09/2023 **Ongoing:** Procurement and installation: 02/2024 Commissioning: 02/2024	Engineering & Operation Teams and Contractors as required.
C2	Pathogenic ingress	Clear Water Storage Tank leaks	1. Identify storage solution for treated water while the Clear Water Tank is off-line being repaired. 2. Repair the Clear Water Tank	Medium	October 2024	**Ongoing:** Investigation and planning on storage while Tank is off-line and solution for relining Tank: 01/2024 Set the temporary storage tank: 05/2024 Inspection of Tank: 06/2024 Relining & Repair of Tank: 10/2024 **Notes:** Beca H2O have been engaged to provide an engineering solution for the commissioning	Engineering & Operation Teams

Ref.	Hazard/Hazardous Event	Description	Improvement Item/s	Priority	Target Date/s	Progress	Responsibility
						of a new Clear Water Tank and the repairs of the existing tank.	
C3	Pathogenic ingress	Ageing infrastructure (oldest mains in Cloncurry are made from AC and are ~60+ years)	1. In the interim consider a booster pump setting that will be compatible with the AC pipe structural capacity – use of booster pumps will increase the pressure in the distribution system which may lead to mains breaks. 2. Replacement of all AC mains – this will be progressed over a decade.	High	TBD	**Ongoing:** Establish the extent of the AC pipe network: TBD Remove representative samples for pressure and corrosive testing to confirm this is the problem: TBD Establish the reason for the deterioration (internal or external corrosion or just poor construction materials: TBD Select a suitable replacement pipe type: TBD Prepare a cost estimate for replacements: TBD **Notes:** TCD 06/2023. Requires engagement with specialist consultant to investigate and assist with Grant application.	Engineering & Operation Teams
C4	Pathogenic ingress	Airport has a low Free Chlorine residual (<0.2mg/L)	1. Warning sign and hand sanitiser have been paced at the airport as an interim solution. 2. There is a semi-Chlorine booster set-up near the airport – investigate this set-up to determine if it can fix the problem. 3. Source a suitable Contractor to complete the works.	High	March 2025	**Actioned:** Procurement of bottled water, warning signs and hand sanitiser: 11/2022 Investigation into Chlorine booster setup: 11/2022 Chlorine booster dosing system re-instated **Ongoing:** Continue monitoring Airport Free Chlorine residual: 2024	Engineering & Operation Teams

Ref.	Hazard/Hazardous Event	Description	Improvement Item/s	Priority	Target Date/s	Progress	Responsibility
			4. Continue to monitor the Free Chlorine residual at the airport.				
C5	Loss of Water Supply	Pump failure of the NWQWP (Lake Julius water supply) – the Lake Julius pumps are not connected to Council's generator and no back-up supply is available in case of a power outage.	1. Cloncurry Main Wells Project – enabling the Cloncurry River to be the main source of drinking water for the town.		TBD	**Actioned:** Mains Well Project: 2023 **Ongoing:** Council to work with SunWater to establish a genset at its Turkeys Nest – Cloncurry Mains Well Project new system capacity does not meet the demand of the town.	Engineering & Operation Teams
C6	Pathogenic Ingress	The Walton's Well (non-potable water supply) is still connected to the potable distribution system.	1. Completely isolate Walton's Well from the River Wells network.	High	December 2024	**Ongoing:** Council to isolate and cap the Walton's Well from the potable distribution system.	Engineering & Operation Teams
C7	Missing operation and maintenance procedures	Some missing operation and maintenance procedures have been identified for the scheme.	1. Draft and implement new operation and maintenance procedures.	High	June 2025	**Ongoing:** Council to draft and implement procedures to capture the following - Mains flushing - Reservoir cleaning - Reservoir roof inspections - Reservoir external inspections - Borehead inspections - River well inspections	Engineering & Operation Teams

Ref.	Hazard/Hazardous Event	Description	Improvement Item/s	Priority	Target Date/s	Progress	Responsibility
						- Chlorine gas bottle management - Bypass valve inspections	
D1	Heavy Metals/ Radiological Activity	Geology of Source Water	1. Quarterly (distribution system) and 6-monthly (source water) verification monitoring for Heavy Metals and Radiological activity to better understand the risk level.	High	December 2025	**Ongoing:** Verification monitoring programme to be updated to include Heavy Metal and Radiological monitoring.	Engineering & Operation Teams
D2	Pathogenic Ingress	Assessment of water testing data to determine the risk level for *E.coli* within the scheme.	1. Monitoring of raw water and distribution system to determine if *E.coli* is being adequately managed within the scheme.	High	December 2025	**Ongoing:** Monitoring data currently being collected.	Engineering & Operation Teams Engineering & Operation Teams
D3	Opportunistic Pathogen Ingress	Assessment of water testing data to determine the risk level for opportunistic pathogens within the scheme.	1. Monitoring of WTP data to determine if Turbidity levels are low enough to adequately manage the risk for opportunistic pathogens.	High	December 2025	**Ongoing:** Monitoring data currently being collected.	Engineering & Operation Teams
D4	Chlorination by-products	Assessment of treated water testing data to determine the risk level for chlorination by-products	1. Quarterly (distribution system) verification monitoring for Chlorates and THMs to better understand the risk level	High	December 2025	**Ongoing:** Verification monitoring programme updated to include Chlorate and THM monitoring.	Engineering & Operation Teams

Ref.	Hazard/Hazardous Event	Description	Improvement Item/s	Priority	Target Date/s	Progress	Responsibility
D5	Under Chlorination	Assessment of treated water data to determine if Free Chlorine residual is being maintained at the water treatment plant and within the distribution system.	1. Monitoring of WTP and distribution system to see if Free Chlorine residual is being consistently maintained.	High	December 2025	**Ongoing:** Monitoring data currently being collected.	Engineering & Operation Teams
D6	Missing operation and maintenance procedures	Some missing operation and maintenance procedures have been identified for the scheme.	2. Draft and implement new operation and maintenance procedures.	High	June 2025	**Ongoing:** Council to draft and implement procedures to capture the following - Mains flushing - Reservoir cleaning - Reservoir roof inspections - Reservoir external inspections - Borehead inspections	Engineering & Operation Teams

8.0 OPERATION AND MAINTENANCE PROCEDURES

8.1 Preventative Measures

Council have developed a series of Operational Control Points (OCP) and Critical Control Points (CCP) for each of their drinking water schemes. These OCPs and CCPs are supported by Operation and Maintenance Manuals for the Cloncurry and Dajarra WTPs and additional Operation and Maintenance Procedures which provide all other operating requirements for the schemes that are not covered by the OCPs, CCPS and WTP Manuals.

Table 24 below outlines the latest version for all Operation and Maintenance Procedures for both the Dajarra and Cloncurry schemes. All relevant manuals for each scheme are located in the WTP Control Offices and Water Sampling Lab. Moving forward, Council will undertake reviews of all OCPs, CCPs and O&M Procedures on the following triggers:

- Following significant changes in processes;
- Upon commissioning of any online SCADA monitoring;
- At the time of the scheduled DWQMP Review.

Table 23: Cloncurry and Dajarra Operation and Maintenance Procedures.

Scheme Component	Manual	Preventive Measure Managed	Version Date
Cloncurry/ Dajarra	CSC Monitoring Plan	Water Quality Monitoring	2021
Cloncurry	Cloncurry WTP SCADA System		2014
Cloncurry/ Dajarra	Sampling & Testing Procedures: - Jar Test Procedure - Chlorine Testing Procedure - Manganese Test Procedure - Iron Test Procedure - pH & Temperature Test Procedure		2021
Cloncurry Cloncurry	Module 3 Filer/Clarifier and Associated Works Upgrade, Operation and Maintenance Instructions	Disinfection	N/A
	CSC Chlorine Gas Inspection Checklist		N/A
	CSC Chinaman Creek Dam Inspection Checklist		N/A
	Polymer Checklist		N/A
	Sodium Hypochlorite Checklist		N/A
	Powder Activated Carbon Checklist		N/A
	WTP Chemical Register		N/A
	Operate Breathing Apparatus with Safe Handling of Chlorine Manual		N/A
	WTP Operation & Maintenance Manual		2014
	Cloncurry WTP Filtration and Disinfection Procedures		N/A
Dajarra	Dajarra WTP Operation and Maintenance Manual		2020

Scheme Component	Manual	Preventive Measure Managed	Version Date
Cloncurry	Cloncurry Drinking Water Systems Analysis	Whole of System	2022
Dajarra	Dajarra Drinking Water System Analysis		2022

8.2 Critical and Operational Control Points

The following Critical Control Points have been identified for the Cloncurry and Dajarra Schemes:

- **CCP1:** Manganese CCP (Cloncurry WTP)
- **CCP2:** Filtration (Cloncurry WTPs)
- **CCP3:** Disinfection (Cloncurry & Dajarra WTPs)
- **OCP1:** Conductivity (Dajarra WTP)
- **OCP2:** Coagulant Dosing (Cloncurry)
- **OCP3:** Free Chlorine in the Distribution System (Cloncurry & Dajarra WTPs)

The CCP/OCP Reporting Form is provide in Appendix A for reference.

CCP1 Manganese Control (Cloncurry)			
What is measured?	**Where /how is it measured?**	**What is the Control Point?**	**What are the Hazards?**
Manganese	Grab sample from the Filter outlet	Potassium Permanganate dosing	Total Manganese
Alarms	Nil.		
WTP Response	Inlet water redox – if redox meter reaches below 39- 40 rh, the low alarm is triggered and the plant shuts down automatically.		
Target Value: <0.05 mg/L			
Alert Level: >0.1 mg/L **Responsibility: Water Operator**		**Critical Limit: >0.5 mg/L** **Responsibility: Water Operator**	
1. Immediately re-take grab sample to verify result. 2. Check the incoming raw water quality, if possible change raw water source. 3. Consider need to undertake Jar Testing. 4. Check dose pumps (re-calibrate) and Potassium Permanganate solution. 5. Adjust Potassium Permanganate dosing as necessary. 6. Determine the need for pre-Chlorination at the filters. 7. Check filtration CCP and take actions as necessary. 8. Re-sample. **Reporting:** Fill in the CCP reporting form and alert Supervisor.		1. Immediately re-take grab sample to verify result. 2. Contact Supervisor and suspend water from the respective filter. 3. Undertake Jar Testing to optimise the Potassium Permanganate dosing. 4. Check upstream processes (Filtration CCP), coagulation/flocculation, de-sludging. 5. Determine the need for pre-Chlorination at the filters. 6. Re-sample, including in the distribution system. 7. Recommence pumping water to Clear Water Tank if Manganese has been corrected. **Reporting:** Fill in the CCP reporting form, notify Water Supply Regulator if CCP was exceeded in the distribution system.	

CCP2 Filtration (Cloncurry)			
What is measured?	**Where /how is it measured?**	**What is the Control Point?**	**What are the Hazards?**
Turbidity	Continuous online monitoring from the Filter outlet and grab sampling	Media Filters	Turbidity Protozoa
Alarms	SCADA alarms and mobile SMS notifications of alert and critical limits.		
WTP Response	Module will shut down if Turbidity is >0.5 NTU for 5 minutes.		
Target Value: <0.2 NTU			
Alert Level: >0.3 NTU for 15 minutes **Responsibility: Water Operator**		**Critical Limit: >0.5 NTU for 5 minutes** **Responsibility: Water Operator**	
1. Immediately take grab sample to verify result. 2. Check calibration records and re-calibrate equipment if required. 3. Investigate cause of increased Turbidity – check incoming raw water quality/change raw water source if possible. 4. Undertake appropriate actions e.g. backwash, optimise coagulate/polymer dosing, de-sludge clarifier. 5. Re-sample. **Reporting:** Fill in the CCP reporting form and alert Supervisor.		1. Immediately take grab sample to verify result. 2. Contact Supervisor and suspend water from the respective filter. 3. Consider the need to suspend water from the respective filter. 4. Undertake Jar Testing to optimise the coagulate/polymer dose. 5. Undertake appropriate actions e.g. backwash, optimise coagulate/polymer dosing, de-sludge clarifier. 6. Re-sample. 7. Recommence pumping water to Clear Water Tank if Turbidity has been corrected. **Reporting:** Fill in the CCP reporting form, notify Water Supply Regulator if CCP exceedance persists.	

CCP3 Disinfection (Cloncurry & Dajarra)			
What is measured?	**Where /how is it measured?**	**What is the Control Point?**	**What are the Hazards?**
Free Chlorine	**Cloncurry –** Continuous online monitoring from the Clear Water Tank outlet and grab sampling. **Dajarra –** Continuous online monitoring from the WTP.	Chlorine Gas dosing into the Clear Water Tank (Cloncurry). Sodium Hypochlorite dosing (Dajarra).	Bacteria Viruses Protozoa
Alarms	**Cloncurry –** SCADA alarms and mobile SMS notifications of alert and critical limits. **Dajarra –** Plant is monitored remotely 24x7 by Osmoflo control centre, email notification and phone call to Council staff from the control centre.		
WTP Response	**Cloncurry –** If the Chlorine content in the Clearwater reservoir is less than the "Clearwater Chlorine Low/Low – High Lift Pump Station Inhibit," both high lift pumps will be inhibited. If the Chlorine content in the Clearwater reservoir is more than the "Clearwater Chlorine Low/Low – High Lift Pump Station Inhibit," both high lift pumps will be inhibited. **Dajarra –** low level set point of 0.5 mg/L, if this is reached, WTP will shut down.		
Target Value: 2- 2.5 mg/L			
Alert Level: <1.5 mg/L or >3.5 mg/L for >30 minutes **Responsibility: Water Operator**		**Critical Limit: <0.5 mg/L or >4 mg/L for >30 minutes** **Responsibility: Water Operator**	
1. Immediately take grab sample to verify result. 2. Check calibration records and re-calibrate equipment if required. 3. Check Chlorine dose pumps and cylinders (e.g. for leaks), adjust Chlorine dose if required. 4. Check upstream processes are working well. 5. Undertake detailed assessment of Chlorine dosing system. 6. Re-sample. **Reporting:** Fill in the CCP reporting form and alert Supervisor.		1. Immediately take grab sample to verify result. 2. Contact Supervisor and suspend water to Town Reservoir. 3. Undertake thorough inspection with Supervisor. 4. Sample and test for Free Chlorine in the Town Reservoir and distribution system. 5. Consider flushing Clear Water Tank and/or mains as necessary. 6. Re-sample. 7. Recommence pumping water to Clear Water Tank if Free Chlroine has been corrected. **Reporting:** Fill in the CCP reporting form, notify Water Supply Regulator if Free Chlorine lower or upper limits are reported in the distribution system (<0.2 mg/L or >5 mg/L).	

OCP1 Conductivity (Dajarra)			
What is measured?	**Where /how is it measured?**	**What is the Control Point?**	**What are the Hazards?**
Conductivity of treated water	Continuous online monitoring. Conductivity feed transmitters measure feed, permeate and final treated water Conductivity.	Nanofiltration	Pathogens pH
Alarms	Plant is monitored remotely 24x7 by Osmoflo control centre, email notification and phone call to Council staff from the control centre.		
Target Value: Conductivity 800 us/cm, pH 6.9 (treated water)			
Alert Level: >1050 us/cm for 1 hour (treated water) **Responsibility: Water Operator**		**Critical Limit: >2500 us/cm for 4 hours (treated water)** **Responsibility: Water Operator**	
1. Immediately take grab sample to verify result. 2. Check Sulphuric Acid dose pumps (decrease/increase dose if required) and cylinders (e.g. for leaks). 3. Check calibration records and re-calibrate equipment if required. 4. Check upstream processes are working well. 5. Undertake detailed assessment of the Nanofiltration system. 6. Re-sample. **Reporting:** Fill in the OCP reporting form and alert Supervisor.		1. Immediately take grab sample to verify result. 2. Contact Supervisor and suspend water to Town Reservoir as likely breach in the NF membrane. 3. Undertake thorough inspection with Supervisor. 4. Sample and test for Conductivity in the Town Reservoir and distribution system. 5. Undertake detailed assessment of the Nanofiltration system. If RO membrane breach confirmed DO NOT operate WTP until external service has been completed. 6. Re-sample. 7. Recommence pumping water to Clear Water Tank if Conductivity has been corrected. **Reporting:** Fill in the CCP reporting form, notify Water Supply Regulator if Conductivity is >2500 us/cm in the distribution system.	

OCP2 Coagulant Dosing (Cloncurry)			
What is measured?	**Where /how is it measured?**	**What is the Control Point?**	**What are the Hazards?**
Turbidity True Colour pH	Grab samples from clarified water	Coagulant Dosing	Turbidity Pathogens
Target Value: <2 NTU, <5 HU			
Adjustment: >2.5 NTU, >10 HU **Responsibility: Water Operator**		**Alert Level: >5 NTU, >15 HU** **Responsibility: Water Operator**	
1. Immediately take grab sample to verify result. 2. Inspect clarifier and floc size. 3. Inspect doing system, drop test dosing pumps to confirm correct dosage. 4. Ensure dosing lines are not damaged/blocked. 5. Carry out Jar Testing if pumps are operating correctly. 6. Adjust Coagulant and Flocculant doses if necessary (i.e. if True Colour >10 HU in clarified water). 7. Test combined filtered water Turbidity and pH hourly and other parameters as needed. **Reporting:** Fill in the OCP reporting form and alert Supervisor.		1. Immediately take grab sample to verify result. 2. Inspect clarifier and floc size. 3. Inspect doing system, drop test dosing pumps to confirm correct dosage. 4. Ensure dosing lines are not damaged/blocked. 5. Carry out Jar Testing if pumps are operating correctly. 6. Contact Supervisor. 7. Consider if there is a need to stop production. 8. Adjust coagulant dosing if necessary (i.e. if True Colour >10 HU in clarified water). 9. Test combined filtered water Turbidity and pH hourly and other parameters as needed. **Reporting:** Fill in the CCP reporting form, notify Water Supply Regulator if Conductivity is >2500 us/cm in the distribution system.	

OCP3 Free Chlorine in the Distribution System (Cloncurry & Dajarra)			
What is measured?	**Where /how is it measured?**	**What is the Control Point?**	**What are the Hazards?**
Free Chlorine	Fortnightly grab sample (Dajarra) and Weekly grab sample (Cloncurry) from the distribution system	Chlorine leaving the WTP	Bacteria Viruses
Target Value: >0.2 mg/L			
Alert Level: <0.2 mg/L or >5 mg/L **Responsibility: Water Operator**			
1. Immediately re-sample to verify result. 2. Flush downstream hydrant for 10 minutes and re-sample. 3. If the Free Chlorine residual is still at the Alert Level, check CCP 3 Disinfection to ensure adequate disinfection at WTP. 4. Check Free Chlorine residual in reservoir. 5. If Chlorine dosing and reservoir are normal, re-flush for another 10 minutes. 6. Re-sample. 7. If Alert Level is still being exceeded, notify Water Supply Regulator. **Reporting:** Fill in the OCP reporting form and alert Supervisor.			

9.0 OPERATIONAL AND VERIFICATION MONITORING

CSC undertakes in-house operational monitoring and external verification monitoring as part of the water quality monitoring programme for the Cloncurry and Dajarra schemes. The water quality monitoring programme is an essential part of the operation of the scheme to ensure that the scheme is operating within its performance limits.

All water quality results are trended in two master spreadsheets – one for each scheme. External laboratory results are sent to CSC. It is the responsibility of the Water Operators, Supervisors and Management to ensure that all data is reviewed, added to the relevant data spreadsheet and saved on Council's database.

Any ADWG health or aesthetic exceedances are dealt with as outlined below in Section 10.

9.1 Cloncurry and Dajarra Water Quality Monitoring Programme

Operational monitoring is undertaken as daily, weekly, fortnightly or monthly grab samples in addition to online instrumentation used to measure Turbidity, pH and Free Chlorine at the Cloncurry WTP and Free Chlorine at the Dajarra WTP. These instruments are connected to Council's SCADA telemetry system and can be viewed remotely with alarms activated when OCPs/CCPs are breached.

The Cloncurry operational monitoring programme is outlined in Tables 25 and 26. The Dajarra operational monitoring programme is outlined in Tables 27 and 28.

Table 24: Cloncurry WTP Operational Monitoring Programme.

Parameter	Raw Water			Treatment Process Water			Monitoring Targets					
	Mixed	Rapid Mix Tank	Pre-Filter	Filter Effluents (1 – 3)	Clear Water Tank	Town Water Reservoir	Mixed	Rapid Mix Tank	Pre-Filter	Filter Effluents (1 – 3)	Clear Water Tank	Town Water Reservoir
Free Chlorine (mg/L)					Daily*/Continuous Online	Daily*/Continuous Online					Refer to CCP3	1-3
True Colour (HU)	Daily		Daily		Daily	Daily	<200		<100		<15	<15
Conductivity (uS/cm)	Daily	Daily	Daily		Daily	Daily	<600	<600	<600		<500	<500
Total Iron (mg/L)	Daily		Daily		Daily	Daily	<0.8		<0.3		<0.3	<0.3
Total Manganese (mg/L)	Daily		Daily	Daily*	Daily	Daily	<0.8		<0.5	Refer to CCP1	<0.1	<0.1
pH	Daily	Daily/Continuous Online		Daily	Daily/Continuous Online	Daily/Continuous Online	>6.5, <8.5	>6.5, <8.5		<8	<8	>6.5, <8.5
Temperature (°C)	Daily	Daily			Daily	Daily						
Turbidity (NTU)	Daily	Daily/Continuous Online	Daily	Daily*/Continuous Online	Daily	Daily/Continuous Online	<30	<30	<10			

Note: Daily and Weekly monitoring samples are taken as grab samples.
*** Frequency to be increased during events.**

Table 25: Cloncurry Operational Monitoring Programme.

Source	Location	Monitoring Frequency	Parameter	Target value	Positions Responsible
Raw Water					
Raw Water	Lake Julius	Monthly Grab Sample	*E.coli*	0	**Overall Responsibility:** Chief Executive Officer **Implementation and Review:** Director of Infrastructure & Environment. **Operations:** Water Operator
			True Colour	<200	
			Conductivity	<600	
			Total Iron	<0.8	
	Cloncurry River		Total Manganese	<0.8	
			pH	>6.5, <8.5	
			Temperature		
			Turbidity		
	4x Source Water Bores				
Infrastructure	Raw Water Intake Pumps	Weekly Visual Inspections	Integrity	No maintenance issues.	
Cloncurry Distribution System					
Distribution System	5 samples taken from any of the following locations: • Hospital tap outside nurses quarters (mandatory) • Council Office • Council Depot • Airport • Railway Station • Coppermine Freedom Camp • Aquatic Centre	Weekly Grab Sample	*E. coli*	0	**Overall Responsibility:** Chief Executive Officer **Implementation and Review:** Director of Infrastructure & Environment. **Operations:** Water Operator
			Turbidity	<0.5 NTU	
			pH	>6.5, <8.5	

Source	Location	Monitoring Frequency	Parameter	Target value	Positions Responsible
	• Racecourse				
Infrastructure	Town Reservoir	Weekly Visual Inspections	Integrity	Sealed, secure and vermin-proof – no maintenance issues	

Table 26: Dajarra WTP Operational Monitoring Programme.

Parameter	Raw Water	Treatment Process Water			Monitoring Targets	
	Combined Raw Water Tank	Nanofiltration	Product Tank	Town Water Reservoir	Product Tank	Town Water Reservoir
Free Chlorine (mg/L)			Fortnightly/Continuous Online	Fortnightly	>0.5 mg/L	>0.5 mg/L
Conductivity (uS/cm)	Fortnightly	Continuous Online (inlet/Reject/Product)	Fortnightly	Fortnightly	<500 (uS/cm)	<500 (uS/cm)
pH	Fortnightly		Fortnightly	Fortnightly	>6.5, <8.5	>6.5, <8.5
Turbidity (NTU)	Fortnightly		Fortnightly/Continuous Online	Fortnightly	<5 NTU	<5 NTU
Note: Daily and Weekly monitoring samples are taken as grab samples.						

Table 27: Dajarra Operational Monitoring Programme.

Source	Location	Monitoring Frequency	Parameter	Target value	Positions Responsible
Raw Water					
Raw Water	Windmill Bore	Monthly Grab Sample	*E.coli*	0	**Overall Responsibility:** Chief Executive Officer **Implementation and Review:** Director of Infrastructure & Environment. **Operations:** Water Operator
	School Bore		pH	>6.5, <8.5	
			Turbidity	<5 NTU	
	Bore #1				
Infrastructure	Borehead	Weekly Visual Inspections	Integrity	Sealed and secure – no maintenance issues	
Cloncurry Distribution System					
Distribution System	3 samples taken from the following locations: • Council Depot • State School • Roadside Rest Area	Weekly Grab Sample	*E. coli*	0	**Overall Responsibility:** Chief Executive Officer **Implementation and Review:** Director of Infrastructure & Environment. **Operations:** Water Operator
			Turbidity	<0.5 NTU	
			pH	>6.5, <8.5	
Infrastructure	Town Reservoir	Weekly Visual Inspections	Integrity	Sealed, secure and vermin-proof – no maintenance issues	

9.2 Cloncurry and Dajarra Verification Monitoring

Council sends all of their external verification monitoring samples to the NATA accredited QLD Health lab located in Brisbane. From Cloncurry, the process for getting samples to the lab is fairly straightforward where samples are taken from within the scheme, driven 120km to Mt Isa and put on a freight plane to Brisbane. However, for Dajarra, sampling is much more complicated due to the geographical isolation of the town. Dajarra is located approximately 180km south-west of Cloncurry. As there is no permanent water operator located in the town, sampling must be undertaken by someone from Cloncurry. This results in a 360km round-trip. Furthermore, access to Dajarra from Cloncurry is via. an unsealed road and therefore, access is subject to weather conditions.

While Council endeavours to undertake verification monitoring in Dajarra as per the DWQMP there may be instances where staff availability and road access issues may prevent sampling form being carried out.

Currently, Council undertakes 6-monthly verification monitoring of the source water for each scheme and quarterly verification monitoring of the distribution systems. The intention is to eventually be able to scale down verification monitoring in Dajarra due to the staff availability and access issues that the town prevents to Council. However, as the scheme is operating as a new potable scheme with limited water quality data, 6-monthly and quarterly verification monitoring has been implemented to enable Council to gather sufficient water quality data for the scheme.

Tables 29 and 30 below identifies the verification monitoring programme for both schemes.

Table 28: Dajarra & Cloncurry Source Water verification monitoring programme (6-monthly).

Characteristic	Parameter	ADWG &/or Regulation Value	Associated Hazard	Sampling Locations		Positions Responsible
				Cloncurry	Dajarra	
Microbial Quality	*E.coli*	Nil Detected – Health	Bacteria	**2x Locations:** - Lake Julius - Cloncurry River	**3x Locations:** - Windmill Bore - School Bore - Bore #1	**Overall Responsibility:** Chief Executive Officer **Implementation and Review:** Director of Infrastructure & Environment. **Operations:** Water Operator
	Total Coliforms	Nil Detected				
Physical	Conductivity	N/A	Hazards that arise from the Natural Geological Processes in the aquifer			
	pH	pH 6.5 – 8.5 – Aesthetic				
	Total Dissolved Solids	600 mg/L – Aesthetic				
	Total Dissolved Ions					
	Total Hardness	200mg/L – Aesthetic				
	Turbidity	5 NTU – Aesthetic				
	True Colour	15 HU – Aesthetic				
Inorganics	Aluminium	0.2 mg/L – Aesthetic				
	Fluoride	1.5 mg/L – Health				
	Nitrate	50 mg/L – Health				
	Nitrite	3 mg/L – Health				
	Sodium	180 mg/L – Aesthetic				
	Sulphate	500 mg/L – Health				
	Total Iron	0.3 mg/L -Aesthetic				
	Total Manganese	0.5 mg/L – Health				

Characteristic	Parameter	ADWG &/or Regulation Value	Associated Hazard	Sampling Locations		Positions Responsible
				Cloncurry	Dajarra	
	Chloride	250 mg/L – Aesthetic				
Heavy Metals	Iodide	0.5 mg/L – Health				
	Antimony	0.003 mg/L – Health				
	Arsenic	0.01 mg/L – Health				
	Barium	2 mg/L – Health				
	Beryllium	0.06 mg/L – Health				
	Boron	4 mg/L – Health				
	Cadmium	0.002 mg/L – Health				
	Chromium	0.05 mg/L – Health				
	Copper	2 mg/L – Health				
	Cyanide	0.08 mg/L – Health				
	Lead	0.01 mg/L – Health				
	Mercury	0.001 mg/L – Health				
	Molybdenum	0.05 mg/L – Health				
	Nickel	0.02 mg/L – Health				
	Total Manganese	0.5mg/L – Health				
	Selenium	0.010mg/L – Health				
	Silver	0.1mg/L – Health				

Characteristic	Parameter	ADWG &/or Regulation Value	Associated Hazard	Sampling Locations		Positions Responsible
				Cloncurry	Dajarra	
Radiological Activity	Uranium	0.017mg/L – Health				
	Gross Alpha	0.5 Bq/L – Aesthetic				
	Gross Beta	0.5 Bq/L – Aesthetic				

Table 29: Dajarra & Cloncurry Distribution System verification monitoring programme.

Characteristic	Parameter	ADWG &/or Regulation Value	Associated Hazard	Sampling Locations		Positions Responsible
				Cloncurry	Dajarra	
Weekly Monitoring						
Microbial Quality	*E.coli*	Nil Detected – Health	Bacteria	**3x Locations:** - Hospital - Racecourse Coppermine Freedom Camp	**3x Locations:** - Council Depot - State School Roadside Rest Area	**Overall Responsibility:** Chief Executive Officer **Implementation and Review:** Director of Infrastructure & Environment. **Operations:** Water Operator
	Total Coliforms	Nil Detected				
	Legionella	N/A	Opportunistic Pathogens			
Monthly Monitoring						
Blue Green Algae **(Cloncurry only)**	Blue Green Algae	See Alert Levels Framework in Section 9.2.1 below.	Cyanobacteria	**2 x Locations:** - Lake Julius outlet - Mixed Raw Water Tank		See below.
Quarterly Monitoring						
Disinfection By-products	Trihalomethanes	0.25 mg/L – Health	Disinfection	**3x Locations:** - Hospital - Racecourse	**3x Locations:** - Council Depot - State School	**Overall Responsibility:**
	Chlorate	0.8 mg/L – Health				

Physical	Conductivity	N/A	Hazards that arise from the Natural Geological Processes in the aquifer	- Coppermine Freedom Camp	- Roadside Rest Area	Chief Executive Officer **Implementation and Review:** Director of Infrastructure & Environment. **Operations:** Water Operator
	pH	pH 6.5 – 8.5 – Aesthetic				
	Total Dissolved Solids	600 mg/L – Aesthetic				
	Total Hardness	200 mg/L – Aesthetic				
	Turbidity	5 NTU – Aesthetic				
	True Colour	15 HU – Aesthetic				
Inorganics	Aluminium	0.2 mg/L – Aesthetic				
	Nitrate	50 mg/L – Health				
	Sodium	180 mg/L – Aesthetic				
	Sulphate	500 mg/L – Health				
	Total Iron	0.3 mg/L -Aesthetic				
	Total Manganese	0.5 mg/L – Health				
	Chloride	250 mg/L – Aesthetic				
Radiological Activity **(Dajarra only)**	Uranium	0.017 mg/L – Health			**<u>3x Locations:</u>** - Raw Water Tank - Product Tank	**Overall Responsibility:** Chief Executive Officer **Implementation and Review:**
	Gross Alpha	0.05 Bq/L – Aesthetic				
	Gross Beta	0.05 Bq/L – Aesthetic				

						Director of Infrastructure & Environment. **Operations:** Water Operator

9.3 Blue Green Algae Management

Currently, Blue Green Algae (BGA) is not a problem for the Cloncurry scheme. Subsequently, the monitoring programme developed by Council is based on external verification monitoring for the initial detection of cyanobacteria presence within the raw water. When a sample is requested for BGA analysis, the four microbial species stated in the Alert Levels Table (Table 30) should be specifically requested for cell counts:

- *Dolichospermum circinale (formerly Anabaena circinalis)*;
- *Raphidiopsis raciborskii*;
- *Microcystis aeruginosa*;
- *Nodularia spumigena*.

9.3.1 Blue Green Algae Alert Levels Framework

CSC has devised BGA Alert Levels Framework (ALF) to use as a gradual response to the onset and progress of a potentially toxic cyanobacteria bloom in the drinking water supply. The intention of the ALF is that it is a situational assessment tool based around data from relevant guidelines for toxins which are used in conjunction with cyanobacterial cell counts to assess the potential hazard from a cyanobacterial bloom.

The ALF is based upon tracking populations of potentially toxic cyanobacteria of concern using cell counts. The range of cyanobacteria included in the ALF is based on the common toxin-producing cyanobacteria found in Australian waters and stated in the ADWG, with health alert or guideline values.

The ALF contains three alert levels:

- **Level 1 –** where there is a potential for cell numbers to give rise to a toxin concentration that is about 30-50% of the ADWG health alert or guideline value. Minimal health risk occurs at this level however, it is a watch and monitor phase.

- **Level 2 –** where there is a potential for cell numbers to give rise to a toxin concentration that is around or greater than the ADWG health alert of guideline value. Additional monitoring takes place at this level of cell counts which segues into the toxin TARP. Using cell counts as an alert level to escalate testing is conservative and allows changes to be made in the WTP early.

- **Level 3 –** where there is a potential for cell numbers to give rise to a toxin concentration that is greater than 10x the ADWG health alert or guideline value. This alert level has been decided upon through a comprehensive literature review, including publications from Water Quality Research Australia and the ADWG. At this stage, toxin testing is escalated to weekly with a high level of monitoring within the toxin TARP. Again, this follows a conservative and cautious response prior to supplying water to the customer.

In all cases, using cell counts is considered an "early warning" system and relies on Water Operators to follow-up with toxin testing as required and outlined in the Toxin Targeted Action Response Plan (below). Toxin results will be the driver for further escalation and action.

Table 30: Blue Green Algae Alert Levels Framework.

Alert Level	Raw Water Triggers	Response Actions
Alert Level 1	- 6,000 - 20,000 cells/mL *Dolichospermum*; - 4,500 - 15,000 cells/mL *Raphidiopsis raciborskii*;	- Alert Drinking Water Regulator

	- 2,000 - 6,500 cells/mL *Microcystis aeruginosa* and Microcystin producing BGA; - 12,000 - 40,000 cells/mL *Nodularia spumigena*.	- Continue quarterly sampling for cell counts; - Commence weekly visual inspection* of raw water surface; - Commence toxin sampling of raw and treated water.
Alert Level 2	- ≥ 20,000 cells/mL *Dolichospermum circinale*; - ≥ 15,000 cells/mL *Raphidiopsis raciborskii*; - ≥ 6,500 cells/mL *Microcystis aeruginosa* and Microcystin producing BGA; - ≥ 40,000 cells/mL *Nodularia spumigena*.	- Alert Drinking Water Regulator - Continue sampling for cell counts, increasing frequency to fortnightly; - Commence weekly visual inspection* of raw water surface; - Commence weekly toxin sampling of raw and treated water.
Alert Level 3	- ≥ 200,000 cells/mL *Dolichospermum circinale*; - ≥ 150,000 cells/mL *Raphidiopsis raciborskii*; - ≥ 65,000 cells/mL *Microcystis aeruginosa* and Microcystin producing BGA; - ≥ 400,000 cells/mL *Nodularia spumigena*.	- Alert Drinking Water Regulator - Continue sampling for cell counts, increasing frequency to weekly; - Commence weekly visual inspection* of raw water surface; - Commence weekly toxin sampling of raw and treated water.

***Note: Visual inspections are for scums and water colouration (greenish tinge) only, to be completed by Operational Staff.**

9.3.2 Toxin Targeted Action Response Plan

The Toxin Targeted Action Response Plan (TARP) detailed in Figure 92 below is the monitoring and action sequence that CSC will use for a graduated response to the detection and management of a toxin at the Cloncurry WTP. This plan integrates both health parameter monitoring and operational strategies to minimise the public health risk.

Using values calculated by the WHO, the first trigger for the TARP occurs from toxin verification monitoring at the following locations:

- **Cloncurry –** Raw Water Tank, and Lake Julius supply outlet

In-house toxin testing is not conducted at the Cloncurry scheme, therefore, all testing must be sent externally to a NATA accredited laboratory.

9.3.3 Toxin Testing and Guidelines

The toxin guideline values are important to drinking water providers as they set the concentration of toxin that is tolerable in drinking water. Table 33 below provides the guideline values for the toxins tested as per the ALF.

Toxin monitoring is associated with the cyanobacterial species which is out-of-spec as per the ALF, with the following applying:

- *Dolichospermum circinale* test for saxitoxin (STX);
- *Raphidiopsis raciborskii* test for cylindrospermopsin (CYN);
- *Microcystis aeruginosa* test for microcystin-LR;
- *Nodularia spumigena* test for nodularin.

It should be noted that currently the ADWG have a health guideline value only for microcystins. No guideline values have been set for concentrations of nodularin, saxitoxins and cylindrospermopsin due to lack of adequate data. However, a range of information has been used to recommend a Health Alert value for these toxins in the ADWG. Toxins are monitored once trigger levels have been reached in Table 30 above. Refer to Figure 92 below for the Targeted Action Response Plan.

Table 31: Toxin guideline values in drinking water.

Toxin	Drinking Water
Cylindrospermopsin	
Microcystin	1.3 µg/L
Nodularin	
Saxitoxin	

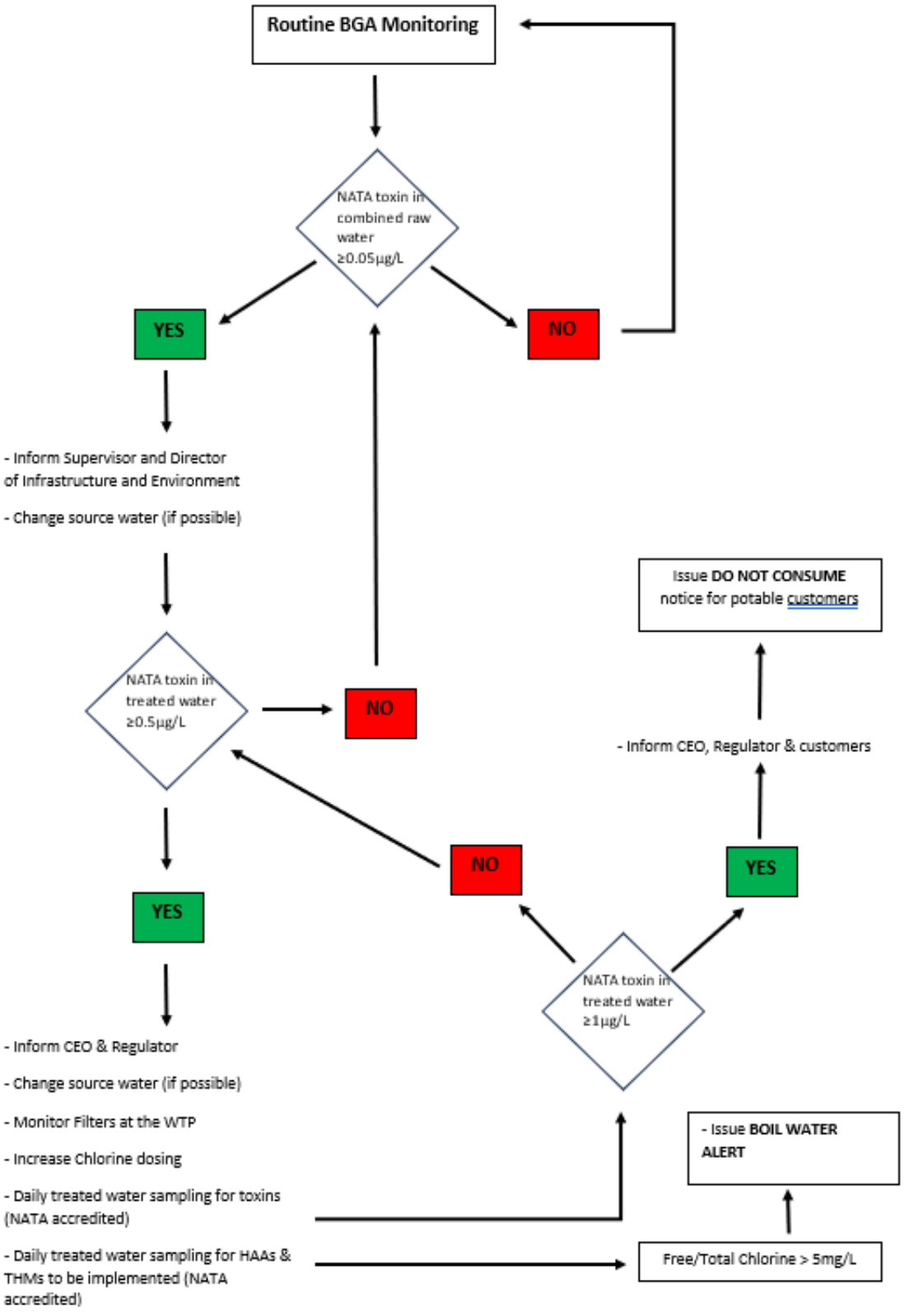

Figure 92: Cloncurry Toxin Action Response Plan (TARP).

10.0 INCIDENTS AND EMERGENCIES

Cloncurry Shire Council operates on a 3-level incident and emergency framework in the management of their drinking water incidents and emergencies, starting at Level 1 (least severe) through to Level 3 (most severe); as outlined in Table 31 below. It should be noted that during a full-scale emergency response and recovery scenario (e.g. a natural disaster), the Local Disaster Management Group is activated in accordance with CSC's Local Disaster Management Plan. The Cloncurry Local Disaster Management Plan can be accessed here: https://www.cloncurry.qld.gov.au/downloads/file/2029/local-disaster-management-plan-2021.

The drinking water incident and emergency action plan for the Cloncurry and Dajarra schemes is provided in Section 9.1 below. Details of the emergency contacts referred to in the Table can be found in Table 2 in Section 1.4

Table 32: CSC 3-level Incident and Emergency Framework.

Alert Level	Description	Key Management Responses	Positions Responsible
Level 1 Low-Risk Operational Actions	Operational issues that could escalate if not responded to. These types of incidents are managed immediately and effectively by CSC staff, without any public health impact to the community. For example: • Exceedance of an OCP. • Exceedance of an ADWG Aesthetic value that can be managed under the DWQMP. • Short-term drinking water infrastructure fail.	1. Notify Water Operator and/or Director of Infrastructure & Environment. 2. Check and act upon OCPs and operation and maintenance procedures. 3. Take appropriate actions to rectify the situation.	WTP Operator, Water & Sewer Supervisor
Level 2 Medium-Risk Incidents and Emergencies	All ADWG health exceedances and incidents where normal actions under the DWQMP do not effectively manage the issue and there is a concern that public health may be impacted. For example: • Detection of a parameter with no water quality criteria that may have an adverse impact upon public health. • Detection of an ADWG aesthetic value exceedance that may have an adverse impact upon public health (e.g. radiological activity). • Minor exceedance of an ADWG health value. • CCP critical limit breach. • Short-term loss of drinking water supply (<24 hours). • Notification by SunWater of BGA issue in Lake Julius.	1. Report incident/event to the Water Supply Regulator (OWSR). 2. Inform Director of Infrastructure & Environment and implement short-term management measures. 3. Undertake incident investigation.	WTP Operator, Water & Sewer Supervisor, Director of Infrastructure & Environment, Water Supply Regulator

Alert Level	Description	Key Management Responses	Positions Responsible
	• Major Cyber Security breach.		
Level 3 High-Risk Declared Disaster	Widespread ADWG health exceedances and drinking water events. For example: • Widespread outbreak of a waterborne disease. • Major loss of drinking water supply, e.g. >24 hours over wide area. • Gross exceedance of an ADWG health guideline value for a chemical parameter (e.g. more than five times the ADWG health guideline limit). • Declared disaster. • Long-term drinking water infrastructure fail. • Detection of *E.coli* in the treated water.	1. Report incident/event to the Water Supply Regulator (OWSR). 2. Notify Director of Infrastructure & Environment who will inform the Chief Executive Officer 3. CEO makes the call to activate the Local Disaster Management Plan (as required) 4. Implement short-term management measures. 5. Undertake incident investigation.	WTP Operator, Water & Sewer Supervisor, Director of Infrastructure & Environment, Water Supply Regulator, Chief Executive Officer

10.1 CSC Incident and Emergency Action Plan

Table 33: CSC drinking water Incident and emergency action plan.

Level	Incident Or Emergency	Summary Of Actions to be Undertaken	Positions Responsible for Actions
1	**Exceedance of OCP or exceedance of an ADWG aesthetic value that can be managed under the DWQMP**	1. WTP Operator to notify Water & Sewer Supervisor. 2. If simple adjustment is required, make adjustment and record details. 3. If a more substantial system change is required (e.g. maintenance to overcome a recurring problem), advise the Director of Infrastructure & Environment so that budget can be made available for the project. 4. Organise system change or list for capital works as appropriate.	WTP Operator, Water & Sewer Supervisor
	Short-term drinking water infrastructure fail	1. WTP Operator to notify Water & Sewer Supervisor. 2. Determine the potentially affected area and isolate. 3. Inform concerned customers of the details of the incident and anticipated progress (if required). 4. Rectify the problem. 5. Investigate options to avoid any reoccurrence. 6. If a more substantial system change is required (e.g. maintenance to overcome a recurring problem), advise the Director of Infrastructure & Environment so that budget can be made available for the project.	WTP Operator, Water & Sewer Supervisor
2	**Detection of a parameter with no water quality criteria that may have an adverse impact upon Public Health OR detection of an ADWG aesthetic value exceedance that may have an adverse impact upon public health**	1. WTP Operator or Water and Sewer Supervisor to notify Director of Infrastructure and Environment. 2. Check with the testing laboratory to confirm the exceedance OR re-commence operational monitoring to confirm aesthetic exceedance or adverse water quality criteria. 3. Report details of the exceedance to the Water Supply Regulator within 3 hours via. the Drinking Water Hotline (P: 1300 596 709) and the online notification form within 24 hours (E: DrinkingWater.Reporting@rdmw.qld.gov.au). 4. Determine the potentially affected area and advise the affected consumers (via. the usual communication channels) if required. 5. Commence investigation into water quality criteria or aesthetic exceedance. Some aesthetic exceedances or adverse water quality (e.g. Turbidity) may be able to be to be fixed with mains flushing. 6. Once investigation is complete and the issue fixed, re-test the drinking water supply and send samples to the external laboratory (if required) for confirmation that there are no issues.	WTP Operator, Water & Sewer Supervisor, Director of Infrastructure & Environment, Water Supply Regulator

Level	Incident Or Emergency	Summary Of Actions to be Undertaken	Positions Responsible for Actions
		7. Investigate options to avoid any reoccurrences. 8. Upon resolution, provide a written report to the OWSR (Part 2 of Incident Reporting Form).	
	Minor exceedance of an ADWG health value OR CCP breach	1. WTP Operator or Water and Sewer Supervisor to notify Director of Infrastructure and Environment. 2. Where an exceedance has been observed check with the testing laboratory to confirm the exceedance. 3. Report details of exceedance or CCP breach to the Water Supply Regulator within 3 hours via. the Drinking Water Hotline (P: 1300 596 709) and the online notification form within 24 hours (E: DrinkingWater.Reporting@rdmw.qld.gov.au) 4. Determine if water quality can be corrected and the time/resources required. 5. Advise consumers and make temporary water supply arrangements including bottled potable water if warranted. 6. Rectify the problem or inform consumers of ongoing water quality limitation. 7. Once rectified, re-test and send the water samples to an external lab for verification monitoring to confirm the issue has been resolved (if required). 8. Provide a written report to the OWSR (Part 2 of Incident Reporting Form).	WTP Operator, Water & Sewer Supervisor, Director of Infrastructure & Environment, Water Supply Regulator
	Short-term loss of drinking water (<24 hours)	1. WTP Operator or Water and Sewer Supervisor to notify Director of Infrastructure and Environment. 2. Details of the supply loss or infrastructure fail are to be reported to the Water Supply Regulator within 3 hours via. the Drinking Water Hotline (P: 1300 596 709) and the online notification form within 24 hours (E: DrinkingWater.Reporting@rdmw.qld.gov.au). 3. Determine the potentially affected area and advise the affected consumers (via. the usual communication channels) and implement temporary water restrictions if applicable. 4. Rectify the problem. 5. Investigate options to avoid any reoccurrence. 6. Upon resolution, provide a written report to the OWSR (Part 2 of Incident Reporting Form).	WTP Operator, Water & Sewer Supervisor, Director of Infrastructure & Environment, Water Supply Regulator
	Notification by SunWater of BGA issue in Lake Julius	1. WTP Operator or Water and Sewer Supervisor to notify Director of Infrastructure and Environment. 2. If possible, Water & Sewer Team to switch Cloncurry raw water over so that it is only being sourced from the Cloncurry River.	WTP Operator, Water & Sewer Supervisor, Director of Infrastructure & Environment,

Level	Incident Or Emergency	Summary Of Actions to be Undertaken	Positions Responsible for Actions
		3. If the Cloncurry River cannot be relied upon as the sole water source, commence raw water testing of Julius Creek water for Blue Green Algae to determine the cell counts. 4. Report details of event to the Water Supply Regulator within 3 hours via. the Drinking Water Hotline (P: 1300 596 709) and the online notification form within 24 hours (E: DrinkingWater.Reporting@rdmw.qld.gov.au) 5. If raw water testing confirms BGA cell counts to be out of specification (>15,000 cells/mL of *Cylindrospermopsis racinborskii* or > 65,000 cells/mL of *Microcystis aeruginosa*), notify Regulator and commence BGA toxin testing in the treated water. 6. If treated water testing confirms BGA cell counts to be out of specification (>1.0 µg/L of *Cylindrospermopsis racinborskii* or >1.3µg/L of *Microcystis aeruginosa*), notify Regulator and escalate incident to Level 3 response, notifying Chief Executive Officer and issuing a Do Not Consume notice to residents. 7. Determine if water quality can be corrected and the time/resources required. 8. Make temporary water supply arrangements including bottled potable water if warranted. 9. Rectify the problem or inform consumers of ongoing water quality limitation. 10. Once rectified, re-test and send the water samples to an external lab for verification monitoring to confirm the issue has been resolved (if required). 11. Provide a written report to the OWSR (Part 2 of Incident Reporting Form).	Water Supply Regulator
	Cyber Security Breach	1. WTP Operator or Water and Sewer Supervisor to notify Director of Infrastructure and Environment. 2. Determine the potentially affected area (i.e. access to WTP or remote access to Council files). 3. Alert Australian Government Cyber Security Hotline (P: (07) 3215 3951) 4. If remote access to WTP has been obtained, report details to the Water Supply Regulator within 3 hours via. the Drinking Water Hotline (P: 1300 596 709) and the online notification form within 24 hours (E: DrinkingWater.Reporting@rdmw.qld.gov.au) 5. Rectify the problem. 6. Investigate options to avoid any recurrence. 7. Upon resolution, provide a written report to the OWSR (Part 2 of Incident Reporting Form), if required.	WTP Operator, Water & Sewer Supervisor, Director of Infrastructure & Environment, Water Supply Regulator

Level	Incident Or Emergency	Summary Of Actions to be Undertaken	Positions Responsible for Actions
3	**Widespread outbreak of a waterborne disease**	1. WTP Operator or Water and Sewer Supervisor to notify Director of Infrastructure and Environment. 2. Director of Infrastructure and Environment to alert CEO. 3. Details of the outbreak are to be reported to the Water Supply Regulator within 3 hours via. the Drinking Water Hotline (P: 1300 596 709) and the online notification form within 24 hours (E:DrinkingWater.Reporting@rdmw.qld.gov.au). 4. Determine the potentially affected area and isolate if possible. Issue a Boil Water Alert and advise the effected consumers (via. the usual communication channels) or other precautions as required. 5. Flush all affected mains. 6. Provide additional/temporary chlorine dosing if practical and test for the Free Chlorine residual within the distribution system. 7. Undertake a comprehensive contamination investigation and take necessary corrective actions. 8. Upon resolution, provide a written report to the OWSR (Part 2 of Incident Reporting Form).	WTP Operator, Water & Sewer Supervisor, Director of Infrastructure & Environment, Water Supply Regulator, Chief Executive Officer
	Major loss of drinking water supply (>24 hours) OR long-term drinking water infrastructure fail	1. WTP Operator or Water and Sewer Supervisor to notify Director of Infrastructure and Environment. 2. Director of Infrastructure and Environment to alert CEO. 3. Details of the supply loss or infrastructure fail are to be reported to the Water Supply Regulator within 3 hours via. the Drinking Water Hotline (P: 1300 596 709) and the online notification form within 24 hours (E:DrinkingWater.Reporting@rdmw.qld.gov.au). 4. Determine the potentially affected area and advise the affected consumers (via. the usual communication channels) and implement temporary water restrictions if applicable. 5. Make temporary water supply arrangements if required. 6. Rectify the problem. 7. Investigate options to avoid any reoccurrence. 8. Upon resolution, provide a written report to the OWSR (Part 2 of Incident Reporting Form).	WTP Operator, Water & Sewer Supervisor, Director of Infrastructure & Environment, Water Supply Regulator, Chief Executive Officer
	Gross exceedance of an ADWG health value	1. WTP Operator or Water and Sewer Supervisor to notify Director of Infrastructure and Environment. 2. Director of Infrastructure and Environment to alert CEO. 3. Check with the testing laboratory to confirm the exceedance (a sudden gross exceedance is only likely to occur as the result of sabotage or an unreported chemical spill).	WTP Operator, Water & Sewer Supervisor, Director of Infrastructure & Environment, Water Supply

Level	Incident Or Emergency	Summary Of Actions to be Undertaken	Positions Responsible for Actions
		4. Report details of the exceedance to the Water Supply Regulator within 3 hours via. the Drinking Water Hotline (P: 1300 596 709) and the online notification form within 24 hours (E: DrinkingWater.Reporting@rdmw.qld.gov.au). 5. Determine the potentially affected area and advise the affected consumers (via. the usual communication channels) not to drink the water. 6. Re-test the drinking water supply and send samples to the external laboratory for confirmation that health exceedance was not a testing error. 7. Make temporary supply arrangements, including bottled potable water if required. 8. Commence investigation into exceedance and rectify the problem. 9. Once, rectified, re-test the drinking water supply and send samples to the external laboratory to confirm that the problem has been fixed and the drinking water is safe for consumption. 10. Investigate options to avoid any reoccurrence. 11. Upon resolution, provide a written report to the OWSR (Part 2 of Incident Reporting Form).	Regulator, Chief Executive Officer
	Declared disaster	1. WTP Operator or Water and Sewer Supervisor to notify Director of Infrastructure and Environment. 2. Director of Infrastructure and Environment to alert CEO. 3. CEO to liaise with Local Disaster Management centre to monitor the potential effect of the disaster upon water supply and sewerage services. 4. If impact to drinking water services, details of the event to be reported to the Water Supply Regulator within 3 hours via. the Drinking Water Hotline (P: 1300 596 709) and the online notification form within 24 hours (E:DrinkingWater.Reporting@rdmw.qld.gov.au). 5. If the water supply has been affected, consider a Boil Water Alert and take relevant actions as per the DWQMP and direction from the Local disaster Management Centre and Water Supply Regulator. 6. If the water supply has been affected, upon resolution, provide a written report to the OWSR (Part 2 of Incident Reporting Form).	WTP Operator, Water & Sewer Supervisor, Director of Infrastructure & Environment, Water Supply Regulator, Chief Executive Officer

Level	Incident Or Emergency	Summary Of Actions to be Undertaken	Positions Responsible for Actions
	Detection of *E.coli* in the treated water	1. WTP Operator or Water and Sewer Supervisor to notify Director of Infrastructure and Environment. 2. Director of Infrastructure and Environment to alert CEO. 3. Boil Water Alert to be issued and effected consumers to be advised (via. the usual communication channels). 4. Details of the outbreak are to be reported to the Water Supply Regulator within 3 hours via. the Drinking Water Hotline (P: 1300 596 709) and the online notification form within 24 hours (E:DrinkingWater.Reporting@rdmw.qld.gov.au). 5. Determine the potentially affected area and isolate if possible. 6. Flush all affected mains. 7. Provide additional/temporary chlorine dosing if practical and test for the Free Chlorine residual within the distribution system. 8. Once corrective actions have been undertaken, re-test for *E.coli*, including verification monitoring to an external lab to confirm results. 9. Once two rounds of verification monitoring can confirm no *E.coli* detections, consider lifting the Boil Water Alert via. consolation with QLD Health and the Water Supply Regulator. 10. Upon resolution, provide a written report to the OWSR (Part 2 of Incident Reporting Form).	WTP Operator, Water & Sewer Supervisor, Director of Infrastructure & Environment, Water Supply Regulator, Chief Executive Officer

11.0 INFORMATION MANAGEMENT

Cloncurry Shire Council is a relatively small organisation with a records system that is available to all relevant staff. Drinking water related records (including investigation and OCP/CCP reports) are computerised and stored in InfoXpert, the document management system utilised by Council. All documents are kept for a minimum of 5 years. Operational monitoring data from grab samples is stored on-site at the WTPs on the daily log sheets by the Water Operators. Verification monitoring results from the external laboratories are received through email and stored in InfoXpert, once the data has also been added to Councils master excel spreadsheets used to record all water quality data. Recording water quality data in a master spreadsheet enables Council to review water quality results as they are made available, helping to ensure that any ADWG aesthetic or health exceedances are identified.

APPENDIX A

OCP/CCP REPORTING FORM

OCP/CCP Limit Exceedance (Operator and Supervisor to Complete)

1. Scheme name		
Cloncurry Scheme		
2. CCP breached (circle)		
CCP1 Manganese Control	CCP2 Filtration	CCP3 Disinfection
3. Sample information		
Date:	Time:	
Result:	Exceedance: Alert or Critical	
4. What corrective actions were undertaken? Include resample results.		
5. Any comments?		
Signed (Operator):	**Date:**	
Team Leader to Review		
Supervisor to Comment		
Signed (Supervisor):	**Date:**	