7.20. DRINKING WATER QUALITY POLICY - 2026

REPORT AUTHOR	Technical Support Officer Water and Wastewater
EXECUTIVE	General Manager Infrastructure
DEPARTMENT	Infrastructure
TEAM	Water and Wastewater
DATE	27 July 2026

RECOMMENDATION

That Council endorse the Drinking Water Quality Policy.

EXECUTIVE SUMMARY

The Australian Drinking Water Guidelines recognise a Drinking Water Quality Policy as an essential component of a water supplier's commitment to providing safe, reliable, and high-quality drinking water. Adopting this policy reinforces Council's commitment to maintaining water quality and delivering a high standard of service to the community.

PREVIOUS COUNCIL CONSIDERATIONS / RESOLUTIONS

At the Ordinary Meeting held 09 July 2019, it was resolved that the Drinking Water Quality General Policy was adopted.

REPORT/BACKGROUND

The proposed policy establishes Council's commitment to providing safe and reliable drinking water, managing risks from catchment to consumer, and supporting continuous improvement in drinking water quality outcomes.

FINANCIAL AND RESOURCE IMPLICATIONS

NIL

RISK MANAGEMENT IMPLICATIONS

The Drinking Water Quality Policy (attachment 1) strengthens Council's risk management framework by establishing a clear commitment to the proactive identification, assessment and management of risks that may impact drinking water quality and public health.

The policy supports the development and implementation of the Drinking Water Quality Management Plan (DWQMP) (attachment 2), ensuring risks across the drinking water supply system are appropriately managed from source water through to customer delivery.

ENVIRONMENTAL IMPLICATIONS

NIL

SOCIAL IMPLICATIONS

The Drinking Water Quality Policy reinforces Council's commitment to protecting public health and maintaining community confidence in the safety and reliability of the drinking water supply.

CORPORATE AND OPERATIONAL PLAN

This report has been prepared in accordance with the following:

Corporate Plan 2025-2030 Initiatives:

Theme 1 - Liveability
To deliver community activities to promote safe, healthy, inclusive and socially engaged communities with an environmental conscious.
1.8 - *Provide safe, efficient and reliable water and wastewater services.*

Theme 3 - Service Delivery
We deliver Council services effectively and efficiently to meet community expectations, focusing on the wellbeing of both the community and our employees.
3.8 - *Deliver safe and reliable drinking water.*

Operational Plan 2026-2027 Actions:

Legislative requirement.

LEGISLATION AND POLICY

Public Health Act 2005
Water Supply (Safety and Reliability) Act 2008

CONSULTATION

Internal Consultation.

CONCLUSION

Adoption of the policy will support best practices and demonstrate Council's commitment to protecting public health and delivering high-quality water services for the community.

ATTACHMENTS

1. DRAFT Drinking Water Quality Policy [**7.20.1** - 2 pages]
2. DSC Drinking Water Quality Management Plan V 4.3 [**7.20.2** - 93 pages]

DOUGLAS SHIRE COUNCIL

30. DRINKING WATER QUALITY POLICY

Purpose

The purpose of this Drinking Water Quality Policy is to establish Douglas Shire Council's (Council) commitment to the provision of safe, reliable and high-quality drinking water that protects public health and meets legislative and regulatory requirements.

Scope

This policy applies to all activities that may influence drinking water quality within Council's drinking water supply systems.

Policy Statement

Council will maintain a risk-based approach to drinking water quality management through the implementation and continual improvement of its Drinking Water Quality Management Plan (DWQMP). This includes identifying and managing risks from catchment to consumer, complying with legislative and regulatory requirements, maintaining effective operational controls, and ensuring appropriate monitoring and incident response processes are in place.

To achieve this, in partnership with stakeholders and relevant agencies, Council will:

- Consider the needs and expectations of customers, stakeholders, regulators and employees and integrate appropriate solutions into planning to provide and maintain safe water supplies.
- Undertake regular monitoring of drinking water quality and maintain effective reporting mechanisms to provide relevant and timely information and promote confidence in the management of the drinking water supply systems.
- Have in place appropriate contingency plans and incident response capabilities to respond to and manage water quality incidents.
- Audit and review practices against industry standards and stakeholder expectations to continually improve performance.
- Provide training to all relevant employees to ensure that they are aware of this policy and are involved in the implementation of the DWQMP.
- Openly communicate this policy to the community to encourage public awareness.

This policy assigns responsibility for drinking water quality management to all Water and Wastewater employees, contractors and to any person or organisation that acts for or represents Council. The policy acknowledges that corporate responsibility lies with the Water and Wastewater Management and ultimately the Chief Executive Officer of Council (CEO).

Related Legislation

- *Public Health Act 2005*
- *Water Supply (Safety and Reliability) Act 2008*

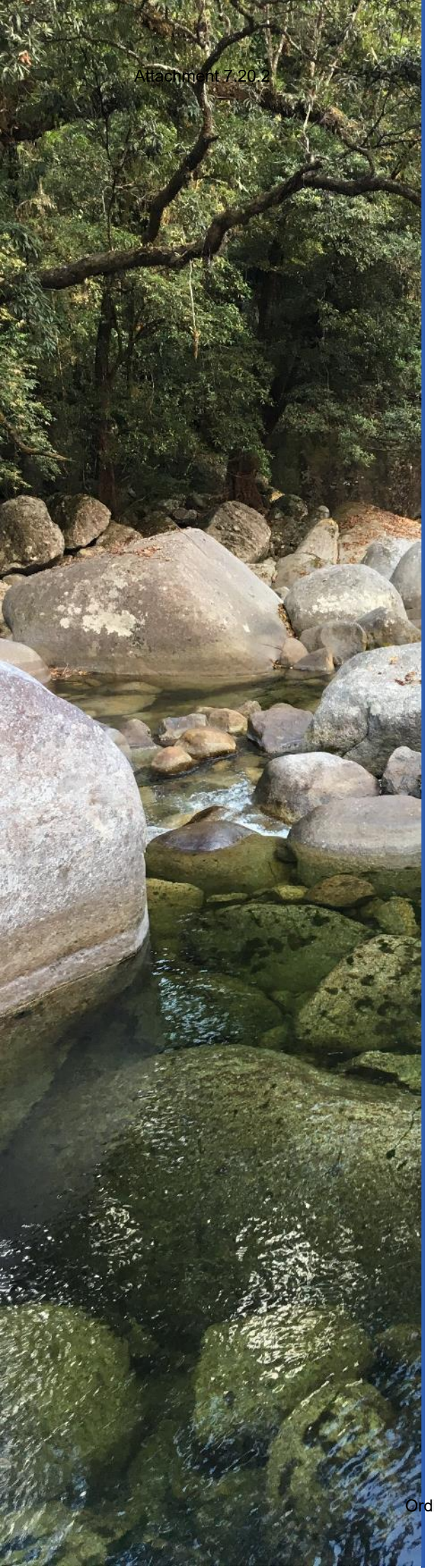
Policy Review

This policy is to be reviewed whenever legislation changes, or every four (4) years if no changes have been required to be enacted, at the direction of the CEO.

Policy Details

Policy Name	**Drinking Water Quality Policy**
Policy Number	30
Policy Version	3
Document Number	810102
Endorsed by	Chief Executive Officer
Policy Type	Council
Approval Authority	Council
Date Adopted	
Time Period	4 Years
Review Date	
Policy Department	Water and Wastewater
Link to Corporate Plan	Strategic Theme 3: Service Delivery
Revoked/Superseded	Nil

This policy is to remain in force until otherwise determined by Council.



DRINKING WATER QUALITY MANAGEMENT PLAN

SPID 558

Version 4.3

2025

DOUGLAS SHIRE COUNCIL

Celebrating Our Communities
Nganamu Bubu Kunbul - Eastern Kuku Yalanji
Nganyji Paman-ku Manyjirri-l - Yirrganydji

Contact Details

Peter White| Coordinator Water and Wastewater

Douglas Shire Council

SPID 558

64-66 Front St | MOSSMAN QLD 4873

P (07) 4099 9570

E peter.white@douglas.qld.gov.au

W http://douglas.qld.gov.au

Version	Authors	Reviewed	Approved	Date
1.0	Michael Lawrence	Wouter van der Merwe		August 2015
1.1	Michael Lawrence	Wouter van der Merwe	Paul Hoye	October 2015
2.0	Michael Lawrence	Peter White		October 2017
2.1	Michael Lawrence	Peter White	Nicholas Wellwood	January 2018
3.0	Melissa Mitchell	Peter White/ Michael Lawrence	Peter Tonkes	May 2020
3.1	Melissa Mitchell	Peter White/ Michael Lawrence	Peter Tonkes	September 2020
4.0	Ada Pasanen	Peter White/ Michael Lawrence	Jonathan Ward	May 2022
4.1	Cathy Johnson	Peter White	Jonathan Ward	August 2022
4.1	Cathy Johnson	Peter White	Delegate of the Regulator - DRDMW	18 August 2022
4.2	Fran Morris, Tony Murphy, Bill Collie, Peter White, Lara Balzarolo, Peter Kirchman, Matt Govorko	Bill Collie, Michael Lawrence	Tony Murphy	May 2024
4.3	Fran Morris, Ada Pasanen	Peter White, Michael Lawrence	Ben Baillie	June 2025

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Drinking Water Quality Management Plan

EXECUTIVE SUMMARY

The Drinking Water Quality Management Plan (DWQMP) for Douglas Shire Council (DSC) is a public health-based risk management plan that meets the requirements of the Australian Drinking Water Guidelines 2016 (ADWG) and the Water Supply (Safety and Reliability) Act 2008.

The DWQMP describes the Mossman, Port Douglas, Whyanbeel and Daintree drinking water schemes operated by Council from catchment to tap.

Council has undertaken a system assessment and a public health risk assessment. Through the risk assessment process, Council has identified several risks to our drinking water schemes that require improvements over time. These are detailed in the risk assessment table, and in the risk management improvement plan.

Council intends to use the risk management improvement program to inform capital and operational budgets in coming financial years.

The following identifies the status of critical items that were identified in the previous DWQMP:

Ongoing and continuing:

- Connecting Cooya Beach Reservoirs, re-chlorination and pipework to the network.
- Mossman alternative intake.
- Upgrading security and disaster response at water treatment infrastructure.
- Rocky Point Reservoir connection to the grid.

Completed:

- Implementation of smart water metering: Smart water meter rollout is complete within the Council water reticulation area. The smart water metering devices have allowed property water leaks to be detected in their earliest stages, allowing property owners the autonomy to act on reducing water leak volumes and thus their water bills.
- Investigation of chlorination options for workplace health and safety reasons.
- 21/22 replaced water mains and updated critical creek crossings.
- Replace UF cartridges at Mossman and Whyanbeel WTPs.
- Upgraded interconnection between Mossman and Whyanbeel schemes.

GLOSSARY

ADWG	Australian Drinking Water Guidelines
CCP	Critical control point
CEB	Chemically enhanced backwash
CIP	Clean in place
DBPs	Disinfection by-products (including trihalomethanes)
DWQMP	Drinking Water Quality Management Plan
LDMP	Local Disaster Management Plan (Douglas Shire Council)
OCP	Operational control point
PDT	Pressure decay test
PH Act	Public Health Act 2005
PHU	Public Health Unit – Queensland Health
PRV	Pressure relief valve
QH	Queensland Health
THM	Trihalomethanes – a subset of possible disinfection by-products
UF	Ultrafiltration
UV	Ultraviolet
The Act	Water Supply (Safety and Reliability) Act 2008
WPR	Water Planning and Regulation, Department of Regional Development, Manufacturing and Water

Figure 1. Landslide at Whyanbeel intake

INTRODUCTION

Douglas Shire Council provides drinking water to customers in three drinking water schemes. The Douglas Shire Drinking Water Quality Management Plan (DWQMP) is a risk-based management plan that ensures that Council can provide all our customers in each of these schemes with safe drinking water.

The DWQMP is based on the principles of the Australian Drinking Water Guidelines 6 2011 (NHMRC V3.8 updated Sept 2022) and meets the regulatory requirements of the *Water Supply (Safety and Reliability) Act 2008* (WS Act).

Purpose of DWQMP

The Douglas Shire Council DWQMP is a public health-based risk management plan that demonstrates how public health risks to our services are managed. In addition, we describe how we meet the requirements of our Environmental Authority for the Mossman water treatment plant under the *Environmental Protection Act 1994* and our water licences under the *Water Act 2000*. Inclusion of the additional requirements for operation are included for our convenience by providing an integrated procedure to plant operators. DSC expects that environmental and water license compliance is still to be regulated by the appropriate regulator under the relevant act. It is not the intent of DSC for this

additional information to be regulated under S93(a) of the *Water Supply (Safety and Reliability) Act 2008* where if it was not included in the DWQMP, it would not have been required.

Registered service details

Douglas Shire Council is a registered water service provider, SPID 558, providing drinking water services to over 16,000 customers. Council supplies water to four separate schemes, of which three are potable drinking water services covered in this DWQMP. Two schemes are similar in their operation and source water from highly protected catchments, utilising a combination of membrane filtration and chlorination. One scheme is sourcing water from a bore. Customers supplied non-potable water (Dagmar Heights) are sent written notification regarding water use by Council annually and are rated differently.

Table 1. Drinking water schemes, populations, and demand

		Current**			Projected in 10 years		
Scheme name	**Intake**	**Population Served**	**Total connected properties**	**Demand ML/annum**	**Population served**	**Total connected properties**	**Demand ML/annum**
Daintree	Daintree Bore	87	50	7.3	99	54	13.9
Daintree (untreated)*	Intake Creek	12	5	0.3	12	5	0.3
Mossman and Port Douglas	Rex Creek	14,055	6,699	4,024.5	14,712	7,065	4,286.7
Whyanbeel	Little Falls Creek	1,700	755	310.2	1,860	827	342.1
Dagmar Heights*	Dagmar Bore	32	14	1.53	33	14	4.1
TOTAL		15,886	7,523	4,447.13	16,716	7,965	4,647.1

*non-potable supply. Not discussed further.

**Data as reported in the annual SWIM 2023 report

ELEMENT 1: COMMITMENT TO DRINKING WATER QUALITY

Policy

Council is committed to consistently providing our customers within the drinking water schemes with a safe and reliable drinking water supply.

DRINKING WATER QUALITY GENERAL POLICY

INTENT

To establish a policy for the implementation and maintenance of a Drinking Water Quality Management System that is consistent with the Australian Drinking Water Guidelines.

SCOPE

This policy applies to all Water and Wastewater activities associated with the supply of drinking water to the community.

PROVISIONS

The Drinking Water Quality Management System will utilise a risk-based "catchment to tap" approach to identify and manage potential risks associated with drinking water quality.

To achieve this, in partnership with stakeholders and relevant agencies, Water and Wastewater will:

- Consider the needs and expectations of our customers, stakeholders, regulators and employees and integrate appropriate solutions into our planning to provide and maintain safe water supplies.
- Undertake regular monitoring of drinking water quality and maintain effective reporting mechanisms to provide relevant and timely information and promote confidence in the management of the water supply systems.
- Have in place appropriate contingency plans and incident response capabilities to respond to and manage water quality incidents.
- Audit and review our practices against industry standards and stakeholder expectations to continually improve our performance.
- Provide training to all relevant employees to ensure that they are aware of this policy and are involved in the implementation of our Drinking Water Quality Management System.
- Openly communicate this policy to the community to encourage public awareness.

This policy assigns responsibility for drinking water quality management to all Water and Wastewater employees and acknowledges that corporate responsibility lies with the Water and Wastewater Management and ultimately the Douglas Shire Council, Chief Executive Officer.

Regulatory and formal requirements

The following table lists the regulatory requirements that Douglas Shire Council is required to meet about the management of drinking water.

Table 2. Regulatory register

Requirement	Council obligations and how they relate to the DWQMP
Water Supply (Safety and Reliability) Act 2008 ***Water Supply (Safety and Reliability) Regulation 2011***	Council registered as a service provider. Service provider given powers to do certain things (e.g., disconnect customers, restrictions). Required to have an approved DWQMP and comply with the DWQMP. Required to report and respond to drinking water incidents. Plumbers are required to install water meters. Regulation currently has no impact.
Public Health Act 2005 ***Public Health Regulation 2018***	Sets minimum sampling frequencies for *E. coli* as a provider. Council must not provide unsafe water.
Water Act 2000	Council is licenced to extract raw water. + Rex Creek – Licence #408436 + Little Falls Creek – Licence #500313 + Daintree – Licence #408446
Environment Protection Act 1994	Water treatment is considered an environmentally relevant activity when treating >10 ML/day. General obligation not to cause environmental harm. + EA Permit number EPPR01790513. DSC Ref #868568 + Whyanbeel Development application and ERA. DSC Ref #729267 + Daintree Development application. DSC Ref #729268
Disaster Management Act 2003	Council is required to have a disaster management plan. This plan links to the Emergency Plan in this document.
Work Health and Safety Act 2011	Council must ensure safe work practices, including in the provision of drinking water.
Plumbing and Drainage Act (2018) ***Plumbing and Drainage Regulation (2019)***	Council must ensure that water infrastructure work is at a particular standard. Requires plumbers to install water meters (transitional arrangements for 18 months from July 2015).
Qld Plumbing and Wastewater Code (QPW code)	The code defines how drinking water infrastructure can be constructed.
Plumbing Code of Australia	Provides additional information to QPW code.
Australian Standards	Numerous standards for plumbing, chemical handling, etc.
Wet Tropics World Heritage Protection and Management Act 1993	Water infrastructure, which is located within Wet Tropics of Queensland World Heritage Area, is maintained within Wet Tropics Permit.

Customer and stakeholder engagement

Douglas Shire Council has established customer service standards against which we are able to measure our performance. The most current version of these standards is available on our website at http://douglas.qld.gov.au/

In addition, when there are issues of community concern, Council undertakes community meetings to ensure that relevant information is made available.

Key stakeholders

Drinking water is managed in Douglas Shire Council by the Manager Water and Wastewater.

The following chart identifies the key internal stakeholders from within the water and wastewater group. This chart is updated by Council as required and will be updated in the DWQMP following the biannual review of the DWQMP.

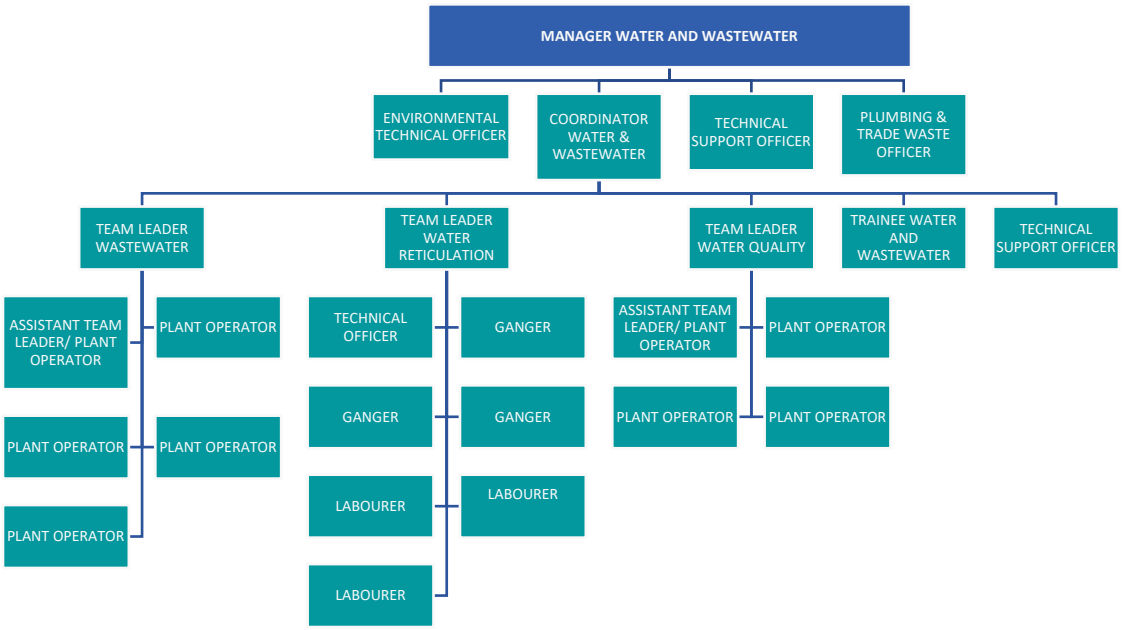


Figure 2. Water and wastewater corporate structure

External stakeholders are identified in the table below. These stakeholders have some influence on the management and operation of the water services.

Table 3. External stakeholders

Regulatory Stakeholder	Contact Details	Role
Water Supply Regulation (Regulator) Department of Local Government, Water and Volunteers	1300 596 709	Regulation of drinking water, and incident reporting
Tropical Public Health Services Cairns (Queensland Health)	4226 5555	Public health advice, assistance managing incidents
Dept of Natural Resources, Mines, Manufacturing and Regional Development	13 QGOV (13 74 68)	Water licenses and flow monitoring
Dept of Environment, Tourism, Science and Innovation	13 QGOV (13 74 68)	Water treatment is ERA. Discharge licences etc.
Wet Tropics Management Authority	07 4241 0500	Catchment manager
Ozcare	07 4087 2800	High Risk Customers
Blue Care Mossman Community Care	07 4098 1126	High Risk Customers
Douglas Shire Aged Persons Home Inc.	0458 939 117	High Risk Customers
Douglas Shire Meals on Wheels	07 4098 1105	High Risk Customers
Mossman Multi-Purpose Health Service (Hospital)	07 4084 1200	High Risk Customers
Apunipima Cape York Health Council - Mossman Gorge Primary Health Care Centre	07 4037 7100	High Risk Customers
Bubu Bamanga Ngadimunku	07 4098 1305	Vulnerable Population Customers
C&K Mossman Community Kindergarten	07 4098 1880	Vulnerable Population Customers
C&K Port Douglas Kindergarten	07 4098 5811	Vulnerable Population Customers
Mossman Medical Centre	07 4098 1248	Vulnerable Population Customers
Port Village Medical Centre	07 4099 5043	Vulnerable Population Customers
Port Douglas Medical Centre	07 4099 5276	Vulnerable Population Customers
New Horizons for Health	07 4099 1111	Vulnerable Population Customers
Daintree State School	07 4098 6135	Vulnerable Population Customers
Goobidi Bamanga CACs Ltd	07 4098 1283	Vulnerable Population Customers
Goobidi Bamanga OSHC	07 4098 1283	Vulnerable Population Customers

Regulatory Stakeholder	Contact Details	Role
Goobidi Bamanga Home Care	07 4098 3030	Vulnerable Population Customers
Goodstart Early Learning Mossman	07 4098 2044	Vulnerable Population Customers
Miallo State School	07 4213 2555	Vulnerable Population Customers
Mossman State High School	07 4084 1333	Vulnerable Population Customers
Mossman State School	07 4099 9333	Vulnerable Population Customers
Port Explorers Craiglie	07 4099 3392	Vulnerable Population Customers
Port Douglas State School	07 4084 3222	Vulnerable Population Customers
Port Explorers Port Douglas	07 4099 3392	Vulnerable Population Customers
Port Explorers OSHC Port Douglas State School	07 4098 5793	Vulnerable Population Customers
Port Explorers Cooya Beach	07 4098 3444	Vulnerable Population Customers
St Augustine's Primary School	07 4099 7500	Vulnerable Population Customers
Enhance (Tropical North) Family Day Care	07 4098 1831	Vulnerable Population Customers
Wonga Beach State School	07 4099 9777	Vulnerable Population Customers
Big 4 Port Douglas Glengarry Holiday Park	07 4098 5922	Large Population Resort
Wonga Caravan Park (Council-owned)	07 4098 7514	Large Population Resort
Coconut Grove Apartments Port Douglas	07 4099 0600	Large Population Resort
Mossman Riverside Leisure Park (Mossman Pool and Caravan Park)	07 4098 2627	Large Population Resort
Mandalay Luxury Beachfront Apartments	07 4099 0100	Large Population Resort
Oaks Resort Port Douglas	07 4099 8900	Large Population Resort
Peppers Beach Club Port Douglas	07 4087 1000	Large Population Resort
Pool Port Douglas	07 4084 3400	Large Population Resort
Port Douglas Outrigger Holiday Apartments	07 4099 5662	Large Population Resort
Pullman Port Douglas Sea Temple Resort & Spa	07 4084 3500	Large Population Resort
Ramada Resort Port Douglas	07 4030 4333	Large Population Resort
Rendezvous Reef Resort	07 4087 2790	Large Population Resort
Sheraton Grand Mirage Resort	07 4099 5888	Large Population Resort
Silkari Lagoons Port Douglas	07 4030 4666	Large Population Resort
Tourism Port Douglas & Daintree (TPDD)	07 4099 4588	Tourism Industry Contact
Douglas Chamber of Commerce	*via email*	Business Industry Contact
Bligh Tanner	07 3251 8509	Water Engineering, Risk Management, DWQMP preparation, Incident investigation, Review and Audits.
Cairns Regional Council Laboratory Services	1300 692 247	Verification sampling

Regulatory Stakeholder	Contact Details	Role
Ixom	0478 401 092	Chlorine Gas
Elite chemicals Coogee	07 4035 5699	Sodium hypochlorite, Citric acid, caustic soda.
KSB	0429 006 895	Pumps
ABB	07 3713 9007	Online Instruments
SGS	1300 781 744	Verification sampling
Siemens	07 3332 8326	Online Instruments
Taggle	02 89991919	Smart Water Solutions
Welcon Technologies	07 4976 0600	SCADA and PLC support

We liaise with these stakeholders as necessary, for example, we may contact these customers individually in the event of implementing “boil water” or “do not drink” alerts.

Customer complaints

Douglas Shire Council takes customer complaints seriously as they can provide advance warning of issues within the water network that may not yet be apparent and may alert us to environmental issues.

All customer complaints received by Council are recorded and investigated, with the officer assigned and the results of the investigation included in the record. These records are reviewed monthly by the Coordinator Water and Wastewater. Customer complaints are reported to the Regulator annually as required under the key performance indicator reporting.

There are sometimes customer complaints related to chlorine. We investigate these complaints, and on occasion flush the system, but as the WTP target dose rate is typically ~1-1.5 mg/L, we do not normally need to take any further action.

ELEMENT 2: ASSESSMENT OF THE WATER SUPPLY SYSTEMS

Water sources and the impact of recent disaster events- including Cyclone Jasper and associated flooding.

Daintree Bore

Douglas Shire Council (DSC) operates a water treatment plant at Daintree Village. The normal intake is from the Intake Creek, which is transferred by a 4 km gravity pipeline to the water treatment plant at Daintree Village. While water for the Daintree scheme was previously sourced from the Cassowary Falls, this scheme is not currently active. The Daintree bore was commissioned following the installation of a calcite filter at the site in August 2022 to ensure that Daintree Village had a contingent water supply.

In December 2022, heavy rainfall events impacted and damaged the Cassowary Creek Intake, and the steel access bridge was completely destroyed. Staff were not able to access any of the intake infrastructure due to risks to safety.

Since then, DSC has been operating supply using the bore as the water source. Bore water is pumped to the Raw Water storage tank at the water treatment plant and undergoes treatment consisting of membrane ultrafiltration and chlorination..

Bore water quality testing for a full range of standard water analysis (pH, alkalinity, hardness, total dissolved solids, turbidity, electrical conductivity and apparent colour), metals (including, calcium, copper, iron; lead, magnesium, manganese, potassium, silicon and sodium) and a range of anions and nutrients (ammonia, fluoride, sulphate and total nitrogen) do not indicate that there is any parameter of concern and are well within Australian Drinking Water Guidelines.

A rainwater system is also set up for the Daintree scheme as a contingency. The rainwater system is designed to collect run-off from the Daintree Water Treatment Plant roof via guttering and feed directly into the raw water supply prior to the treatment process during rainfall events.

Rex Creek and Little Falls Intakes

Raw water for Mossman and Port Douglas and Whyanbeel schemes is sourced from remote intakes in rugged weathered granitic terrain, located in the Wet Tropics World Heritage Rainforest. The remote catchments have specific Wet Tropics legislation that defines what can be done within the catchment. As a result, there is very limited potential for any human activity within the catchment area for any of the intakes, and the catchments can therefore be considered highly protected, and at low risk of containing human pathogens than typical water sources. There is minimal to no risk of pesticides, heavy metals or other hazards in these catchments. There is a prevalence of native and feral wildlife in these catchments, creating microbiological hazards for our services. The water quality coming from these catchments is good (Category 2) based on the Vulnerability Class of Source Water. The locations of the water treatment plant intakes are indicated in Figure 3, demonstrating the protected nature of these catchments.

In recent times, both water intakes have encountered major damage due to heavy rainfall events. In December 2023, Tropical Cyclone Jasper and the following flooding event caused major damage to both Whyanbeel water intake and Rex Creek water intake, which supply raw water for Whyanbeel and Mossman/Port Douglas water schemes respectively. During the Jasper disaster event, over 3,000 mm of rainfall was measured at Rex Creek within 7 days. The heavy rainfall caused landslips at and above the intake locations, dislodging rocks and boulders, removing vegetation, and making the land unstable. Rocks and sand blocked the intake structures, preventing normal water flow into the raw water pipeline.

Historically, rain events in these catchments resulted in short term increases in turbidity that rapidly reduced. This allowed operators to cease production and wait for the turbidity to reduce. Since Tropical Cyclone Jasper, changes in the landscape currently mean that any significant rainfall event causes turbidity issues. During the wet season, there are regular “high turbidity” events (> 50 NTU) and the turbidity now remains higher for longer, and the previous management option is no longer

appropriate in all circumstances. The disaster event also resulted in multiple mains breaks. Network breaks were caused by debris moved by flood waters, pressure fluctuations and ground movement due to high water tables and soil saturation differences. These issues lead to major water supply disruptions in the region. DSC is still in the recovery phase and remedial actions are still evolving.

Rainfall

Rainfall in the wet tropics is typically concentrated from November to May. The rainfall averages in Figure 4 are for Port Douglas, which has the longest record. Data from Whyanbeel and Mossman indicates a very similar pattern.

To date, there have been no occasions when raw water volumes from Little Falls Creek or Rex Creek were too low to utilise.

The Mossman/Port Douglas scheme has a much higher demand, and there have been occasions in October/November when water supply from Rex Creek becomes less reliable. Douglas Shire Council must also meet its *Water Act 2000* obligations and is obliged to maintain an environmental flow in Rex Creek per the conditions of the water licence (licence #408436). Accordingly, water restrictions are regularly imposed during September, October, and November. DSC also acknowledges that climate change may alter water reliability in the future. As such, Douglas Shire Council will be constructing an alternate intake on the Mossman River to access the additional strategic reserve set aside in the Regional Operations Plan (ROP) for town water supply purposes. The project has commenced with the design review in 24/25, with the intent to build in 26/27. The Mossman River catchment is likely to be considered as a Category 3 or 4 water source based on the Vulnerability Class of Source Water. The initial assessment considers that while the upper catchment is World Heritage rainforest with no human activity, there is a popular upstream swimming area in the Mossman Gorge. There are also areas of agriculture in the immediate area of the offtake, although this is predominantly cane farming at present, and unlikely to add to the pathogen risk. More detailed analysis of the catchment will be undertaken prior to commissioning of the Mossman River pretreatment facility.

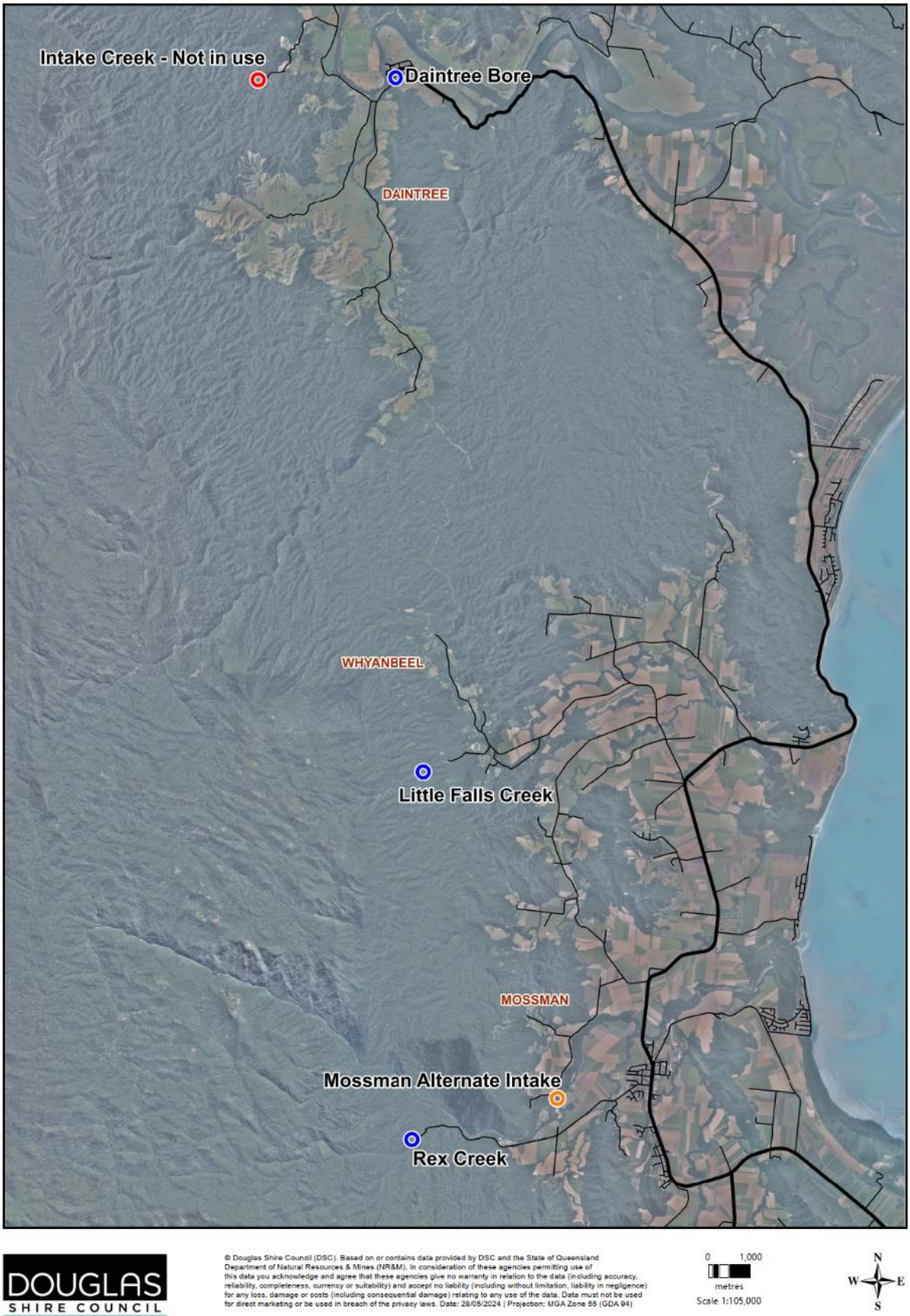
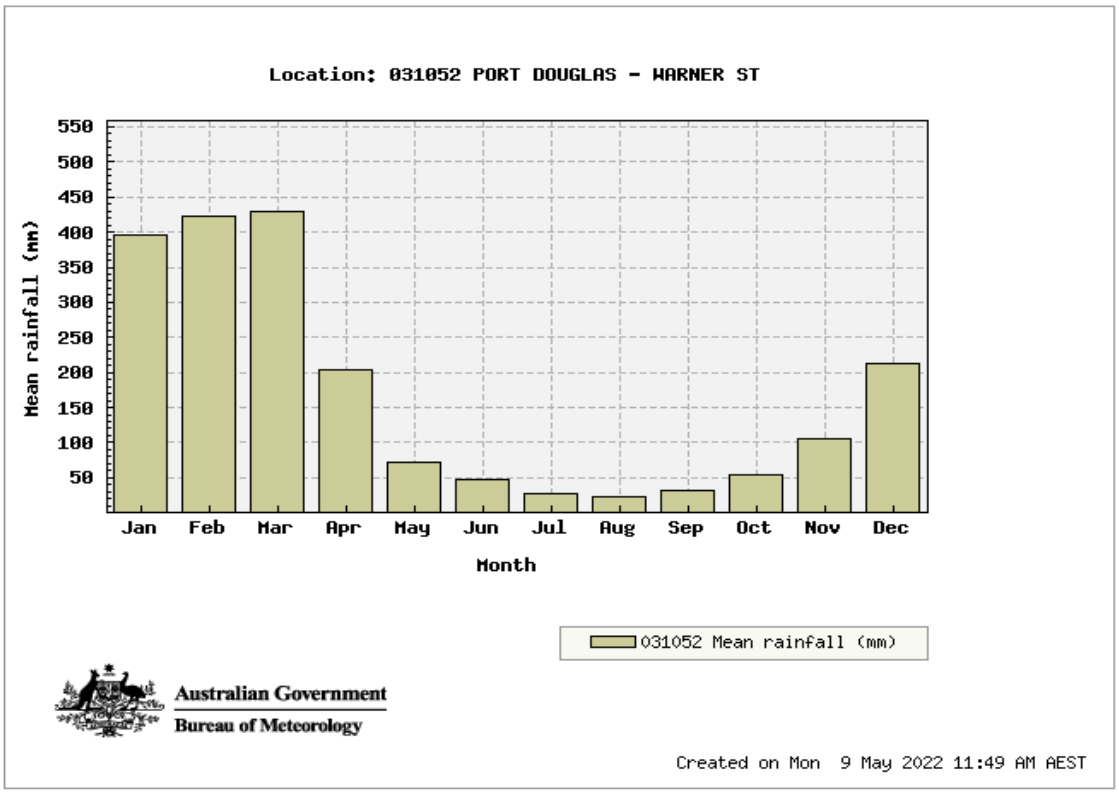


Figure 3. Location of intakes for the Douglas Shire Council water schemes



Statistics	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual	Years
Mean rainfall (mm) for years 1884 to 2022	395.8	422.0	429.4	203.3	73.0	47.4	26.3	23.4	32.1	53.1	106.1	213.5	2028.3	132

Figure 4. Rainfall data Port Douglas

Treatment overview

Mossman, Whyanbeel and Daintree Water Treatment Plants treat water from Rex Creek, Little Falls Creek and the Daintree Bore. Mossman and Whyanbeel treatment plants have all of the following process steps, while the Daintree bore has all with the exception of the Johnson screens. The Bore also has a calcite filter.

- Johnson screen
- 200-micron pre-filter
- Ultrafiltration
- Chlorination (using 1 or more of sodium hypochlorite, calcium hypochlorite and/or gas chlorination)
- The Whyanbeel WTP has a sodium carbonate pH adjustment step as the chlorine gas resulted in lower pH readings. Similar dosing may be required in the future at the Mossman WTP.
- The Daintree Bore has a calcite filter.

Reticulation overview

Water quality testing of the reticulation network and reservoirs are conducted regularly to ensure adequate chlorination of the network.

All available data regarding asset age, type and make is available in the Authority Asset Register and is also accessible to all staff using the MapInfo Interface corporate mapping software.

Network maintenance is tracked and fed into the asset management documentation for these assets. Council is moving across to Assetic Asset System in the near future to manage this resource.

There are relatively high proportions of asbestos cement mains, which are slowly being phased out of the system where possible through general maintenance, emergency works, or if works are conducted and the main is identified as in need of repair. A camera, where possible, is passed up the main to look further at the condition. The actual age of many of the cast iron pipes is unknown as they were all been assigned a generic date of installation when the asset system was first started. Water main assessment, design and replacement is ongoing.

Mossman – Port Douglas drinking water scheme

The Mossman water treatment plant is a 30 ML/day design treatment plant, with a daily production average of 11.6 ML/day. The schematic, including bypasses is included in Figure 5. Opening bypass valves requires manual intervention, and none of these options are used in normal operation.

The water treatment plant is designed with the relevant development approval and environmental authorities in mind, such as ensuring that chemicals are appropriately bunded, and stormwater cannot be contaminated by activities on site.

Intake

The Mossman water treatment plant source is located on Rex Creek. The intake channel has been built into the rock bed, and it diverts raw water flow to a series of Johnson screens. The Johnson screens offer initial coarse filtering of the raw water prior to the raw water entering the raw water pipeline and remove solids (generally sand and leaf matter) more than 1 mm in diameter. The screens are designed to be self-cleaning but are inspected weekly, 52 weeks per year and cleaned as required.

The water licence for Rex Creek has a nominal entitlement of 4,800 ML/year. There are maximum extraction limits based on creek flow. These limits are listed in the raw water operational procedure and additionally are programmed into SCADA.

Screened water feeds 6 km by gravity to the WTP through two raw water mains. The available head is more than sufficient to provide water pressure feed to operate the ultrafiltration membranes.

Turbidity is measured immediately pre and post the Johnson screens and a second turbidity meter is located on the raw water main at Marrs Creek, just prior to entry into the WTP. A third meter is located at the WTP. A fourth meter is post the pre filters. With exception of the fourth meter, any of the turbidity meters can be selected for duty (Critical Control Point) to control shutdown of the WTP in the event of high turbidity.

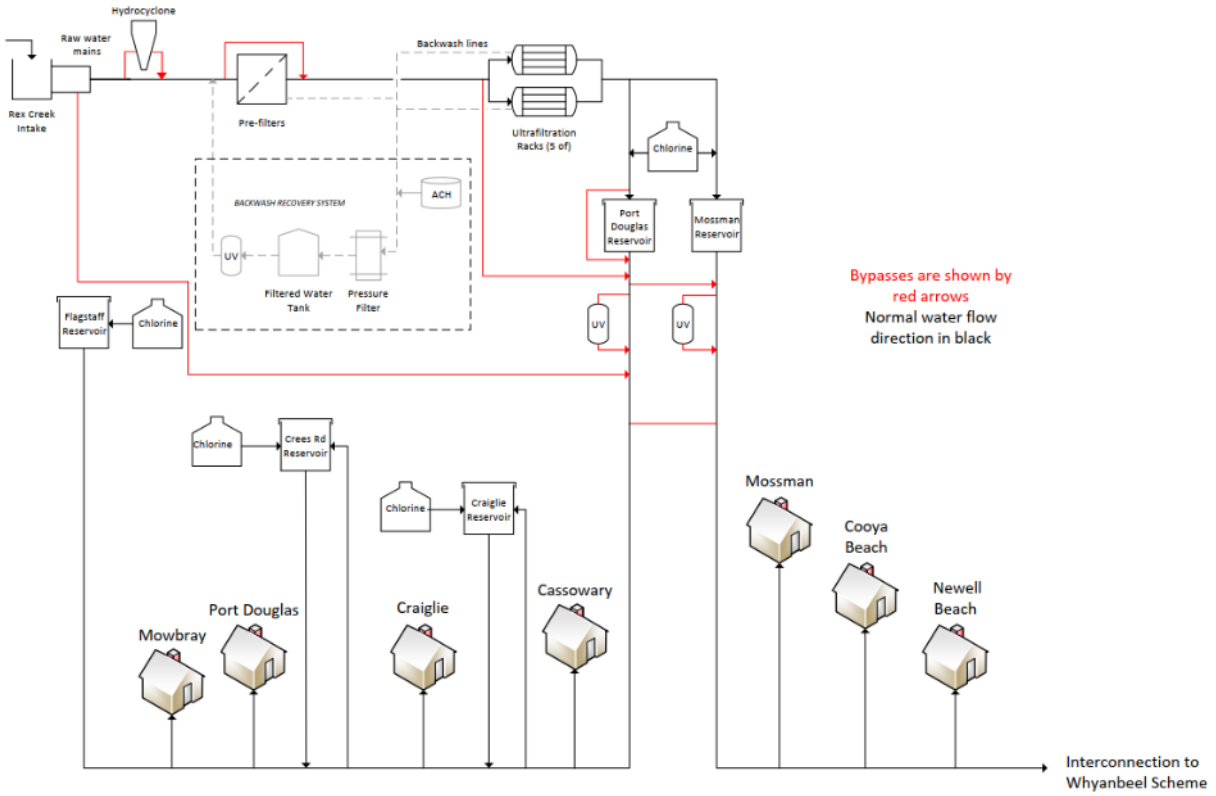


Figure 5. Catchment to tap schematic

The operational limit for raw water turbidity at the Mossman WTP is typically 30 NTU. Any higher than this and the plant is shut down and Team Leader authorisation is required to restart water production. The target turbidity is <20 NTU. The water treatment plant can operate at higher turbidity, e.g. in extended periods of high demand if necessary, but this comes at the expense of membrane life and increases the frequency of cleaning.

It is possible to bypass the Mossman WTP and provide raw water directly to the community. This was the original configuration of this scheme, but it is not intended to be used into the future. This option was investigated during Tropical Cyclone Jasper, and, determined that it would take many months to bring water back to potable standard. This would only ever be used under direction of DLGWV or under a Public Health Order from Queensland Health.

Figure 6. Rex Creek intake – race is lined with stainless steel

Hydrocyclone and pre-filtration

Raw water is filtered to 200 microns through four pre-filters. The pre-filters provide a duty/ standby operation and are designed to provide raw water flow to meet 100% of the treatment plant design capacity. Water is additionally passed through a hydrocyclone.

The pre-filters are cleaned by automated backwashing using raw water (typically every 60 minutes depending on raw water turbidity). As no chemicals are used, backwash water is discharged directly to the water course. The pre-filters are removed and inspected to assess serviceability once every 12 months. It is possible to bypass the pre-filters at Mossman.

Ultrafiltration

The Mossman treatment plant uses five racks of Memcor L40N membrane filtration modules. These modules provide pressurised ultrafiltration with a nominal membrane pore size of 0.04 µm.

The ultrafiltration process is fully automated and includes its own main control panel which operates UF inlet/outlet valves, recirculation pumps, backwash supply pumps, process air unit, a chemically-enhanced-backwash (CEB), and clean-in-place (CIP) system including chemical dosing equipment. Critical process equipment is installed with a duty/standby capacity to minimise disruptions to the water treatment process.

Operation and monitoring of the ultrafiltration treatment plants is via a PLC/SCADA system with a Citect user interface for process operation, monitoring, and alarming functions.

Memcor filtration modules utilise outside to inside flow mode, where contaminants accumulate on the outer wall of the fibre. This design allows for higher solids handling capacity and easier cleaning. The cleaning of the cartridges is via an automated backwashing sequence that utilises water-only backwashing and compressed air (typical frequency of 50-100 minutes) and CEBs with a normal ratio of one CEB to 20 backwashes.

Chemically-enhanced-backwashing utilises sodium hypochlorite cleaning solution with an approximate duration of 1 hour. Effectiveness of the backwashing sequence is continually monitored, and all associated parameters are recorded for reporting and operational planning purposes. CEB backwash water is directed to the sewer. Following backwashes, the membranes are rinsed prior to coming back into service.

Memcor ultrafiltration membrane CIP utilises citric acid with an approximate duration of 4 hours. At the completion of a CIP the UF rack is backwashed, rinsed and tested to ensure all traces of chemicals are removed prior to placing the UF rack back into service. Testing is performed on the UF rack by means of sampling the retentate and permeate header water and conducting in house lab testing for pH and free chlorine levels. Test limit results for free chlorine <0.1 mg/L and a pH result equivalent to the raw water pH value (typically 6.5 to 7.5) must be achieved prior to placing the UF rack back into service. Additional rinse cycles can be performed to ensure test results are within defined limits.

The frequency of cleaning procedures may be varied and is determined by the operator by observing trending values of the trans-membrane pressure (TMP) in relation to production flow set points and raw water inflow turbidity.

Figure 7. Memcor membranes at Mossman/Port Douglas WTP

Backwash recovery

Pre-filter and UF water-only backwashes are recycled through backwash recovery plant and fed back into the head of works to minimise water losses across the treatment process. The backwash recovery plant is a direct filtration plant that utilises 3-5 mg/L aluminium chloralhydrate (ACH) for coagulation, pressurised sand filtration to typically <1 NTU and disinfection by UV with a dose of 34.8 mJ/cm^2. This dose rate will achieve > 4 LRV *Cryptosporidium* and *Giardia* inactivation when the UVT is above the certified level of 55%. By utilising the backwash recovery plant, approximately 1 ML of water is recovered daily that would otherwise be lost to waste.

Membrane integrity – direct testing

Membrane integrity is evaluated every 24 hours (of elapsed production time) by undertaking an automated pressure decay test (PDT). The pressure decay test measures whether there are any breaches of the membrane greater than three microns in size. Membrane integrity is considered as a critical control point for managing the protozoa risk, and the CCP procedure, is presented in a later section. If the UF rack fails, the integrity check it is immediately and automatically taken offline for inspection and repair.

Trending data and outcomes of the integrity check cycle are monitored to pre-determine UF cartridge maintenance/repair intervals allowing UF racks to be removed from service and repaired to avoid unexpected shutdowns on account of integrity check failure.

Nonetheless, there is sufficient production capacity of treated water that under normal demand two racks can remain offline until repaired.

Membrane integrity – indirect testing.

The permeate turbidity is monitored using individual filter rack permeate turbidity meters capable of 0.001 NTU resolution.

Where the permeate turbidity exceeds 0.15 NTU on any rack for over 15 minutes, the affected UF rack is taken offline and undergoes a PDT to determine if there is a breach of the membranes, as per the relevant CCP procedure.

The ultrafiltration racks can be bypassed – but this would not be used by choice by DSC, except in emergency situations, and/or under a public health order or direction notice. Raw water in this case can be directed to the clearwater reservoirs.

Chlorination

All disinfection points are operated as per the Chlorination (Primary and Re-dosing) CCP procedure. Disinfection is achieved through gas chlorination using two 920 kg chlorine gas drums as duty standby, with automated change over operation. The system uses a vacuum chlorine gas draw off injector disinfection system to chlorinate the Mossman 1.8 ML and Port Douglas 5 ML reservoirs. Current operation uses a recirculation system on each of the treated water reservoirs with a set point control mode of operation.

The target, action and critical limits for chlorine are stated in the CCP. Two critical limits ensure effective disinfection (low side) and prevent exceedances of the chemical health guideline value (high side). It is possible to bypass chlorination. This is not used under normal operation.

(Ultraviolet disinfection)

The UV units are a redundant system that are not currently operational but physically remain - they are still included on the schematic.

Reticulation

Water is reticulated under gravity to Mossman / Port Douglas water scheme. Network maps showing sampling locations are included under Element 5. The reticulation network has the following materials and age ranges.

Table 4. Mossman/Port Douglas treated water reticulation

Scheme	Total Length (km)	% of total	Length (km)	Material	Age Range
Mossman/ Port Douglas	209	42%	88	Asbestos Cement	1940-1989
		35%	73	Polyvinylchloride	1960-2024
		17%	36	Ductile Iron Cement Lined	1940-2022
		1%	2.6	High Density Poly Ethylene	1970-2020
		4%	9	Cast Iron	1935-1986
		0.01%	0.02	Galvanised Iron	Approx 1975
		0.33%	0.7	Steel	Approx 1986
		0.02%	0.04	Copper	1980-2019

There are two reservoirs associated with the Mossman water treatment plant: the Port Douglas and Mossman reservoirs. There are two Cooya reservoirs, but these are currently not in use. It is intended to commission these reservoirs in the future (subject to funding). There are three reservoirs that service Port Douglas: Crees Road reservoir, the Craiglie reservoir (Hope St) and Flagstaff reservoir.

The Crees Rd, Craiglie and Flagstaff reservoirs are utilised to provide additional storage capacity for the Port Douglas scheme. All three reservoirs can be gravity fed from the Mossman WTP, but Flagstaff reservoir can additionally be fed from the Craiglie reservoir pump station or Port Douglas pump station. Outflow from the Craiglie reservoir is via two pumps in a duty/standby arrangement. Outflow from the Crees Rd reservoir is gravity fed. All three reservoirs are roofed and have vermin proofing. Other operational reservoirs are in reasonable to good condition, but the vermin proofing on all reservoirs will nonetheless be sequentially and comprehensively assessed and ensured. In the

case of Cassowary and Mowbray, these reservoirs are offline as their condition is poor. They will not be brought online until they are rehabilitated.

There are no areas of low pressure within the scheme, but the distribution network to Newell Beach, Cooya Beach and the extremities of the network to Cassowary and Mowbray, have relatively long detention times.

The Mossman/Port Douglas scheme and the Whyanbeel Scheme are interconnected to provide supply security to either system. These interconnections are currently being investigated to ensure functional flow for this network.

Table 5. Mossman/Port Douglas treated water reticulation

Reservoir	Capacity (ML)	Status	Material	Roofed	Vermin Proof	(Re) chlorination	Alarms
Mossman Clearwater	1.8	Active	Concrete	Y	Y	Y	Chlorine high and low level. Reservoir level. Hatch access alarms.
Port Douglas Clearwater	5	Active	Concrete	Y	Y	Y	Chlorine high and low level. Reservoir level. Hatch access alarms.
Cooya Beach	2	Offline	Concrete	Y	Y	N	
Cassowary	0.1	Offline	Zinc Anneal	Y	N	N	
Craiglie	10.1	Active	Concrete	Y	Y	Y	Chlorine high and low level. Reservoir level, pressure alarms for pumps, flow rate. Hatch access alarms.
Flagstaff Two Reservoir	2.2	Active	Concrete	Y	Y	Y	Chlorine high and low level. Reservoir level, pressure alarms for pumps, flow rate. Hatch access alarms.
Mowbray	0.125	Offline	Concrete	Y	N	N	Reservoir level
Crees Road	20	Active	Concrete	Y	Y	Y	Chlorine high and low level. Reservoir level. Hatch access alarms.

Redosing

The Crees Rd, Craiglie and Flagstaff reservoirs are re-chlorinated. Craiglie reservoir now has an electro-chlorination redosing system. The Crees Road reservoir re-doses with chlorine gas (two 920 kg cylinders). The Flagstaff reservoir has calcium hypochlorite eroders. All chlorination systems are operated within the CCP procedure set points. A chlorination and chemical review to ensure compliance with workplace health and safety risks associated with gas chlorination has been completed and was deemed compliant by WestWater Enterprises PTY LTD.

Whyanbeel drinking water scheme

The Whyanbeel water treatment plant is a 4.7 ML/day design treatment plant, with an average flow of 900 kL/day. As the WTP capacity is <5 ML/day it is not considered an environmentally relevant activity.

Intake

The Whyanbeel intake is located on Little Falls Creek.

The intake channel has been built into the rock bed, and it diverts raw water flow to a series of Johnson screens. The Johnson screens offer initial coarse filtering of the raw water, prior to it entering the pipeline, removing all solids (generally sand and leaf matter) more than 1 mm in diameter. The screens are designed to be self-cleaning but are inspected weekly, 52 weeks per year and cleaned as required.

Screened raw water gravity feeds (0.5 km) to the WTP through two raw water mains. At the WTP, two raw water booster pumps (duty/ standby) pump water to the ultrafiltration membranes.

Turbidity is measured using an online turbidity meter which is located at the WTP and is the Critical control point to shutdown Whyanbeel WTP. Operationally, the Whyanbeel WTP shuts down when raw water turbidity exceeds 20 NTU. The water treatment plant can operate at a higher turbidity (for example in extended periods of high demand) if necessary, but this comes at the expense of membrane life and increases the frequency of cleaning. As there is sufficient treated water supply, in the past there was generally no need to operate outside this level. Landslides both at and upstream of the Whyanbeel intake (Cyclone Jasper), mean that during current significant rainfall events, turbidity possess an ongoing issue that requires management.

The water licence for Little Falls Creek provides for an annual allocation of 630 ML. While it is possible to bypass the Whyanbeel WTP and provide raw water directly to the community, this option was investigated during Tropical Cyclone Jasper, and, determined that it would take many months to bring water back to potable standard. This would only ever be used under direction of DLGWV or a Public Health Order from Queensland Health.

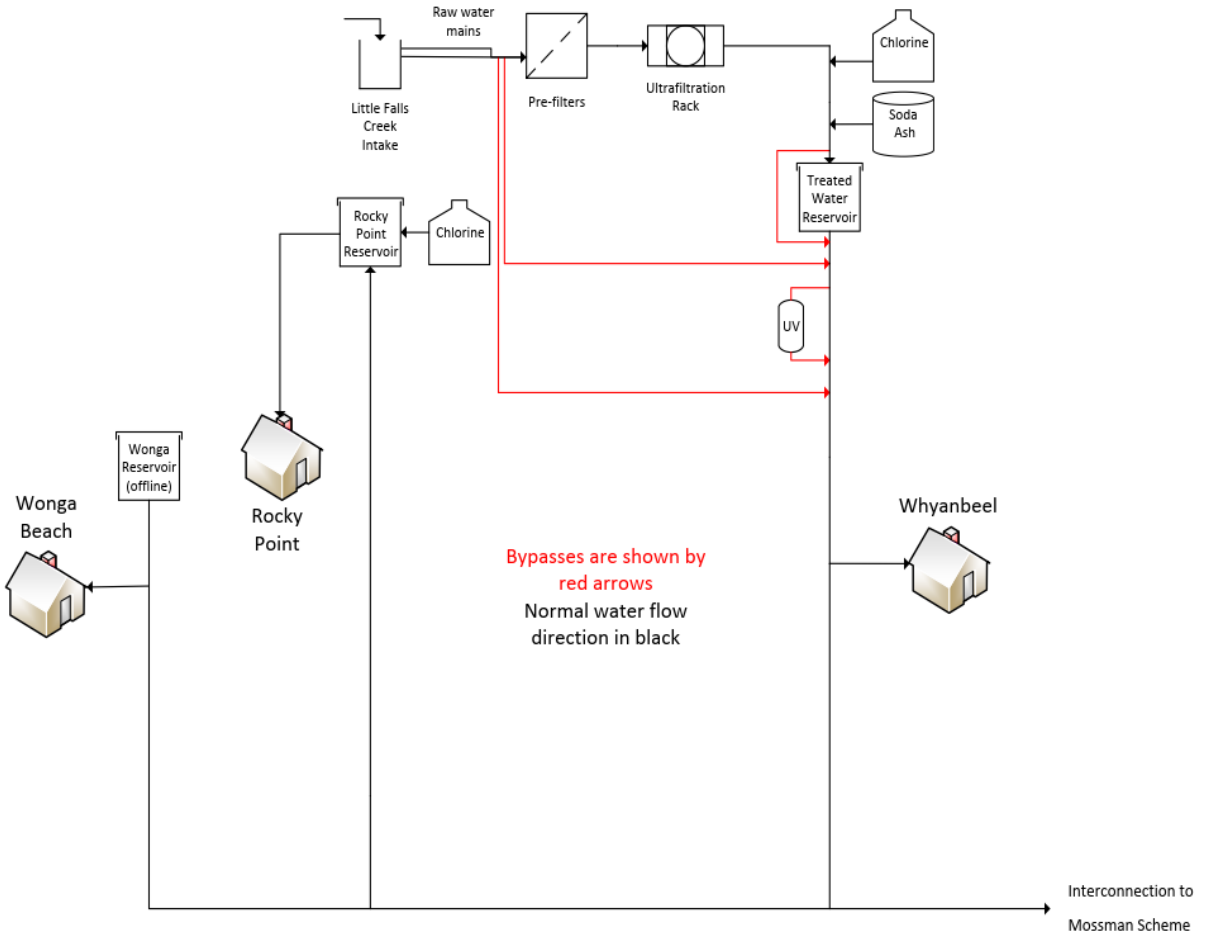


Figure 8. Whyanbeel WTP schematic

Pre-filtration

Pre-filters are operated in the same manner as described for Mossman WTP. It is not possible to bypass the pre-filters at Whyanbeel.

Ultrafiltration

The treatment plant uses one rack of Memcor L40N membrane filtration modules.

While the ultrafiltration process at Whyanbeel WTP is like Mossman, the Whyanbeel WTP is a single rack and has a greater storage volume of treated water, allowing the plant to operate with a raw water turbidity cut-off of 20 NTU, rather than 30 NTU.

Environmental discharge

Whilst the Whyanbeel WTP is not an environmentally relevant activity, Douglas Shire Council still has an obligation not to cause general environmental harm. As such, we ensure that only uncontaminated pre-filter backwash, and water only backwash water is discharged to the creek. CIP waters are stored onsite and transported by trucks to Port Douglas WWTP under a trade waste approval. CEB discharged to the environment.

Membrane integrity – direct testing

Membrane integrity is evaluated every 24 hours in accordance with the CCP procedure. If the UF rack fails, the integrity check it is immediately taken offline for inspection and repair.

Trending data and outcomes of the integrity check cycle are monitored to pre-determine UF cartridge maintenance/repair intervals allowing preventive maintenance to occur as appropriate. Nonetheless, there is sufficient production and storage capacity of treated water that the rack can normally remain offline until it is repaired.

Membrane integrity – indirect testing

The permeate turbidity is monitored and managed in accordance with the CCP procedure. Where the permeate turbidity exceeds 0.15 NTU for over 15 minutes, the UF rack is taken offline and undergoes a PDT to determine if there is a breach of the membranes.

The ultrafiltration rack can be bypassed – but this is not intended to be used. Raw water can be directed to the clearwater reservoir.

Chlorination

Disinfection is achieved by gas chlorination (two 70 kg chlorine gas cylinders) configured as duty/standby with automated switchover in accordance with the CCP procedure. The system utilises a set point-based vacuum chlorine gas draw off injector disinfection system to chlorinate the treated water reservoir.

The target, action and critical limits for chlorine are stated in the CCP. Two critical limits ensure effective disinfection (low side) and prevent exceedances of the chemical health guideline value (high side).

pH adjustment

Sodium carbonate is dosed to increase the pH and increase alkalinity of the treated water. 15% batched sodium carbonate solution is dosed (Depolox 5 analyser, set point control) at ~0.03 ml/L to increase the pH in accordance with the OCP procedure.

(Ultraviolet disinfection)

The UV unit is a redundant system that is not currently operational but physically remains.

Reticulation

Water is reticulated, under gravity from the treated water reservoir to the Whyanbeel scheme. Network maps showing sampling locations are shown in Element 5. There is one operational reservoir at Rocky Point. There is an additional reservoir available at Wonga Beach, which is normally offline. This reservoir requires a detailed engineering design including vermin proofing, re-roofing, pipe work and re-chlorination. It is planned to be brought back online in the near future. This reservoir will be incorporated into the testing regime when operational. DSC is also currently investigating utilising a reconfigured Rocky Point Reservoir to service Wonga which will increase the resilience of the scheme.

Table 6. Whyanbeel reticulation

Scheme	Total Length (km)	% of total	Length (km)	Material	Age Range
Whyanbeel	75	56%	42	Polyvinylchloride	1972-2024
		33%	25	Asbestos Cement	1972-1989
		7%	5.6	Ductile Iron Cement Lined	1972-2024
		3%	2.1	High Density Poly Ethylene	1972-2021
		1%	.6	Cast Iron	1935-1988

The Rocky Point reservoir receives its flow from the Whyanbeel treatment plant via two pumps, duty/standby, that pump the water to the reservoir. Wonga Beach is fed by gravity from the WTP.

There are no areas of low pressure in Whyanbeel, and PRVs are used to reduce pressures to <600 kPa.

There are two mains from Whyanbeel to Wonga Beach – a higher pressure main feeds to Rocky Point and a lower pressure feed to Wonga Beach. There are closed interconnections between the mains, with PRVs in place to protect the lower-class mains.

Whyanbeel water scheme and Mossman/Port Douglas water scheme are interconnected to provide supply security to either system.

Figure 9. Whyanbeel clearwater reservoir

Table 7. Reservoir details – Whyanbeel scheme

Reservoir	Capacity (ML)	Status	Material	Roofed	Vermin Proof	(Re) chlorination	Alarms
Whyanbeel Clearwater	3.5	Active	Concrete	Y	Y	Y	Chlorine high and low level. Reservoir Level.
Rocky Point Reservoir	1	Active	Concrete	Y	Y	Y	Chlorine high and low level. Duty pump start/stop. Reservoir Level.
Wonga Beach Reservoir	2	Offline	Concrete	Y	Y	N	Reservoir level

Redosing

Redosing of chlorine occurs at the Rocky Point reservoir. Current operations use a recirculation system on the Rocky Point reservoir that doses using calcium hypochlorite eroders with set point operation. Redosing is operated in accordance with the CCP procedure.

Daintree drinking water scheme

The Daintree water scheme is supplied from the Daintree bore. Bore construction details are in Appendix B. The bore sustainably yields 4.5 L/s. The results of water quality testing for the bore are presented in Appendix B and include standard water analysis and 19 metals (total and dissolved). A calcite filter is installed after the bore to maintain acceptable pH and alkalinity. The bore water line has an automated scour system that flushes the raw water line and maintains water quality prior to the reservoir. Bore water is fed directly into the WTP.

The Daintree WTP is a 0.49 ML/day design treatment plant, with an average flow range of 100 kL/day. The small WTP is not considered an environmentally relevant activity.

Turbidity is measured using an online turbidity meter which is located at the WTP and provides the Critical Control Point for the Daintree WTP shutdown. The turbidity of the bore water is very low and has to date, not triggered any shut down. The current turbidity limit is 5 NTU. Like all other DSC water treatment plants, the Daintree WTP can operate at higher turbidity (for example in extended periods of high demand) if necessary, but this comes at the expense of membrane life, and increases the frequency of cleaning. Similarly, it is possible to bypass the Daintree WTP and provide raw water directly to the community. This was the original configuration of this scheme, but it is not intended to be used into the future, except under emergency scenarios.

Daintree rainwater system

There is also the potential to utilise rainwater as an additional supply. Daintree rainwater system is used as a contingency water source during adverse heavy rainfall events. Rainwater catchment is set on the Daintree WTP roof and feeds into the raw water tank. Rainwater supply is only available during rain events. Rainwater has minimal risks to the water quality and thus can be defined as protected water source. The area has minimal traffic and no industrial emissions. However, a microbial risk is

present due to wildlife and lack of integrity of constructed rainwater catchment may cause chemical hazards. Due to these risks, the rainwater system requires frequent maintenance of the roof catchment. Maintenance includes gutter guard inspections and maintenance, cleaning of roof, gutters and onsite vegetation removal. Additionally, the rainwater system is equipped with a first flush system, which assists with cleaning. While available, this system has not been greatly utilised to date.

Daintree Raw water reservoir

Raw water enters the raw water reservoir. This tank detains the water and allows sediment to settle, reducing any turbidity load to the WTP. The raw water tank is cleaned to prevent sediment build up.

Pre-filtration

Raw water is further filtered to 200 microns through pre-filters. The pre-filters run continuously and are cleaned by automated backwashing (typically every 10 minutes depending on raw water turbidity) to ensure constant feed of raw water to the treatment plants. The pre-filters are arranged in banks to provide a duty/standby operation and are designed to provide raw water flow to meet 100 % of the treatment plant design capacity.

The pre-filters are removed and inspected to assess serviceability once every 12 months. Backwash water supply is from the raw water supply and is directed back to the water course.

Ultrafiltration

The treatment plant uses one rack with six available positions for Koch polysulfone ultrafiltration membrane cartridges with a nominal size cut-off of 100,000 Daltons. These filters are no longer manufactured and will be replaced over time with the Memcor system. The number of cartridges used can be changed depending on operational requirements and demand. The Daintree water treatment has a maximum design capacity of 0.49 ML per day.

The ultrafiltration process is fully automated and includes its own main control panel which operates UF inlet/outlet valves, recirculation pumps, backwash supply pumps, CIP system including chemical dosing equipment. Critical process equipment is installed with a duty/standby capacity to minimise disruptions to the water treatment process.

Operation and monitoring of the ultrafiltration treatment plants is via a PLC/SCADA system with a Citect user interface for process operation, monitoring and alarming functions.

The cleaning of the cartridges is via an automated backwashing sequence that utilises water only backwashing typically required every 40 minutes. The frequency of backwashing is determined by the operator by observing trending values of the trans-membrane pressures (TMPs) in relation to production flow set points and raw water inflow turbidity.

Currently, no CEBs are performed at Daintree due to the discharge being to the Daintree River. Only CIPs are performed with the wastewater being collected in the chemical holding tank then pumped out and transported by road tanker to the Port Douglas WWTP.

A CIP utilises a heated cleaning solution of either citric acid, caustic, or a combined caustic/chlorine solution. These are used to remove both organic and inorganic fouling. A CIP is typically undertaken on the rack as required.

At the completion of a CIP, the UF rack is backwashed and rinsed and tested to ensure all traces of chemicals are removed prior to placing the UF rack back into service. Testing is performed on the UF rack by means of sampling the retentate and permeate header water and conducting in house lab testing for pH and free chlorine levels. Test limit results for free chlorine <0.1 mg/L and a pH result equivalent to the raw water pH value (typically 6.5 to 7.5) must be achieved prior to placing the UF rack back into service. Additional rinse cycles can be performed to ensure test results are within defined limits.

Membrane integrity – direct testing

Membrane integrity is evaluated every 24 hours (of elapsed production time) by undertaking an automated pressure decay test (PDT). Membrane integrity monitored and managed in accordance with the CCP procedure.

Membrane integrity – indirect testing.

The treated water reservoir turbidity is monitored using a turbidity monitor capable of 0.001 NTU resolution and managed in accordance with the CCP procedure.

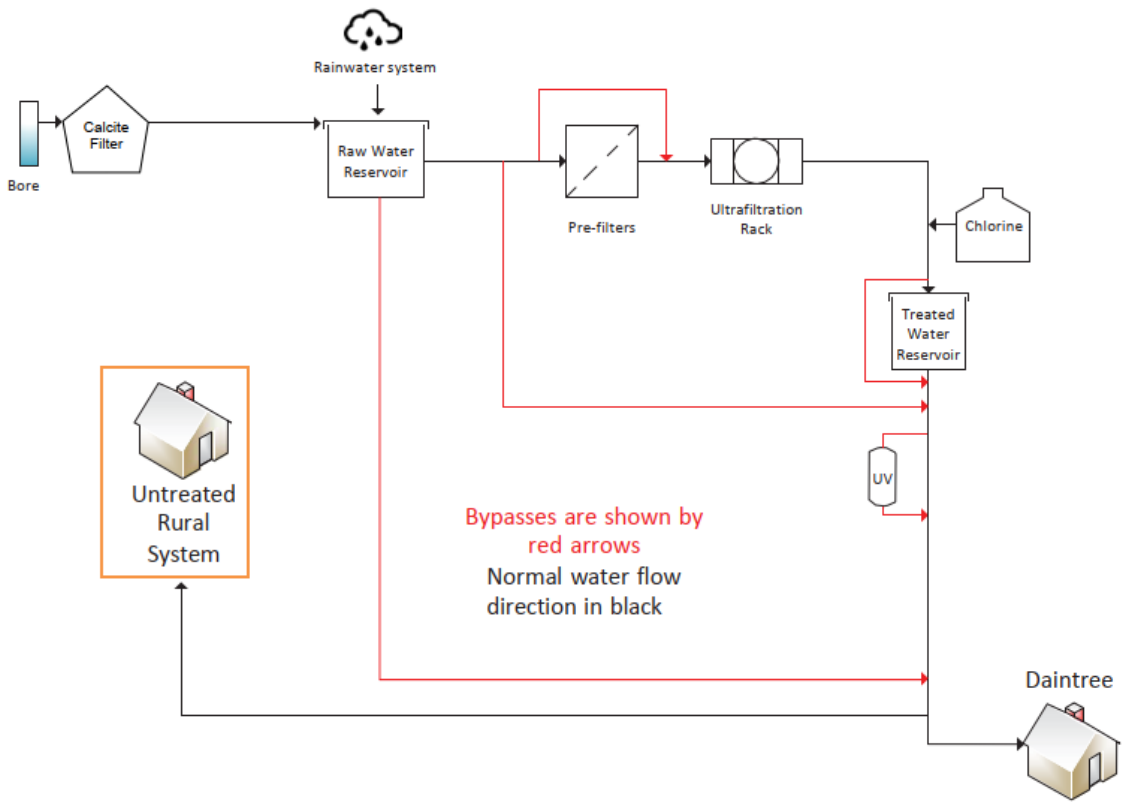


Figure 10. Daintree WTP schematic

Chlorination

Disinfection is achieved through chlorination. Current operations use a recirculation system on the treated water 400kL reservoir that doses sodium hypochlorite with a set point control mode of operation.

The target, action and critical limits for chlorine are stated in the CCP. Two critical limits ensure effective disinfection (low side) and prevent exceedances of the chemical health guideline value (high side).

(Ultraviolet disinfection)

The UV unit is a redundant system that is not currently operational, but it physically remains.

Reticulation

Water is reticulated, under gravity to the Daintree scheme directly from the 400kL treated water reservoir at the plant – there are no additional reservoirs.

There is a relatively low turnover in this scheme, in the past this has led to low chlorine residuals in the reticulation system. When chlorine residual reduces below 0.2 mg/L, mains are flushed until the chlorine residual is above 0.2 mg/L. There is sensitivity in this community to chemicals in their water supply, so if changes are made, they are done so slowly to acclimatise the consumers without resulting in increased opposition to chlorination. Network maps showing sampling locations are under Element 5.

Water quality data

Douglas Shire Council undertakes water quality testing of raw, treated, (reservoirs) and reticulation. Data has been analysed, and a summary of the available data (in some cases since 2008) has been presented in Appendix A. The Drinking Water Quality Management Plan report is the normal method by which our data is reported publicly.

In addition to the parameters identified in those tables, Council has previously also undertaken testing to inform the management of the water supplies. For example, we have undertaken monitoring for *Cryptosporidium* and *Giardia* in the raw water, with infrequent low level positive detections that demonstrate their presence in the catchment. Similarly, we have undertaken testing for *Naeglaria* in the reservoirs, but have not detected this pathogen. Given the focus on operational monitoring ensuring the effectiveness of treatment barriers, we no longer consider it necessary or cost effective to continue to monitor for these pathogens. Rather, we emphasise the optimal operation of our treatment barriers.

Council has also undertaken monitoring for disinfection by-products within the reservoirs. The highest level detected was at Rocky Point reservoir, with only 150 μg/L, which is well below the ADWG health guideline value. Of note, with over 6,762 *E. coli* samples (2014-2023), three post-treatment samples were positive - one in the Flagstaff reservoir in Dec 2014, one in the Mossman post-UV sample in March 2015 and a May 2016 sample at Cooya. All three samples were collected in very adverse weather conditions and are thought to be the result of contamination of the samples, rather than reflecting the

water quality at the time. Incidents that occurred prior to chlorination of these schemes are no longer considered relevant.

Water quality data in general indicates that the treatment processes are very effective at reducing or eliminating hazards.

Risk methodology

Douglas Shire Council has adopted a risk methodology based on the "Preparing a Drinking Water Quality Management Plan Supporting Information, September 2010" documentation provided by the Queensland Water Supply Regulator.

There are some minor differences to the published version in that the consequence descriptor for catastrophic has been quantified, and the uncertainty descriptors tailored to reflect the data availability in these schemes.

Public Health Risk Matrix and Definitions

The public health risk matrix used for the risk assessment is presented below. Medium and Low risks are acceptable - High and Extreme risks should be reduced by implementing risk improvement actions.

Table 8. Risk matrix

Public Health Risk Matrix	**Consequence**	Insignificant	Minor	Moderate	Major	Catastrophic
Likelihood		*Isolated aesthetic exceedance, little operational disruption*	*Local aesthetic exceedance, potential isolated breach of chemical health parameter*	*Widespread aesthetic exceedance, or repeated breaches of chronic health guidelines*	*Potential acute health impact, no outbreak expected*	*Potential acute health impact, declared outbreak likely*
Almost Certain	*Occurs daily to weekly*	Medium 6	High 10	High 15	Extreme 20	Extreme 25
Likely	*1-4 occurrences per month*	Medium 5	Medium 8	High 12	High 16	Extreme 20
Possible	*1-11 occurrences per year*	Low 3	Medium 6	Medium 9	High 12	High 15
Unlikely	*1 occurrence per 1-5 years*	Low 2	Low 4	Medium 6	Medium 8	High 10
Rare	*<1 occurrence per 5 years*	Low 1	Low 2	Low 3	Medium 5	Medium 6

Table 9. Uncertainty descriptors

Uncertainty Level	Uncertainty descriptor
Certain	The processes involved are thoroughly understood and supported by very extensive on-site knowledge covering multiple drought and flood cycles, and/or high frequency (weekly or better) water quality monitoring data.
Confident	The processes involved are well understood and supported by extensive on-site knowledge of more than one drought and flood cycle, and/or monthly water quality data
Reliable	There is a good understanding of the process which is supported by quarterly water quality data and operational experience that covers drought and flood years.
Estimate	The process is reasonably well understood, and data covers seasonal and drought and flood cycles.
Unreliable	The process is not well understood, and water quality data does not cover seasonal variations for drought and flood years.

Methodology

The entire risk assessment process is conducted over three stages. These include

1. Hazard identification, Unmitigated
2. Risk assessment, and
3. Mitigated risk assessment.

As Douglas Shire Council has two schemes with a very similar treatment train, the risk assessment was undertaken for these schemes simultaneously but considering any individual differences.

The relevant hazards were identified from previous versions of the DWQMP, water quality data, incident history, known water quality issues, and experience of the hazard identification team. The hazards that were considered are listed in the unmitigated risk assessment table in the following section.

After a hazard is identified, the likely sources were identified. This sometimes resulted in the identification of specific schemes where the hazard was significantly different to another. Where this is the case, the different schemes were considered separately for their unmitigated public health risk (the same hazard is identified on multiple lines).

For each hazard, an unmitigated risk was determined by first determining the consequence of the hazard, and then considering the likelihood that the hazard would result in that consequence. The unmitigated risk assumes that a person consumes the water with the hazard present and no treatment in place. (In some cases, such as overdose of treatment chemicals, this simplistic definition is broadened to assume that the hazard is introduced to the water supply with no further control measures after the hazard has been introduced).

The consequence definitions are adhered to strictly, such that any hazards that could result in an acute health risk (for example pathogens), must have either a major or catastrophic consequence. On the contrary, parameters with chronic health risks, such as manganese or trace level pesticides, will have

either minor or moderate consequences. The ADWG does not provide guidance on acute chemical risks, and none have been identified in this process.

Once the consequence and likelihood were assigned, the Public Health Risk was determined using the matrix in the next section. An uncertainty is also assigned to demonstrate the level of confidence in the assessment.

Douglas Shire Council considers that a Public Health Risk of medium or below is acceptable. If an unmitigated risk was determined to be low, this was not carried forward to a mitigated risk assessment. Hazards with unmitigated risks of medium or above are generally carried forward to the scheme specific risk assessments, detailed in the individual scheme-based plans.

For the mitigated risk assessment, the hazards and the sources of the hazards/ hazardous events are then separated out to consider where in the treatment process that the hazard can eventuate as a risk. This is done to examine failure modes for individual process elements. Where a hazard is present, the preventive measures that are intended to minimise the risk are identified.

The effectiveness of the identified measure, given the hazardous event is then assessed. Where an unmitigated risk is unacceptable, and reduced, the operational procedure used to manage the risk is identified. Again, an uncertainty is assigned. If the mitigated risk remains unacceptable, or there is no operational procedure, a risk management improvement item was identified.

Hazard identification and risk assessment

In June 2015 a team was assembled to identify the hazards that are present across any or all schemes. Members of this team were also involved in the water supply system description and analysis. Following agreement on the hazards that are present, the unmitigated risks were evaluated. The hazard identification team that was involved in this process is detailed in the table overleaf.

During the Hazard identification workshop, available raw water quality data, and operational knowledge was used to inform the workshop conclusions.

An unmitigated risk was then assigned for each hazard, considering any differences in types of schemes that may change the unmitigated risk rating. The hazard identification and unmitigated risk assessment is presented in the following pages.

Risk reviews

Following an audit in 2021, and a DWQMP review in 2022, DSC conducted a desktop review of the completed RMIP (Risk Management Implementation Plan) actions, updated the current risks, and identified risk improvement items that had either been deferred or have been recently added to the infrastructure programs.

The risk register was updated to ensure the mitigated risk column reflects current risks. Similarly, the risk assessment, RMIP and comments were updated in 2025.

The RMIP (the final columns of the risk register) has similarly been updated to remove items that have been completed, and to include those relevant items that are required to mitigate unacceptable

risks. The relevant unmitigated risks above are passed forward to the scheme by scheme mitigated risk assessment. In this case, relevant generally means that the hazard is present for that type of scheme, with an unmitigated risk of medium or above. Low risks identified above are not considered further, as they are not considered to pose a public health risk within the timeframe for plan review where these outcomes will be revisited.

Some asset management issues have been included as whole of system risks (failure of supply in Mossman/Port Douglas due to drought). In these cases, we have been very conservative in the application of the likelihood as the consequence of loss of supply is so severe. For example, whilst it may be rare that we are unable to supply the Mossman/Port Douglas scheme, we have assessed the likelihood as “unlikely.” This is partially to differentiate from the Daintree and Whyanbeel schemes, but also because we believe it essential for supply security to develop an alternate water source in this scheme.

As stated above, following determination of the mitigated risk, we identified if we have a robust implemented documented procedure for that process that ensure that the measures are effective. As appropriate, we have also assessed and documented whether the barrier was a critical control point. This is described more fully in the following section.

Table 10. Risk assessment participants.

Participants	Position	Relevant Workshop	Water Industry/Risk Management Experience
Paul Hoye	General Manager Operations	2015	22 years, Previously an EHO, food safety auditor, HACCP training. 20 years in DSC
Wouter van der Merwe	Manager Water and Wastewater	2015	30 years water industry. Formal risk training.
Henry Maro	Team Leader Water Treatment	2015, 2017 and 2020	25 water industry, with 14 years at DSC. Cert 3 in water and wastewater. Multiple risk assessments.
Samadhi Senior	Technical Officer Water and Wastewater	2015	5 years in Council/ water, risk assessment experience
Mark Howarth	Team Leader Water Reticulation	2015	37 years with Council/ water. Risk assessment experience.
Matt Govorko	Water Operator	2015	10 years water industry, DSC. Cert 3, Council risk assessments.
Steve Davis	Water Operator	2015	4 years DSC and water industry, Cert 3, Council risk assessments
Tony Kadwell	Technical Officer	2015 and 2020	28 years, Cert 3 Reticulation. Previous risk training
Michael Lawrence	Bligh Tanner - Facilitator	2015, 2017, 2020 and 2022, 2024	>15 years in water industry, formal ADWG training, water quality management systems auditor.
Nicholas Wellwood	General Manager Operations	2017	Engineer, 30 years in water industry, formal risk training
Peter White	Coordinator Water and Wastewater	2017, 2020 and 2022, 2024	17 years in Council in water and wastewater, risk assessment experience
Marie Lawson	Administration Officer Water and Wastewater	2017	12 years in DSC, initial drinking water risk assessment
Peter Tonkes	Manager Water and Wastewater	2020	1 year in Council Water and Wastewater management
Ada Pasanen	Environmental Technical Officer	2020 and 2022	5 years in Council water and wastewater compliance management
Mitchell Simpson	Team Leader Water Reticulation	2020 and 2022	3 years in Council Water and Wastewater management
John Petherbridge	Assistant Team Leader Water Quality	2020 and 2022	6 years in Council Water and Wastewater management
Jason Wilkie	Team Leader Wastewater	2020	10 years in Council Water and Wastewater management
Melissa Mitchell	Environmental Technical Officer	2020	<1 year in Council Water and Wastewater compliance management. 17 years in DSC
Jonathan Ward	Manager Water and Wastewater	2022	Registered Professional Engineer. 30+ years water industry experience, 16 years in Local Government.
Tony Murphy	Disaster Recovery for Water and Wastewater	2024	30+ years water industry experience
Bill Collie	Disaster Recovery for Water and Wastewater	2024	30+ years water industry experience
Fran Morris	Environmental Technical Officer	2024	3+ years with DSC. 20+ years in Natural Resource Management.

Table 11. Unmitigated risks

Hazard	Type of Hazard	Sources of Hazard	Unmitigated Risk			Uncertainty	Comments	Treatment Barrier/s
			Consequence	Likelihood	Risk			
Bacteria/Virus	Biological	Native animals in catchment, ineffective disinfection	Catastrophic	Almost Certain	Extreme 25	Certain	**Rex Creek; Whyanbeel; Daintree bore.** More likely than protozoa, but low risk of human-human pathogenic forms. Zoonotic disease more likely. Risk is same for Daintree Rainwater system as for other catchments. Risk is lower for Daintree Bore but captured under this unmitigated risk score.	Protected catchment, UF, chlorination.
Bacteria/Virus	Biological	Ingress into reservoirs/water mains, insufficient residual disinfection	Catastrophic	Likely	Extreme 20	Confident	Reservoir integrity requires constant attention to ensure that this is managed.	Reservoir integrity, residual disinfection, redosing, mains break procedures.
Cyanobacteria	Biological	algal bloom	Minor	Rare	Low 2	Confident	Shaded intakes, high relief in the catchment, constant flow. Will not build up.	Protected catchment.
Protozoa	Biological	Native animals in catchment, ineffective UF.	Catastrophic	Almost Certain	Extreme 25	Confident	Possible, but high concentrations of human pathogenic forms not considered likely. Risk is same for Daintree rainwater system as for other catchments. Risk is lower for Daintree bore but captured under this unmitigated risk score.	Protected catchment, UF.
Protozoa	Biological	Ingress into reservoirs/water mains	Catastrophic	Likely	Extreme 20	Reliable	Possible, but high concentrations of human pathogenic forms not considered likely.	Protected catchment, UF.
Amoeba (*Naeglaria, Acanthamoeba* etc)	Biological	Ingress into reservoirs/water mains, insufficient residual disinfection.	Major	Possible	High 12	Estimate	If present likely impact to only single person.	residual disinfectant, mains repair procedure.
Chlorate	Chemical	Chemical breakdown.	Moderate	Likely	High 12	Confident	Currently no guideline value, but Qld Health have set a limit of 0.8 mg/l. Council limiting use of hypochlorite solutions.	Moved to gas chlorination at all large WTPs.
Chlorine	Chemical	Chemical overdose.	Moderate	Possible	Medium 9	Confident	Can potentially occur due to equipment failure, operator error or due to sabotage/terrorism.	SCADA control of dosing.
DBPs	Chemical	Elevated organics and long detention times.	Moderate	Likely	High 12	Reliable	Low organic loading and tight membranes reduce formation potential.	UF, stable water, low doses of chlorine, multiple redosing points in longer reticulation systems.
Heavy metals	Chemical	Natural geology	Moderate	Rare	Low 3	Reliable	Acknowledged that metals exist in groundwater naturally.	Monitoring as per the verification monitoring program. Investigative monitoring of Daintree bore before being brought online.
Hydrocarbons	Chemical	Illegal disposal of fuel, etc.	Moderate	Rare	Low 3	Confident	Single issue on lot at Wonga beach - but potential to leach through mains.	Nil required.
Iron	Chemical	Natural geology, sediment.	Minor	Unlikely	Low 4	Reliable	Acknowledged that Iron exists in the natural environment	Raw water intake CCP, UF. Monitoring as per the verification monitoring program.
Lead	Chemical	Pipework	Moderate	Possible	Medium 9	Reliable	Some lead joints in old pipework (Mossman gorge intake). Not believed to be any service connection lead left, when identified it is replaced.	Old mains replacement program. Refer to mains replacement program (in the capital works program).
Manganese	Chemical	Natural geology.	Moderate	Rare	Low 3	Reliable	Acknowledged that Manganese exists in the natural environment.	Raw water intake CCP, UF. Monitoring as per the verification monitoring program.
Pesticides	Chemical	Limited use in catchment.	Moderate	Rare	Low 3	Reliable	Land management activities generally occur downstream of the intake locations within the catchment.	Nil required.
Scaling	Chemical	TDS or organics in raw water.	Minor	Likely	Medium 8	Confident	Catchment characteristics and natural geology influence TDS values and organics in raw water.	CIPs and CEBs.
Taste and odour	Chemical	Algae blooms.	Minor	Unlikely	Low 4	Confident	Catchment characteristics, including high relief, constant flow and shaded intakes reduces risk of build-up.	UF
Taste and odour	Chemical	Regrowth in reticulation.	Minor	Likely	Medium 8	Confident	More likely to occur in longer reticulation systems.	Mains flushing program, stable disinfection program.
Alkalinity	Chemical	Potential change in ratio of surface runoff to springs.	Minor	Unlikely	Low 4	Reliable	Change in alkalinity appears to drive pH change in AC mains.	Nil - but affects water stability in reticulation.

Hazard	Type of Hazard	Sources of Hazard	Unmitigated Risk			Uncertainty	Comments	Treatment Barrier/s
			Consequence	Likelihood	Risk			
High pH	Chemical	Interaction with AC mains.	Minor	Almost Certain	High 10	Confident	As pH increases in AC mains, residual disinfection becomes less effective.	Long-term replacement of AC mains. Monitoring per the verification monitoring program.
Low pH	Chemical	Naturally occurring, chlorine gas	Minor	Almost Certain	High 10	Reliable	Annual pH decline at end of dry season typically < 6.5. Addition of chlorine gas may lower pH further - Whyanbeel has required pH adjustment as a result. Mossman WTP may require in future, but acceptable pH to date.	Sodium carbonate dosing at Whyanbeel, monitoring of operation at Mossman to identify if this is also required. Calcite filter installed after Daintree bore. Monitoring per the verification monitoring program.
Colour	Physical	Naturally occurring	Minor	Possible	Medium 6	Confident		Raw water intake CCP, UF.
Temperature	Physical	Seasonal	Minor	Likely	Medium 8	Certain	Chlorine consumption, regrowth.	Nil required.
Turbidity	Physical	Rainfall events	Minor	Almost Certain	High 10	Certain	High turbidity events are managed through early warning alarm system to reduce damaging treatment plant infrastructure.	Raw water intake CCP, hydrocyclone, pre-filters, UF.
Turbidity	Physical	Sloughing of biofilm, resuspension of sediment in reservoirs/mains	Minor	Possible	Medium 6	Reliable		Mains flushing program, stable disinfection regime.
Radioactivity	Radiological	Natural geology	Moderate	Rare	Low 3	Confident	Radioactivity occurs in the natural environment.	Nil required.
Failure of supply	Whole of System	Drought	Catastrophic	Unlikely	High 10	Unreliable	Climatic change is expected to exacerbate dry periods potentially leading to reduced water supply.	Water restrictions. Investigating alternate source for Mossman/Port Douglas scheme.
Failure of supply	Whole of System	Landslide at raw water intake	Catastrophic	Almost Certain	Extreme 25	Estimate	Event has occurred. Daintree scheme: - Bore functioning in place, public consultation has taken place. Whyanbeel and Mossman- both intakes blocked during TC Jasper. High rainfall events will contribute to landscape instability.	Build system capacity and reticulation inter-linkages. Water restrictions, stored water supplies, alternate supplies. See DMP (e.g. use of pumps to source water from alternate locations, water tanks at key public facilities). Long term plans to build resilience in the system.
Failure of supply	Whole of System	Flood/repeated storms resulting in WTP shutdown	Catastrophic	Almost Certain	Extreme 25	Confident	Successive storms/flooding have shut down production several times to the point of being unable to treat enough water to supply consumers.	Build system capacity and reticulation inter-linkages. Water restrictions, stored water supplies, alternate supplies. See DMP (e.g. use of pumps to source water from alternate locations, water tanks at key public facilities). Long term plans to build resilience in the system.
Failure of supply	Whole of System	Cyclone	Catastrophic	Possible	High 15	Confident	Contingency measures in place ongoing capital works project to provide long term water security.	Generators, cyclone preparedness plans, DMP.
Failure of supply	Whole of System	Loss of power	Catastrophic	Possible	High 15	Confident	Port Douglas worst area, others can be gravity fed under most circumstances. Ergon has improved infrastructure.	Generators, contingency preparedness plans, DMP.
Reduced supply	Whole of System	Demand exceeds capacity	Catastrophic	Almost Certain	Extreme 25	Reliable	This is based off longer term considerations - so while we currently have sufficient capacity, if nothing is done, demand may exceed capacity by 2025. Ongoing capital works project to provide long term water security.	Build system capacity and reticulation inter-linkages.
Operator error	Whole of System	Untrained/overworked/mistake	Catastrophic	Almost Certain	Extreme 25	Confident	Technical equipment requires skilled operational staff and continual training.	Staff training (HR records in Authority).
Sabotage/Terrorism/Cyber security incident	Whole of System	Any chemical or microbiological hazard	Catastrophic	Possible	High 15	Estimate	Council recognises ongoing security assessments are mandatory. This includes cyber security measures.	Regular inspections, security fencing, and CCTV.
WTP fire	Whole of System	Electrical fire	Catastrophic	Rare	Medium 6	Reliable	Electrical fire risks exist.	Regular inspections. Smoke alarms connected to SCADA system.

Table 12. Mitigated Risk Assessment Summary

Site	Ref	Treatment Stage	Primary Hazard	Other hazards managed by barrier	Hazardous Event	Unmitigated Risk	Control Measures in place	Other Measures	Procedure to ensure measure is effective	Mitigated Consequence	Mitigated Likelihood	Mitigated Risk	Uncertainty	Improvement Action Required - Immediate	Improvement Action Required ~ 2 years	Improvement Action Required - Long term
Mossman and Whyanbeel	1MW	Catchment	Bacteria/Virus		Present in catchment - animals	Extreme 25	Disinfection	UF (Bacteria).Promote and support efforts to control feral animal activity in the water supply catchment.	SCADA	Catastrophic	Rare	Medium 6	Certain			
Mossman and Whyanbeel	2MW	Catchment	Protozoa		Present in catchment - animals	Extreme 25	UF	Promote and support efforts to control feral animal activity in the water supply catchment.	SCADA	Catastrophic	Rare	Medium 6	Confident			
Daintree	3D	Bore	Protozoa- Daintree Bore		Ingress into aquifer	High 10	Sealed bore head, UF		SCADA	Catastrophic	Rare	Medium 6	Certain			
Daintree	4D	Bore	Bacteria/Virus Daintree Bore		Ingress into aquifer	High 10	Sealed bore head, UF, chlorination		SCADA	Catastrophic	Rare	Medium 6	Certain			
Mossman and Whyanbeel	5MW	Catchment	Turbidity		Storm events	High 10	Raw water turbidity trigger. Membranes replaced in 2024 for both treatment plants.	Increases capacity of the UF membrane to produce water more rapidly. All membranes replaced in 2024 at Whyanbeel and Mossman/Port Douglas schemes.	SCADA	Minor	Unlikely	Low 4	Confident		1) Planning for redesign of intake at Rex Creek. Project Work Order Number WO6439 (Approved budget $290k)	2) Future Planning for redesign of intake at Whyanbeel.
Mossman	6M	Intake	Failure of supply - Intake		Raw water main break	Extreme 25	Internal conditions assessments carried out frequently. Spare reticulation equipment and fittings available for repairs.	Treated water storage has been increased in Mossman/Port Douglas scheme.	SOP and BCP	Catastrophic	Rare	Medium 6	Confident		Mossman River intake - to be commissioned by 2027, WO6536 (budget $16.4M joint funded with state and federal government)	

Site	Ref	Treatment Stage	Primary Hazard	Other hazards managed by barrier	Hazardous Event	Unmitigated Risk	Control Measures in place	Other Measures	Procedure to ensure measure is effective	Mitigated Consequence	Mitigated Likelihood	Mitigated Risk	Uncertainty	Improvement Action Required - Immediate	Improvement Action Required ~ 2 years	Improvement Action Required - Long term
Mossman and Whyanbeel	7MW	Intake	Failure of supply - Intake		Blocked Johnson screen (Rex Creek)	Extreme 25	Rex Creek intake allows self-cleaning of Johnson screens. All intakes checked regularly.	Treated water storage has been increased in Mossman/Port Douglas scheme.	SOP	Catastrophic	Unlikely	High 10	Reliable		Planning for redesign of intake at Rex Creek and Whyanbeel (see 5MW). Alternative pumping arrangements put into place as a contingency (hire pumps, have been costed, not a permanent option).	
Daintree and Whyanbeel	4DW	Intake	Failed infrastructure		Raw water UF feed pump failure (Daintree/ Whyanbeel).	High 16	Regular maintenance and checks of pumps.	Duty and standby pumps.	SCADA alarms on reservoir levels	Major	Rare	Medium 5	Certain			Asset maintenance program purchased, being implemented
Mossman and Whyanbeel	8MW	Prefilters	Failed infrastructure		Blocked pre-filters	High 16	Duty standby pre-filter operation. Screens replaced in 2024.	WTPs set offline during high turbidity events.	SCADA raw water deviation alarm on UF allows identification.	Major	Rare	Medium 5	Confident		Capital Works Program for new hydrocyclones WO6576 ($600k).	
Mossman and Whyanbeel	9MW	Prefilters	Turbidity		Turbidity above limit	High 10	Raw water turbidity trigger	UF	SCADA, turbidity CCPs, SOP	Minor	Rare	Low 2	Confident			
All	10A	UF membranes	Protozoa	Turbidity	Loss of integrity	Extreme 25	24-hr PDT, new membranes for Mossman and Whyanbeel in 2024	Continuous turbidity monitoring.	SCADA and turbidity CCPs, SOP	Catastrophic	Rare	Medium 6	Confident			
All	11A	UF membranes	Protozoa	Turbidity	Loss of integrity	Extreme 25	Continuous turbidity monitoring, new membranes for Whyanbeel and Mossman in 2024.	24 hr PDT	Turbidity CCP	Catastrophic	Rare	Medium 6	Confident			

Site	Ref	Treatment Stage	Primary Hazard	Other hazards managed by barrier	Hazardous Event	Unmitigated Risk	Control Measures in place	Other Measures	Procedure to ensure measure is effective	Mitigated Consequence	Mitigated Likelihood	Mitigated Risk	Uncertainty	Improvement Action Required - Immediate	Improvement Action Required ~ 2 years	Improvement Action Required - Long term
All	12A	UF membranes	Reduced supply		Membrane scaling reducing plant capacity	Extreme 25	Regular backwashes, including CEB/CIP as required. Aquamanage maintenance contract - 6 monthly for Mossman and Whyanbeel		TMP monitored, high-high alarm for each rack.	Catastrophic	Rare	Medium 6	Reliable			
Mossman and Whyanbeel	13MW	Sodium carbonate dosing	Low pH		pH < 6.5	High 10	Sodium carbonate dosing.	Online pH monitoring at Whyanbeel WTP. In situ pH monitoring within reticulation system	SCADA, pH adjustment OCP, SOP	Minor	Unlikely	Low 4	Confident			
Daintree	14D	Calcite filter after Daintree bore	Low pH		pH < 6.5	High 10	Calcite filter after Daintree bore.	In situ pH monitoring within reticulation system	pH adjustment OCP, SOP	Minor	Unlikely	Low 4	Confident			
Mossman and Whyanbeel	15MW	Chlorination	Chlorine		Overdose	Medium 9	Alerts at 2 mg/L, critical at 4 mg/L (dosing system shutdown).		High CCP, SOP	Moderate	Rare	Low 3	Confident			
Mossman and Whyanbeel	16MW	Chlorination	Bacteria/virus		Insufficient chlorine dose	Extreme 25	Online chlorine monitoring at dosing points.	Two recirculation pumps (duty/standby) at each chlorination system.	SCADA, low CCP, SOP	Catastrophic	Rare	Medium 6	Confident			
Mossman and Whyanbeel	17MW	Chlorination	Chlorate		Chemical breakdown (Mossman/Port Douglas and Whyanbeel)	High 12	Gas chlorination currently installed at all dosing points.	Low organics in source water.		Moderate	Unlikely	Medium 6	Confident			

Site	Ref	Treatment Stage	Primary Hazard	Other hazards managed by barrier	Hazardous Event	Unmitigated Risk	Control Measures in place	Other Measures	Procedure to ensure measure is effective	Mitigated Consequence	Mitigated Likelihood	Mitigated Risk	Uncertainty	Improvement Action Required - Immediate	Improvement Action Required ~ 2 years	Improvement Action Required - Long term
Daintree	18D	Chlorination	Chlorate		Chemical breakdown (Daintree)	High 12	Continuous turnover of sodium hypochlorite solution to reduce product age.	Low organics in source water. Investigative chlorate monitoring in reticulation network completed; all results under 0.8 mg/L.		Moderate	Possible	Medium 9	Reliable			
All	19A	Chlorination	Bacteria/Virus		Ineffective disinfection due to turbidity	Extreme 25	UF		Turbidity CCP for UF	Catastrophic	Rare	Medium 6	Certain			
Mossman and Whyanbeel	20MW	Storage	Bacteria/virus		Ingress into reservoirs	Extreme 25	All active reservoirs inspected and maintained regularly and after storm events.	Primary disinfection at water treatment plants, redosing at reservoirs.	Chlorination CCP	Catastrophic	Rare	Medium 6	Confident			
All	21A	Storage	Protozoa		Ingress into reservoirs	Extreme 25	All active reservoirs inspected and maintained regularly and after storm events.			Catastrophic	Rare	Medium 6	Confident			
All	22A	Storage	Amoeba (Naeglaria, Acanthamoeba etc)		Ingress into reservoirs	High 12	All active reservoirs inspected and maintained. regularly	Primary disinfection at water treatment plants, redosing at reservoirs.	CCP for chlorine	Major	Rare	Medium 5	Reliable			
Mossman and Whyanbeel	23MW	Storage	Reservoir capacity lost		Storage capacity	High 10	Storage capacity increased by building Crees Rd reservoir.	Continuous reservoir inspection program.		Catastrophic	Possible	High 15	Reliable		Build system capacity and reticulation inter-linkages. E.g. Cooya Beach reservoirs to be brought online WO6438 ($1.45M).	

Site	Ref	Treatment Stage	Primary Hazard	Other hazards managed by barrier	Hazardous Event	Unmitigated Risk	Control Measures in place	Other Measures	Procedure to ensure measure is effective	Mitigated Consequence	Mitigated Likelihood	Mitigated Risk	Uncertainty	Improvement Action Required - Immediate	Improvement Action Required ~ 2 years	Improvement Action Required - Long term
Mossman and Whyanbeel	24MW	Reticulation	Protozoa	Bacteria / Virus	Main break	Extreme 25	Network pressure, residual disinfection, mains break procedure.		SOP, CCP for chlorine	Catastrophic	Rare	Medium 6	Confident			
Mossman and Whyanbeel	25MW	Reticulation	Protozoa	Bacteria / Virus	Ingress of contaminated water	Extreme 25	Network pressure, mains break procedure, chlorination (bacteria and virus only)	Boil Water Alert if system is depressurised and ingress is likely	SOP	Catastrophic	Rare	Medium 6	Reliable			
Mossman and Whyanbeel	26MW	Whole of system	Failure of supply - Power		Power failure	High 15	Power supply generally robust with automatic start up generators at water treatment plants. Many areas gravity fed from reservoirs.			Catastrophic	Rare	Medium 6	Confident			
Mossman and Whyanbeel	27MW	Reticulation	Turbidity		Change in flow rate disturbing sediment in pipe	High 10	Mains flushing as required		SOP	Minor	Unlikely	Low 4	Confident			
Mossman and Whyanbeel	28MW	Reticulation	DBPs		Long water age	High 12	Low organics in source water, effective filtration, low chlorine doses.	High water demand in Mossman/Port Douglas scheme.	SOP	Moderate	Rare	Low 3	Confident			
Mossman and Whyanbeel	29MW	Reticulation	Protozoa Retic		Backflow - e.g. from customer meters or standpipes	Extreme 20	Backflow register maintained for all commercial properties.	Backflow devices installed on all standpipes.	Backflow register	Catastrophic	Unlikely	High 10	Estimate		Design and install designated water filling stations within Shire. Request for funding for design in 25-26 budget ($40k)	
Mossman and Whyanbeel	30MW	Reticulation	Chlorine		Overdose	Medium 9	Alerts at 2 mg/L, critical at 4.5 mg/L (redosing shutdown).		CCP	Moderate	Unlikely	Medium 6	Reliable			

Site	Ref	Treatment Stage	Primary Hazard	Other hazards managed by barrier	Hazardous Event	Unmitigated Risk	Control Measures in place	Other Measures	Procedure to ensure measure is effective	Mitigated Consequence	Mitigated Likelihood	Mitigated Risk	Uncertainty	Improvement Action Required - Immediate	Improvement Action Required ~ 2 years	Improvement Action Required - Long term
Mossman and Whyanbeel	31MW	Redosing	Bacteria/virus		Insufficient dose	Extreme 25	Disinfection alarms at 0.7 and critical at 0.2 mg/L.	Primary disinfection provides residual in most cases. Small top-up at reservoirs.	CCP	Catastrophic	Rare	Medium 6	Confident			
Mossman and Whyanbeel	32MW	Whole of system	Protozoa		SCADA/ telemetry failure/Cyber attack	Extreme 25	Regular SCADA backups.		BCP and cyber security arrangement and planning	Catastrophic	Rare	Medium 6	Reliable			
Mossman and Whyanbeel	33MW	Whole of system	Reduced supply		Demand exceeds supply	Extreme 25	Interconnection between schemes upgraded. Asset planning	Water restrictions and water education implemented.	Asset management plan and BCP.	Catastrophic	Likely	Extreme 20	Reliable		Mossman River alternate intake construction (See 6M).	
Mossman and Whyanbeel	34MW	Whole of system	WTP fire		WTP Fire	Medium 6	Can provide raw water with Boil Water Alert.	Water restrictions and water education implemented.	LDMP and BCP	Catastrophic	Rare	Medium 6	Reliable			
Mossman and Whyanbeel	35MW	Whole of system	Failure of supply - Drought		Drought (Mossman, Whyanbeel)	High 10	Restrictions leading to dry season	Construct Mossman River intake to access additional water allocation.		Catastrophic	Rare	Medium 6	Estimate		Mossman River intake construction (see 6M).	
Daintree	36D	Whole of system	Failure of supply - Drought		Drought (Daintree)	High 10	Bore used as main water source. Up to 10 days supply in the raw water reservoir.	Water restrictions and water education implemented.		Catastrophic	Rare	Medium 6	Estimate			Second bore and permanent backup power supply for bore
Mossman and Whyanbeel	37MW	Whole of system	Failure of supply - Flood		Flood	Extreme 25	Sufficient treated water storage. Membrane capacity increased to produce after an event. Emergency water restrictions and demand management in place. Interlinkage between schemes	Build system capacity and reticulation inter-linkages. Daintree scheme has alternative raw water sources (second Bore).	BCP	Catastrophic	Unlikely	High 10	Reliable		Mossman River intake construction (see 6M).	Raw water and treated water storage upgrades (Whyanbeel and Mossman). Funding applications being prepared.

Site	Ref	Treatment Stage	Primary Hazard	Other hazards managed by barrier	Hazardous Event	Unmitigated Risk	Control Measures in place	Other Measures	Procedure to ensure measure is effective	Mitigated Consequence	Mitigated Likelihood	Mitigated Risk	Uncertainty	Improvement Action Required - Immediate	Improvement Action Required ~ 2 years	Improvement Action Required - Long term
Mossman and Whyanbeel	38MW	Whole of system	Failure of supply - Flood	Turbidity in raw water	Landslide	Extreme 25	Sufficient treated water storage, water restrictions.	Alternative raw water sources.	BCP	Catastrophic	Possible	High 15	Reliable		Mossman River intake construction (see 6M).	Raw water and treated water storage upgrades (Whyanbeel and Mossman). Funding applications being prepared.
Mossman and Whyanbeel	39MW	Whole of system	Failure of supply - Cyclone		Cyclone	High 15	Treated water storage at various locations.	Interconnection of Mossman/Port Douglas and Whyanbeel schemes.	LDMP, BCP	Catastrophic	Possible	High 15	Reliable	Develop Level 5 restrictions	Mossman River intake construction (see 6M).	Raw water and treated water storage upgrades (Whyanbeel and Mossman). Funding applications being prepared.
Mossman and Whyanbeel	40MW	Whole of system	Operator error		Operator error	Extreme 25	Operators all Cert 3 (or completing training). Training, experience, mentoring. Operational manuals.	SCADA	HR training register.	Catastrophic	Unlikely	High 10	Estimate		Organisational learning management system (Pulse) to be implemented.	
Mossman and Whyanbeel	41MW	Bypass	Protozoa	Bacteria/virus	Accidental use of bypass	Extreme 25	Bypass valves identified as permanently closed and tagged out.	Operator training	SOP	Catastrophic	Rare	Medium 6	Confident			
Daintree	42D	Raw water reservoir	Failed infrastructure		Loss of raw water reservoir at Daintree due to subsidence.	High 16	Stabilisation works completed, but still a concern. Bypass of Raw water reservoir has been constructed to allow direct feed to UF cartridges.	Sufficient treated water capacity to last 13 days in Daintree. Spare pumps available.	SCADA alarms on reservoir levels	Major	Rare	Medium 5	Reliable			

Site	Ref	Treatment Stage	Primary Hazard	Other hazards managed by barrier	Hazardous Event	Unmitigated Risk	Control Measures in place	Other Measures	Procedure to ensure measure is effective	Mitigated Consequence	Mitigated Likelihood	Mitigated Risk	Uncertainty	Improvement Action Required - Immediate	Improvement Action Required ~ 2 years	Improvement Action Required - Long term
Daintree	43D	Bore	Failed infrastructure		Daintree Bore pump failure	High 16	Spare pump available to be installed, up to 10 days supply in raw water reservoir, mobile diesel generator.	Sufficient treated water capacity to last 13 days in Daintree.		Major	Rare	Medium 5	Reliable			Second bore and permanent backup power supply for bore
All	44A	Whole of system	Operator error		Loss of knowledge	Extreme 25	Ensure all staff know the correct record keeping procedure. SOPs	Assets captured in GIS system. Mentoring /Shadowing.	Asset management plan	Catastrophic	Possible	High 15	Estimate	Reviewing SOPs with operators for update and for training.	Reviewing SOPs with operators for update and for training.	Planning to implement the Assetic maintenance system to capture all reactive break down program maintenance.
All	45A	Whole of system	Sabotage/ Terrorism/ Cyber security incident		Cyber threat/Attack	High 15	Cyber security safeguards and continuous improvements. Essential 8 audit completed identifying vulnerabiliities.	Staff training	BCP and cyber security arrangements and planning.	Catastrophic	Unlikely	High 10	Reliable		Implementing expert recommendations.	
All	46A	Whole of system	Bacteria/Virus		Chemicals Unavailable	Extreme 25	Operational planning to ensure sufficient chemical stock levels available.	UF	BCP	Catastrophic	Rare	Medium 6	Confident			

Raw Water Operational Procedure - Whyanbeel WTP

DOUGLAS SHIRE COUNCIL

What is measured	Where or how is it measured	What is the control point	What are the hazards	Record Keeping
Raw Water Turbidity	Turbidity at any of intake, raw water main or WTP inlet. Measured online by online turbidity meters	WTP Inlet	Turbidity	SCADA records

Adjustment Limit

Turbidity > 20 NTU

Extraction at License

- Shut down plant at 20 NTU
- Check supply volumes to ensure that there is sufficient treated water supply
- If treated water supply is low, contact Team Leader
- Do not restart unless authorised by Team Leader or raw water turbidity is < 20 NTU
- If plant required to operate, reduce production as low as possible to retain adequate supply
- If extraction is at license limit contact Manager
- Consider need to implement water restrictions to comply with extraction license
- Do not operate above extraction limits without written authorisation from Co-ordinator or Manager

Target

Turbidity < 5 NTU

Extraction within license

- Operator receives alarm and paging
- Consider weather event and treated water volumes
- If appropriate reduce plant flow or cease production
- If treated water volumes are low or demand high, continue to treat water
- Extraction limits to be monitored manually.
- Adjust plant production to ensure extraction is below license limits

Water License Extraction Limits

Little Falls Creek Flow Rate (L/s)	Maximum Extraction Rate (L/s)
≤10	0
11-20	5
21-40	10
71-80	20
61-80	30
81-100	40
101-150	50
>151	60

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Level 9, 269 Wickham St
PO Box 612 Fortitude Valley
Qld 4006 Australia
T+61 7 3251 8555
blightanner.com.au

Raw Water Operational Procedure - Mossman WTP

DOUGLAS SHIRE COUNCIL

What is measured	Where or how is it measured	What is the control point	What are the hazards	Record Keeping
Raw Water Turbidity	Turbidity at any of intake, raw water main or WTP inlet. Measured online by online turbidity meters	WTP Inlet	Turbidity	SCADA records

Adjustment Limit

Turbidity > 30 NTU

Extraction at License

- Shut down plant at 30 NTU
- Do not restart unless authorised by Team Leader or raw water turbidity is <30 NTU
- If plant required to operate, reduce production as low as possible to retain adequate supply
- If extraction is at license limit contact Manager
- Consider need to implement water restrictions to comply with extraction license
- Do not operate above extraction limits without written authorisation from Co-ordinator or Manager

Target

Turbidity <20 NTU

Extraction within license

- Operator receives alarm and paging
- Consider weather event and treated water volumes
- If appropriate reduce plant flow or cease production
- If treated water volumes are low or demand high, continue to treat water
- Extraction limits to be monitored online.
- Adjust plant production to ensure extraction is below license limits

Water License Extraction Limits

≤50	0
51-60	5
61-70	15
71-80	20
81-100	30
101-120	50
121-140	70
141-160	80
161-200	100
201-250	125
251-300	150
301-350	175
351-400	200
401-450	225
541-500	250
501-550	275
551-600	300
601-650	325
651-700	350
701-739	370
>740	370

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Qld 4006 Australia
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Raw Water Operational Procedure
Daintree WTP

DOUGLAS SHIRE COUNCIL

What is measured	Where or how is it measured	What is the control point	What are the hazards	Record Keeping
Raw Water Turbidity	Turbidity at any of intake, raw water main or WTP inlet. Measured online by online turbidity meters	WTP Inlet	Turbidity	SCADA records

Adjustment Limit

Turbidity > 20 NTU

Extraction at License

- Shut down plant at 20 NTU
- Check supply volumes to ensure that there is sufficient treated water supply
- If treated water supply is low, contact Team Leader
- Do not restart unless authorised by Team Leader or raw water turbidity is < 5 NTU
- If plant required to operate, reduce production as low as possible to retain adequate supply
- If extraction is at license limit contact Manager
- Consider need to implement water restrictions to comply with extraction license
- Do not operate above extraction limits without written authorisation from Co-ordinator or Manager

Target

Turbidity <5 NTU

Extraction within license

- Operator receives alarm and paging
- Consider weather event and treated water volumes
- If appropriate reduce plant flow or cease production
- If treated water volumes are low or demand high, continue to treat water
- Extraction limits to be monitored manually
- Adjust plant production to ensure extraction is below license limits

Water License Extraction Limits

≤5	0
>5	6
Maximum Daily Volume	0.3 ML
Maximum Annual Volume	80 ML

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Direct Koch Membrane Integrity Pressure Decay Test Critical Control Point Procedure Daintree WTP

DOUGLAS SHIRE COUNCIL

What is measured	Where or how is it measured	What is the control point	What are the hazards	Record Keeping
Pressure decay	Automated PDT program run every 24 hours of filter rack operation	Membrane Filter Racks	Pathogens, turbidity	SCADA records of PDTs, manually record results of tests on daily operational sheet and in operational data spreadsheet

Critical Limit
> 1.5 kpa/min

- Automatic shut down of failed UF rack
- Follow all adjustment procedures as appropriate
- Review reservoir levels (SCADA) to determine if community can be supplied from existing storage until situation is resolved
- Check that Turbidity Critical Limit was continually met since previous passed PDT - if so, no action required.
- If turbidity CCP was also compromised, Environmental Technical Officer (or Water operator) to arrange daily water quality monitoring at treated water reservoir for:
  1. pH
  2. turbidity
  3. *E. coli*
  4. Total and free chlorine
- Report breach to Coordinator Water and Wastewater on CCP reporting form
- If situation cannot be resolved, and rack must be brought online to ensure continuity of supply Coordinator Water and Wastewater or Manager Water and Wastewater to;
  - Provide written direction to Water Treatment Operators or Team Leader
  - Contact Regulator on 1300 596 709 if required
- Manager Water and Wastewater to determine corrective action/incident management if required. This may include actions such as:
- 1. Restart plant under increased monitoring conditions and increased chlorine

  OR
- 2. Restart plant with boil water alert

Adjustment Limit
> 1 kpa/min

- Take rack offline
- Conduct manual PDT and observe for signs of bubbles
- If bubbles observed mark with electrical tape to signal need for maintenance/ repair
- Note the estimated number of leaking straws on the UF rack repair sheet and provide to Team Leader
- If no, or minimal bubbles are observed, this may be an indication of leaking valves/ pipework. Conduct full system check of relevant valves and pipework.
- Fix any identified leaks if possible, or report on UF rack repair sheet and keep rack offline
- On receipt of UF rack repair sheets, Team Leader to schedule repairs as appropriate
- Racks can only be returned to service if the PDT result on a manual or automatic test is < 1 kpa/min
- Provide weekly report to Coordinator Water and Wastewater indicating which racks have exceeded PDT limits, and repairs that were required/ need to replace spare parts.

Target Criterion
< 1 kpa/min

- Record results of each pressure decay test in daily operational sheet
- Enter results in operational monitoring spreadsheet and check trends for any increasing trend or sudden jump in pressure decay
- If increasing trend or jump, consider scheduling a manual PDT to observe for leaks if time permits.
- If manual PDT undertaken, take actions as per adjustment limit actions above
- Record observations in plant diary so other operators are aware of actions that have been taken

The action and critical limits are based on demonstrating that the ultrafiltration membranes achieve a 3.0 log reduction of *Cryptosporidium* under the proposed Health Based Targets Framework.

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Qld 4006 Australia
T+61 7 3251 8555
blightanner.com.au

Direct Memcor Membrane Integrity Pressure Decay Test Critical Control Point Procedure

Mossman WTP and Whyanbeel WTP

DOUGLAS SHIRE COUNCIL

What is measured	Where or how is it measured	What is the control point	What are the hazards	Record Keeping
Pressure decay	Automated PDT program run every 24 hours of filter rack operation	Membrane Filter Racks	Pathogens, turbidity	SCADA records of PDTs, manually record results of tests on daily operational sheet and in operational data spreadsheet

Critical Limit

> 20 kpa/2min

- Automatic shut down of failed UF rack
- Follow all adjustment procedures as appropriate
- Review reservoir levels (SCADA) to determine if community can be supplied from existing storage until situation is resolved
- Check that Turbidity Critical Limit was continually met since previous passed PDT - if so, no action required.
- If turbidity CCP was also compromised, Environmental Technical Officer (or Water operator) to arrange daily water quality monitoring at treated water reservoir for:
  1. pH
  2. turbidity
  3. *E. coli*
  4. Total and free chlorine
- Report breach to Coordinator Water and Wastewater on CCP reporting form
- If situation cannot be resolved, and rack must be brought online to ensure continuity of supply Coordinator Water and Wastewater or Manager Water and Wastewater to;
  - Provide written direction to Water Treatment Operators or Team Leader
  - Contact Regulator on 1300 596 709 if required
- Manager Water and Wastewater to determine corrective action/incident management if required. This may include actions such as:
- 1. Restart plant under increased monitoring conditions and increased chlorine

  OR
- 2. Restart plant with boil water alert

Adjustment Limit

> 10 kpa/2min

- Take rack offline
- Conduct manual PDT and observe for signs of bubbles
- If bubbles observed mark with electrical tape to signal need for maintenance/ repair
- Note the estimated number of leaking straws on the UF rack repair sheet and provide to Team Leader
- If no, or minimal bubbles are observed, this may be an indication of leaking valves/ pipework. Conduct full system check of relevant valves and pipework.
- Fix any identified leaks if possible, or report on UF rack repair sheet and keep rack offline
- On receipt of UF rack repair sheets, Team Leader to schedule repairs as appropriate
- Racks can only be returned to service if the PDT result on a manual or automatic test is < 1 kpa/min
- Provide weekly report to Coordinator Water and Wastewater indicating which racks have exceeded PDT limits, and repairs that were required/ need to replace spare parts.

Target Criterion

< 10 kpa/2min

- Record results of each pressure decay test in daily operational sheet
- Enter results in operational monitoring spreadsheet and check trends for any increasing trend or sudden jump in pressure decay
- If increasing trend or jump, consider scheduling a manual PDT to observe for leaks if time permits.
- If manual PDT undertaken, take actions as per adjustment limit actions above
- Record observations in plant diary so other operators are aware of actions that have been taken

The action and critical limits are based on demonstrating that the ultrafiltration membranes achieve a 3.0 log reduction of *Cryptosporidium* under the proposed Health Based Targets Framework.

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Indirect Membrane Integrity
Permeate Turbidity
Critical Control Point Procedure

DOUGLAS SHIRE COUNCIL

What is measured	Where or how is it measured	What is the control point	What are the hazards	Record Keeping
Individual rack permeate turbidity	Continuous online turbidity and weekly manual grab samples	Membrane Filter Racks	Pathogens, turbidity	SCADA records. Manually record grab sample results on daily operational sheet and in operational data spreadsheet

Critical Limit

> 0.15 NTU

Immediate for grab sample, or with 15 minute delay for online monitoring

- Automatic shut down of failed UF rack
- Follow all adjustment procedures as appropriate
- Review reservoir levels (SCADA) to determine if community can be supplied from existing storage until situation is resolved
- If rack did not shut down automatically after 15 minute delay, and water with >0.15 NTU may have entered reticulation, Environmental Technical Officer (or Water operator) to arrange daily water quality monitoring at treated water reservoir for:
  1. pH
  2. turbidity
  3. *E. coli*
  4. Total and free chlorine
- Report breach to Coordinator Water and Wastewater on CCP reporting form
- If situation cannot be resolved, and rack must be brought online to ensure continuity of supply Coordinator Water and Wastewater or Manager Water and Wastewater to;
  - Provide written direction to Water Treatment Operators or Team Leader
  - Contact Regulator on 1300 596 709 if required
- Manager Water and Wastewater to determine corrective action/incident management if required. This may include actions such as:
- 1. Restart plant under increased monitoring conditions and increased chlorine

  OR
- 2. Restart plant with boil water alert

Adjustment Limit

> 0.1 NTU

Immediate for grab sample, or with 15 minute delay for online monitoring

- Take rack offline
- Review reservoir levels (SCADA) to determine if community can be supplied from existing storage until situation is resolved
- Take manual permeate turbidity sample to confirm result
- If significantly different, clean and recalibrate turbidity meter and resample
- If grab sample confirms value is close to or exceeds 0.1 NTU, conduct manual PDT and observe for signs of bubbles
- If bubbles observed mark with electrical tape to signal need for maintenance/ repair
- Note the estimated number of leaking straws on the UF rack repair sheet and provide to Team Leader
- If no, or minimal bubbles are observed, this may be an indication of leaking valves/ pipework. Conduct full system check of relevant valves and pipework.
- Fix any identified leaks if possible, or report on UF rack repair sheet and keep rack offline
- On receipt of UF rack repair sheets, Team Leader to schedule repairs as appropriate
- Racks may be returned to service if the PDT result on a manual or automatic test is < 1 kpa/ min and turbidity is <0.1 NTU
- If rack does not pass, and water supply security is of concern, immediately complete CCP reporting form and send to Coordinator Water and Wastewater of General Manager Operations.
- Provide weekly report to Coordinator Water and Wastewater indicating which racks have exceeded PDT limits, and repairs that were required/ need to replace spare parts.

Target Criterion

< 0.1 NTU

- Record results of manual grab sample in daily operational sheet
- Enter results in operational monitoring spreadsheet and check trends
- Ensure turbidity meters are maintained (cleaned and calibrated) as per normal schedule
- Record any observations in plant diary

The action and critical limits are based on demonstrating that the ultrafiltration membranes achieve a 3.0 log reduction of *Cryptosporidium* under the proposed Health Based Targets Framework.

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pH adjustment - Whyanbeel Operational Control Point Procedure

DOUGLAS SHIRE COUNCIL

What is measured	Where or how is it measured	What is the control point	What are the hazards	Record Keeping
pH in recirculation line from Whyanbeel Reservoir	Continuous online monitoring at WTP, weekly grab samples	Soda Ash Dosing system	Chlorine sensitive pathogens	SCADA records, grab sample in daily operational monitoring sheet and spreadsheet

Operational Limit

pH <6 or > 7.5

- Automatic alarms (shut down of soda ash dosing at high pH)
- Follow all adjustment procedures as appropriate
- Do not restart Soda Ash Dosing until the cause of the overdose has been rectified.
- Report exceedence to Coordinator Water and Wastewater on CCP reporting form
- if pH < 6, re-establish soda ash dosing
- if pH > 7.5 cease dosing and allow low pH water to reduce the pH of the reservoir - but normal operation can continue
- If pH > 9, report an incident to Regulator as disinfection may be compromised

Adjustment Limit

pH < 6.5 or > 7

- Immediate manual retest
- Check online instrument calibration
- If pH <6.5 Check chemical supply and all dosing lines (e.g. for blockages or leaks), and if dosing system operating correctly, increase dose rate
- if pH > 7, reduce soda ash dose rate
- Review previous chlorine results as recorded on operational check sheet
- Notify Team Leader Water Quality
- Record actions in plant diary
- Report actions to Coordinator Water and Wastewater in weekly report

Target Criterion

pH 6.5-7

- Plant visual inspection, including checking soda ash dosing system.
- Normal dose rate is 0.03 mL/L of 15% soda ash (sodium carbonate)
- Equipment checks and chemical volume
- WTP water sampling and testing
- weekly grab sample (compare to online instrument)
- Record results in operational sheet and spreadsheet
- Instrument maintenance and calibration as required

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Chlorination (Primary and Re-dosing) Critical Control Point Procedure

DOUGLAS SHIRE COUNCIL

What is measured	Where or how is it measured	What is the control point	What are the hazards	Record Keeping
Free chlorine in treated water reservoir and reticulation network reservoirs	Continuous online monitoring at WTPs Craiglie, Rocky Point and Flagstaff Reservoirs, weekly manual grab samples	Chlorine dosing system	Chlorine sensitive pathogens	SCADA records, grab sample in daily operational monitoring sheet and spreadsheet

Critical Limit

< 0.2 mg/L or > 4.5 mg/L

online for > 15 min

+ Automatic alarms
+ Follow all adjustment procedures as appropriate
+ Check reservoir chlorine levels to ensure within adjustment limit
+ Consider need to adjust target at Reservoirs or need to manually dose reservoirs
+ On breach of low level critical limit, Environmental Technical Officer (or Water Operator) to arrange water quality monitoring at reticulation sampling locations for:
  1. pH
  2. turbidity
  3. *E. coli*
  4. Total and free chlorine
+ On breach of high level critical limit, Environmental Technical Officer (or Water operator) to arrange water quality monitoring at reticulation sampling locations for:
  1. Total and free chlorine
+ Report breach to Coordinator Water and Wastewater on CCP reporting form
+ If situation cannot be resolved, Coordinator Water and Wastewater or Manager Water and Wastewater to;
  + Provide written direction to Water Treatment Operators or Team Leader
  + Contact Regulator on 1300 596 709 if required
+ Manager Water and Wastewater to determine corrective action/incident management if required. This may include actions such as:
+ 1. Consider need to take reservoir offline

  OR
+ 2. Calculate chlorine contact time in conjunction with UF operation to inform need to consider issuing boil water alert

Adjustment Limit

< 0.7 mg/L or > 2 mg/L

online for > 15 min

+ Immediate manual retest
+ Check online instrument calibration
+ Check chemical supply and all dosing lines (e.g. for leaks)
+ Resolve any identified issue
+ Review previous chlorine results as recorded on operational check sheet
+ Notify Team Leader Water Quality
+ Record actions in plant diary
+ Report actions to Coordinator Water and Wastewater in weekly report

Target Criterion

1.0 - 1.5 mg/L

+ Plant visual inspection, including checking chlorine dosing system.
+ Equipment checks and chemical volume (e.g. weight of cylinders, remaining liquid or solid)
+ WTP water sampling and testing
+ weekly grab sample (compare to online instrument)
+ Record results in operational sheet and spreadsheet
+ Instrument maintenance and calibration as required

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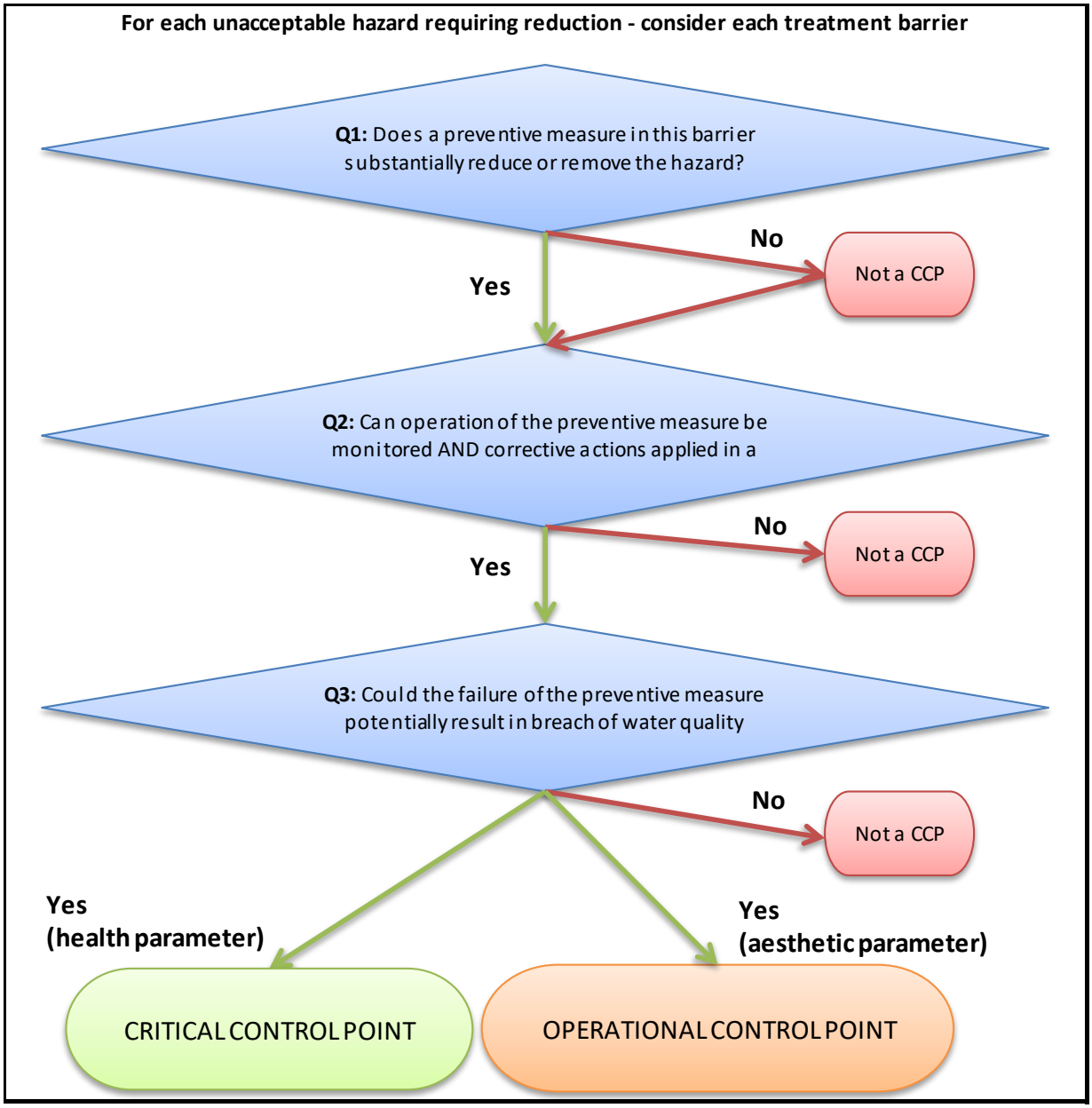
Table 13. CCP decision tree



ELEMENT 3: PREVENTIVE MEASURES FOR DRINKING WATER QUALITY MANAGEMENT – CRITICAL CONTROL POINTS

For hazards that are unacceptable without treatment, but acceptable following treatment using a robust barrier, the process was assessed to determine whether the process was a critical control point. This is included in the risk register on the previous pages. The CCP decision tree in Table 14 was used to determine CCPs.

The actual CCP procedures were included in the preceding pages.

ELEMENT 4: OPERATIONAL PROCEDURES AND PROCESS CONTROL

Operational monitoring is based off the OCP and CCP procedures. Where possible these procedures are directly embedded into the SCADA system. This removes some of the risk that the procedure is not implemented as the SCADA system will send pages and alarms to operators or shut down processes automatically.

Corrective actions

Corrective actions are undertaken as defined in the OCP/ CCP tables. Where manual tests indicate that water quality is outside the OCP/ CCP action limits, the benchtop instruments are recalibrated, and the sample retested. If the sample still fails, the online instrumentation is recalibrated.

Breaches of action limits always result in operators taking the appropriate actions to bring the process back within normal operational limits and, reporting to the Team Leader as per the CCP procedures and the incident and emergency response plan.

If a critical limit is breached, the CCP actions are implemented, and the Manager Water and Wastewater is informed as soon as possible. This is defined as an operational action under the incident and emergency response plan but may be escalated to a reportable incident if necessary.

Equipment capability and maintenance

Online instruments are calibrated and maintained according to manufacturer specifications. Calibrations are also conducted when operators identify differences between online and benchtop instruments.

Other procedures

Other procedures related to drinking water management are listed in the following table.

Table 14. Relevant procedures

Procedure	Document Number	Approved	Date reviewed
Water Main Breaks SOP	#914997	Manager Water and Wastewater	Apr-25
Inspection and Maintenance of Intakes - All Water Intakes	#811032	Manager Water and Wastewater	May-25
Raw Water Turbidity Monitoring Mossman WTP	#878093	Manager Water and Wastewater	May-25
Ultrafiltration Cartridge Fibre Repair	#878100	Manager Water and Wastewater	Dec-19
Mossman WTP - Ultrafiltration Plant CIP	#878097	Manager Water and Wastewater	Sep-19
Whyanbeel WTP - Ultrafiltration Plant CIP	#878098	Manager Water and Wastewater	Sep-19

Procedure	Document Number	Approved	Date reviewed
Daintree WTP - Ultrafiltration Plant CIP	#878096	Manager Water and Wastewater	April-21
Whyanbeel WTP - pH Adjustment	#878091	Manager Water and Wastewater	May-25
Chlorination (Primary and Re-dosing)	#878088	Manager Water and Wastewater	Apr-25
Treated Water Turbidity Monitoring - Water Treatment Plants	#878089	Manager Water and Wastewater	May-25
Accidental Bypass	#810989	Manager Water and Wastewater	Apr-25
Mossman WTP - Chlorine Gas Dosing Facility Safety and Emergency Management Plan	#861547	Manager Water and Wastewater	May-19
Council Metered Standpipes Conditions of Hire and Use	#819971	Manager Water and Wastewater	May- 24
DSC Operational Business Continuity Sub- Plan for Water and Wastewater	#948661	Manager Water and Wastewater	Dec-23
Local Disaster Management Plan	#1195410	CEO	Dec-24
Emergency Water Supply Plan	#1213330	Manager Water and Wastewater	Mar 2024

ELEMENT 5: VERIFICATION OF DRINKING WATER QUALITY

Purpose and principles

Verification monitoring has been comprehensively reviewed and altered on the following basis.

Demonstrating a safe supply

- CCPs – the CCPs are in place to ensure that the ultrafiltration membranes are intact. This is done by two complimentary CCPs, the indirect (continuous turbidity) and direct (pressure decay test) limits ensure at least 3-log reduction of *Cryptosporidium* and allow credit to be claimed for bacterial and viral reduction.
- Chlorination CCP is then in place to ensure that any remaining bacteria and viruses are inactivated.
- If the chlorination CCP is breached on the low critical limit, a stated action is to undertake additional *E. coli* sampling.

As the chlorination CCP applies at the WTP (ensuring a primary kill) and is duplicated in the reticulation reservoirs, there is continuous online monitoring of chlorine residuals. As such, if the plants are operated with the CCPs within the target ranges, we have high confidence that the water supply is safe.

Supporting programs

1. Reservoir inspections are undertaken at least every 6 months (and on an ad hoc basis), usually pre and post wet season, to ensure the integrity of the structures and to check run-off and vermin proofing. A procedure has been developed and a checklist is completed during each inspection. Any points of ingress or other damage recorded on the checklist. The completed checklist is sent to the Team Leaders and Coordinator Water and Wastewater who programs necessary repairs with priority based on the risk to the integrity of the water supply (iAuditor).
2. Network operations have a routine flushing program that ensures that the primary mains into the reticulation zones are regularly flushed. This is typically monthly in each zone. Mains are flushed until the chlorine residual is above 0.2 mg/L.
3. Operators undertake regular reticulation chlorine testing in the reticulation network and initiate ad-hoc flushing when the residual is <0.2 mg/L.

Routine monitoring programs

As chlorine residual is used as the mechanism to ensure safe water, *E. coli* testing is not likely to result in positive tests at the water treatment plants. Therefore, WTP *E. coli* samples are no longer considered necessary, except when investigating an incident.

Similarly, reservoirs have SCADA alarms for action and critical limits, and are operated under the same chlorination CCP as at the WTPs. Again, these are not considered as high priorities to monitor as frequently as previously.

Instead, the focus is to ensure that the individual reticulation zones are monitored regularly with monthly sampling at the reservoirs. The number of sampling sites has been reduced to one per reticulation zone rather than the previous 2-3.

Public Health Regulation (PHR) requirement

PHR Schedule 3A sets the standards for frequency of sampling based on the population of the water provider. The Australian Bureau of Statistics lists the population of Douglas Shire 12,445 (based on 2021 census). However, based on SWIMs reporting, the population is currently higher (>15,000) and potentially reaching >16,500 within 10 years. The population also increase considerably at peak tourist times. The PHR requires 1 *E. coli* sample per week for populations above 5,000, with an additional monthly *E. coli* sample for every 5,000 people that exceed 5,000 population. For a population of almost 16,000, the minimum requirement is one per week plus three per month, or a total of 88 *E. coli* samples per year. Based on the current sampling program we are collecting over 400 *E. coli* samples per year (351 on drinking water, 65 on raw/intake water and 26 on a non-potable water source), using a combination of internal and NATA testing.

Schedule 3A also sets the value that must be met per sample as well as the annual value. *E coli* results are presented in Appendix A.

Sampling locations

The sampling locations for each scheme are shown on maps in the following pages. The table opposite indicates the frequency of monitoring. The monitoring locations are chosen to be representative of the water delivered to customers (reservoirs) or to identify problems (end of reticulation zones). The balance of sites ensures we can demonstrate we produce safe drinking water.

External laboratory samples and parameters.

- Raw water is monitored quarterly for Alkalinity, Ca, Colour, EC, F, Hardness, Mg, pH, K, Silica, Na, SO_4, turbidity, Fe, Mn, Pb, Cu, TDS, TON, TN, NH_4.
- Monthly samples are taken from reservoir locations for Alkalinity, pH, and *E. coli*.
- Reticulation samples are analysed monthly for colour, pH, E coli, Cu, Fe, Pb, Mn and turbidity.
- In 2020/21, we commenced investigative monitoring of chlorate in the Daintree scheme to determine baseline concentrations. Monitoring is conducted quarterly across seasons to capture whether there is increased breakdown in summer due to temperature effects or winter due to less chemical turnover. If results are consistently below 0.5 mg/L the need to continue monitoring will be reconsidered. The results so far are presented in the table below. All testing is undertaken by a NATA-accredited laboratory.

Sample site	Sample date	Test	QH limit	Result	Units
Daintree - Shire Hall	2/12/2020	Chlorate	0.8	0.012	mg/L
Daintree - Shire Hall	24/02/2021	Chlorate	0.8	0.635	mg/L
Daintree - Shire Hall	2/06/2021	Chlorate	0.8	0.248	mg/L
Daintree - Shire Hall	20/10/2021	Chlorate	0.8	0.19	mg/L
Daintree - Shire Hall	15/12/2021	Chlorate	0.8	0.586	mg/L
Daintree - Shire Hall	9/03/2022	Chlorate	0.8	0.417	mg/L
Daintree - Shire Hall	1/06/2022	Chlorate	0.8	0.24	mg/L

Internal testing and parameters.

Raw water is sampled monthly for *E. coli*.

Reticulation samples are tested for pH, chlorine, and *E. coli* (Colilert) as indicated in the table below. We sample every week of the year, alternating between the identified sample locations.

The parameters monitored allow Council to observe trends in water quality throughout the schemes and has (in the example of changing pH) led to the replacement of aging AC mains that result in increasing pH in reticulation. Similarly, by monitoring for iron, manganese, lead, copper, and alkalinity, we can observe changes in the reticulation network over time. Turbidity monitoring alerts the water maintenance team of any damage/ingress to reticulation pipework and triggers and investigation.

Event based and investigative monitoring.

Douglas Shire Council will also initiate investigative water quality sampling if there are events likely to impact on water quality.

For example, Council undertook investigative THM (Trihalomethanes) monitoring under the previous DWQMP, and all results were consistently below 200 μg/L (refer to Appendix A for results of the monitoring). As stated in the previously approved DWQMP, this was a trigger point to cease THM sampling.

If there are events that occur in the catchment or reticulation network, we will undertake monitoring to identify the cause of the issues, and take actions as described in the incident response plan.

Response to exceedance

Where any exceedance of the water quality criteria is identified, this activates the incident and emergency plan and is immediately treated as a Reportable incident or emergency. We will report events as required under the conditions of approval of the DWQMP.

Scheme-by-scheme monitoring locations.

Sampling locations are identified in the following table and maps:

Mossman/Port Douglas (pop < 15000)	Raw	Reservoir	Retic
Mossman Intake	Monthly		
Cassowary - Bunns Corner			Alternate weeks
Cooya Beach - Northern End - Boat Ramp			Alternate weeks
Craiglie - Reef Park Reservoir		Monthly	
Flagstaff - Reservoir		Monthly	
Four Mile Beach - Barrier Street			Monthly
Cooya Reservoir		Monthly when commissioned	
Four Mile Beach - Esplanade			Alternate weeks
Mossman - Davis Park in front of Church			Alternate weeks
Mowbray - Connolly Road			Monthly
Newell Beach - Esplanade - T-Intersection			Alternate weeks
Crees Road Reservoir		Monthly	
Whyanbeel (pop < 5000)	Raw	Reservoir	Retic
Whyanbeel Intake	Monthly		
Rocky Point - Hibiscus Ct			Alternate weeks
Rocky Point Reservoir		Monthly	
Wonga Beach - Esplanade			Alternate weeks
Daintree (pop < 1000)	**Raw**	**Reservoir**	**Retic**
Daintree Raw Water	Monthly		
Daintree Bore	Monthly		
Daintree Rainwater	Monthly when raining		
Daintree - Shire Hall			Alternate weeks

TOTAL	48 - not counted to PHR requirement as raw water	48	244

Alternate Weeks - in Whyanbeel means that samples are taken weekly, alternating between the two Retic sites of Wonga Beach and Rocky Point Hibiscus Ct. In Daintree, samples are taken every two weeks at the Shire Hall. In Mossman/Port Douglas, each site is sampled in every two-week period, with samples taken for at least two sites every week. Monthly samples are additional to this.

In this way each scheme meets the PHR, well above minimum requirements.

Quality assurance

Monthly duplicate *E. coli* samples are taken from 4 sites and tested internally (Colilert) to compare with the external (NATA) *E. coli* samples.

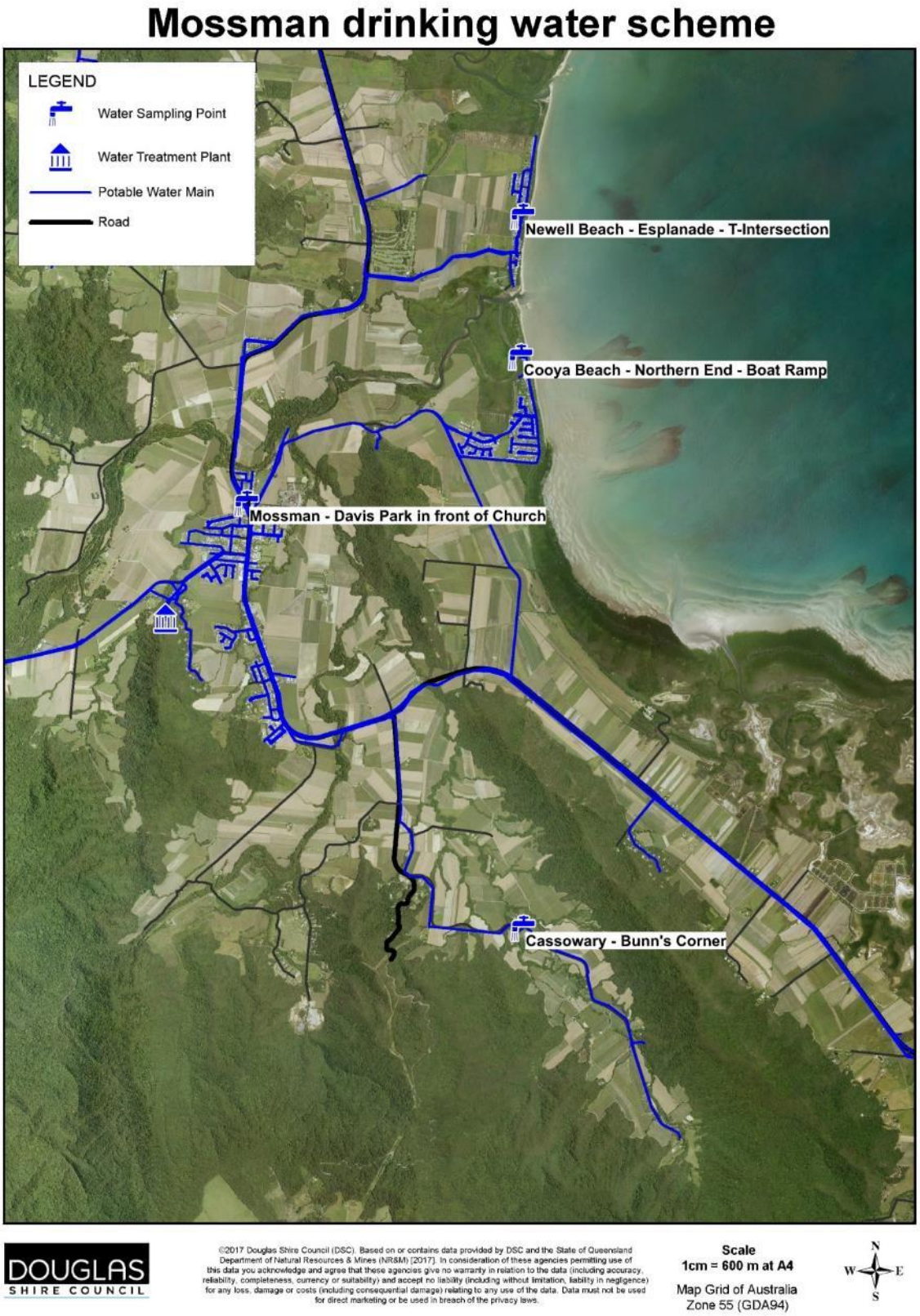


Figure 11. Mossman sampling locations

Mossman/Port Douglas drinking water scheme

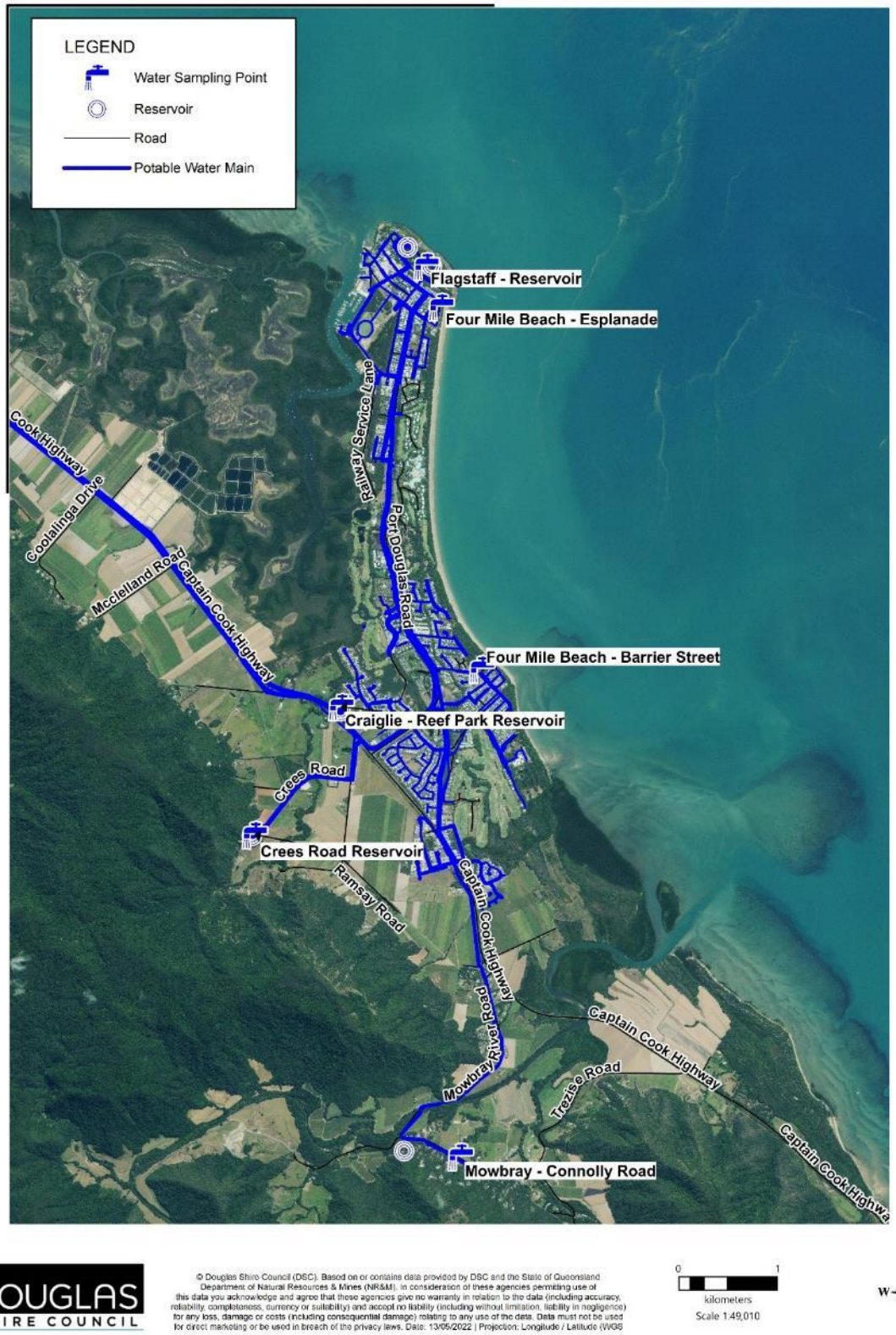


Figure 12. Port Douglas sampling locations

Figure 13. Whyanbeel sampling locations

Daintree drinking water scheme

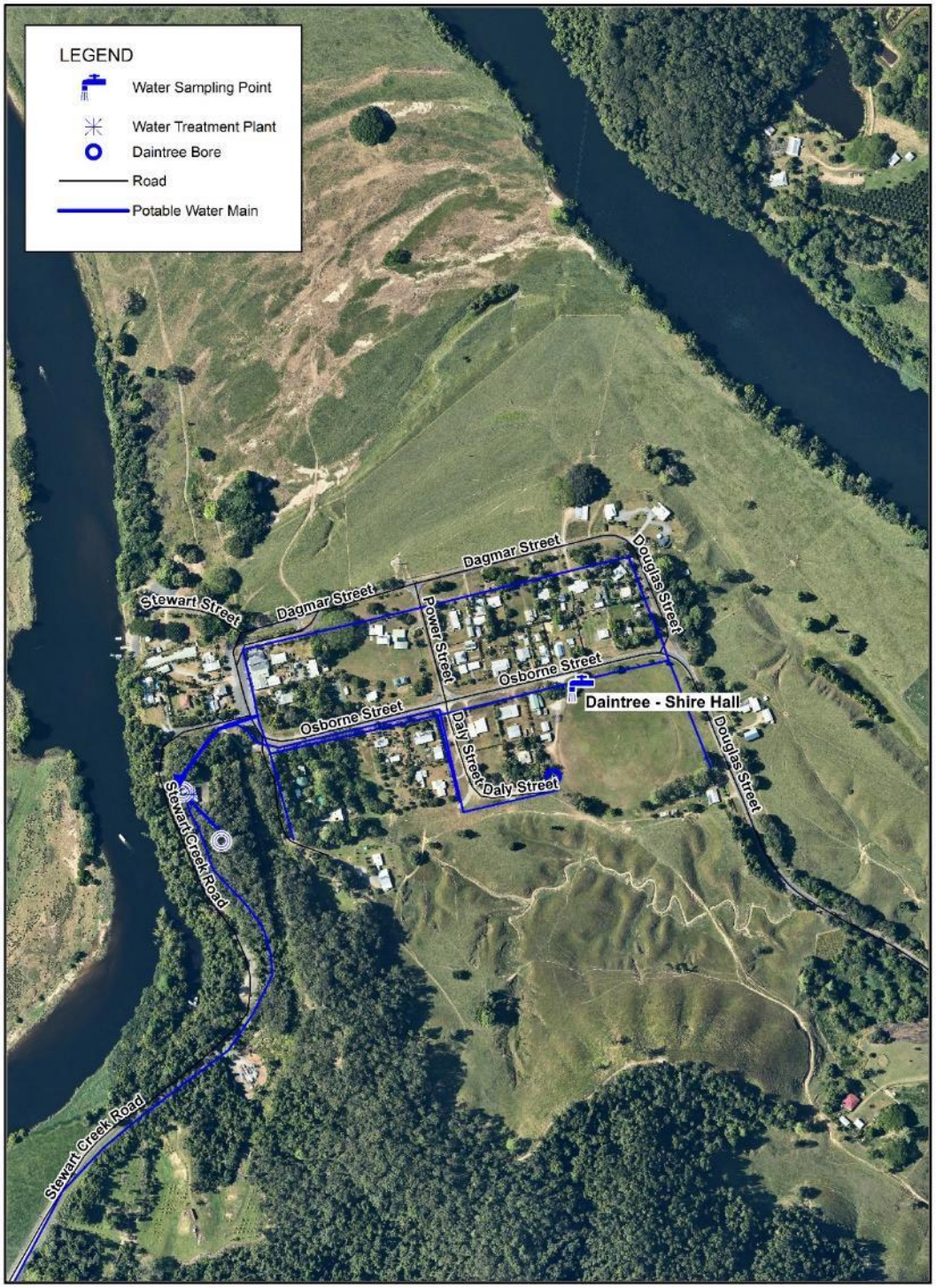


Figure 14. Daintree sampling locations

ELEMENT 6: INCIDENT AND EMERGENCY RESPONSE

Levels of Incident are as defined below:

- High – Declared Disaster
- Medium – Incidents and Emergencies
- Low – Operational Action

Table 15. Emergency response levels

Alert Level	Description	Key management response(s)	Position(s) responsible
High: **Declared Disaster**	Declared disaster. Examples include a cyclone or asignificant flood.	Activate disaster managementplan.	CEO
Medium: **Incidents and Emergencies**	Exceedance of ADWG healthguideline value Outbreak of waterborne disease Detection of a parameter with no water quality criteria that may havean adverse effect on public health An event which is beyond the ability of DSC to control and may have an adverse effect on public health. Loss of water supply for >6 hours. Cyber Security Incident likely to impact ability to supply safe drinkingwater.	Activate incident response plan. Ensure all control measures identified in the DWQM Plan are functioning effectively.	Coordinator Water and Wastewater Team Leader Water Quality Environmental Technical Officer Waterand Wastewater
Low: **Operational Action**	Exceed operational limit Exceed critical limit, but not ADWG Health Guideline. Effectively managed by the water treatment team undertaking operational actions in line with ourDWQMP.	Ensure all barriers are functioning effectively. Check and act upon operationsand maintenance records and procedures. Take appropriate actions to rectify situation.	Team Leader Water Quality WTP operators

Table 16. Summary of emergency responses

Alert Level	Key management response(s)	Brief summary of actions	Documented Plans & Procedures
High: **Declared Disaster**	Activate disaster management plan.	Notify CEO Coordinate internal notification, investigation and response of waterrelated aspects Consider what community notification is needed (if any) e.g. do not drink alert, boil water alert or bottled/emergency water distribution Notify Regulator of escalation from incident/event or of standalone emergency as soon as practicable	Disaster management plan.
Medium: **Incidents and Emergencies**	Activate incident response plan. Ensure all barriers identified in the DWQMP are functioningeffectively.	Notify Manager Water and WastewaterNotify Regulator of any reportable incidents immediately (within 3 hours). Ensure all control measures identified inthe DWQMP are functioning effectively Commence investigation Arrange for re-samples to be taken (where required) Implement appropriate immediate remediation actions, (this may include hand dosing reservoirs, flushing of mains,or isolation of affected areas) Consider what community notification is needed (if any) e.g. do not drink alert, boil water alert or bottled/emergency water distribution Review associated laboratory reports and operational records In case of customer complaints, coordinate investigation and resolution, including obtaining water samples whererequired	Incident response plan (this document) DSC DWQMP
Low: **Operational Action**	Ensure all operational steps identified in the DWQMP are functioningeffectively. Check and act upon operations and maintenance records and procedures.	Notify Team Leader Water. Quality. Review operations and maintenancerecords for anomalies Commence investigation to determinecause, if not identifiable through operational records Investigate immediate remediationactions Increase operational monitoringfrequency where required	Operations and maintenance records andprocedures. DSC DWQMP. Routine monitoring

Operational actions

At this level, operational actions are required to manage the issue and prevent escalation.

Issues at this level are identified by implementation of the CCP Procedures. Corrective actions will be taken according to the specific CCP - either at the adjustment or at the critical limit.

Exceedance of a critical limit does not automatically escalate a CCP response to the next incident and emergency level if the water quality criteria are not breached.

Reportable incident or emergency

At this level, there is a potential for an adverse public health impact (or environmental harm).

These issues are identified through either operational or verification monitoring of the processes and water quality, or where there has been a significant widespread treatment or reticulation network failure resulting in the loss (or likely loss) of water supply for a period >6 hours. When identified, these issues are escalated as required.

In general, the Team Leader Water Quality still manages the incident, but in close consultation with the Coordinator Water and Wastewater and the Environmental Technical Officer.

Appropriate corrective actions will be identified and implemented as soon as practicable to minimise the effect of the incident.

Flow charts indicating Council actions to detections of exceedances of water quality criteria are included in the following pages.

Incidents at this level are reportable to the Regulator. Douglas Shire Council will inform the Regulator within three hours of becoming aware of the incident (three hours allows sufficient time to investigate the cause of the incident and commence corrective actions as soon as possible). Advice may be directly sought from Queensland Health if we believe expert health advice is required.

Resampling: A resample will be arranged immediately (prior to corrective actions) for any parameter where the initial sample did not meet the ADWG health guideline value and another sample taken when corrective actions have been implemented.

Declared Disaster

The CEO and the Coordinator of the Local Disaster Management Group (LDMG) activate the Disaster Management Plan when a Disaster is declared by the State Government.

This requires coordination across Council departments and requires external resourcing and support from agencies, such as Queensland Fire and Emergency Services, Department of Local Government Water and Volunteers, Department of Health, local disaster management groups, emergency responders like Fire and Rescue and Police.

When a Disaster Management Group is stood up, drinking water quality management actions will be taken as necessary to respond to the requirements of the Disaster Coordinator. The Manager Water and Wastewater is a core member of the LDMG and will report directly to the Coordinator of the LDMG on water requirements.

While every effort will be made to continue to implement the Drinking Water Quality Management Plan, Disaster Management actions may take precedence. Every effort will be made to keep the Regulator informed of the situation as soon as practicable.

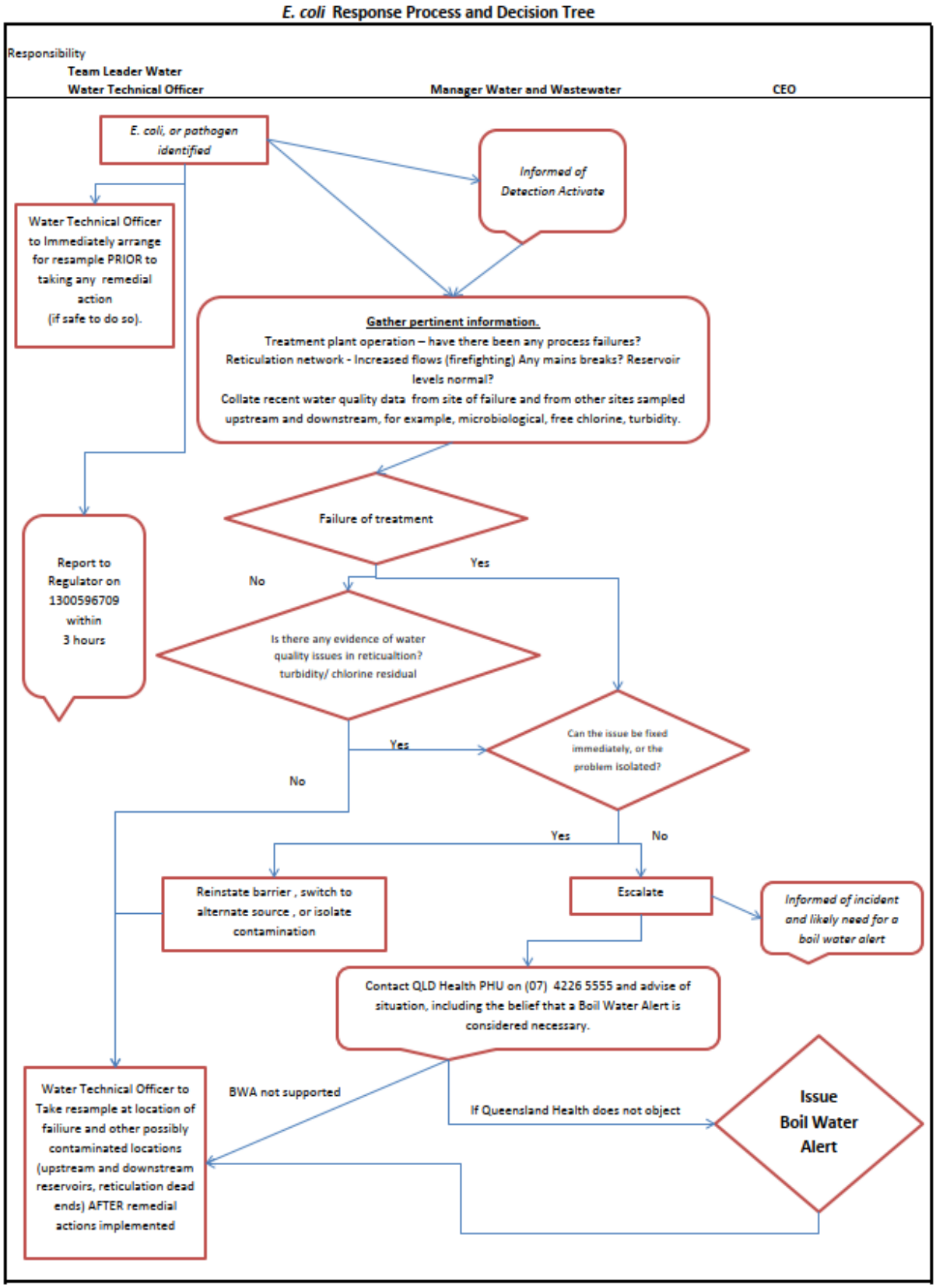


Figure 15. E coli response protocol

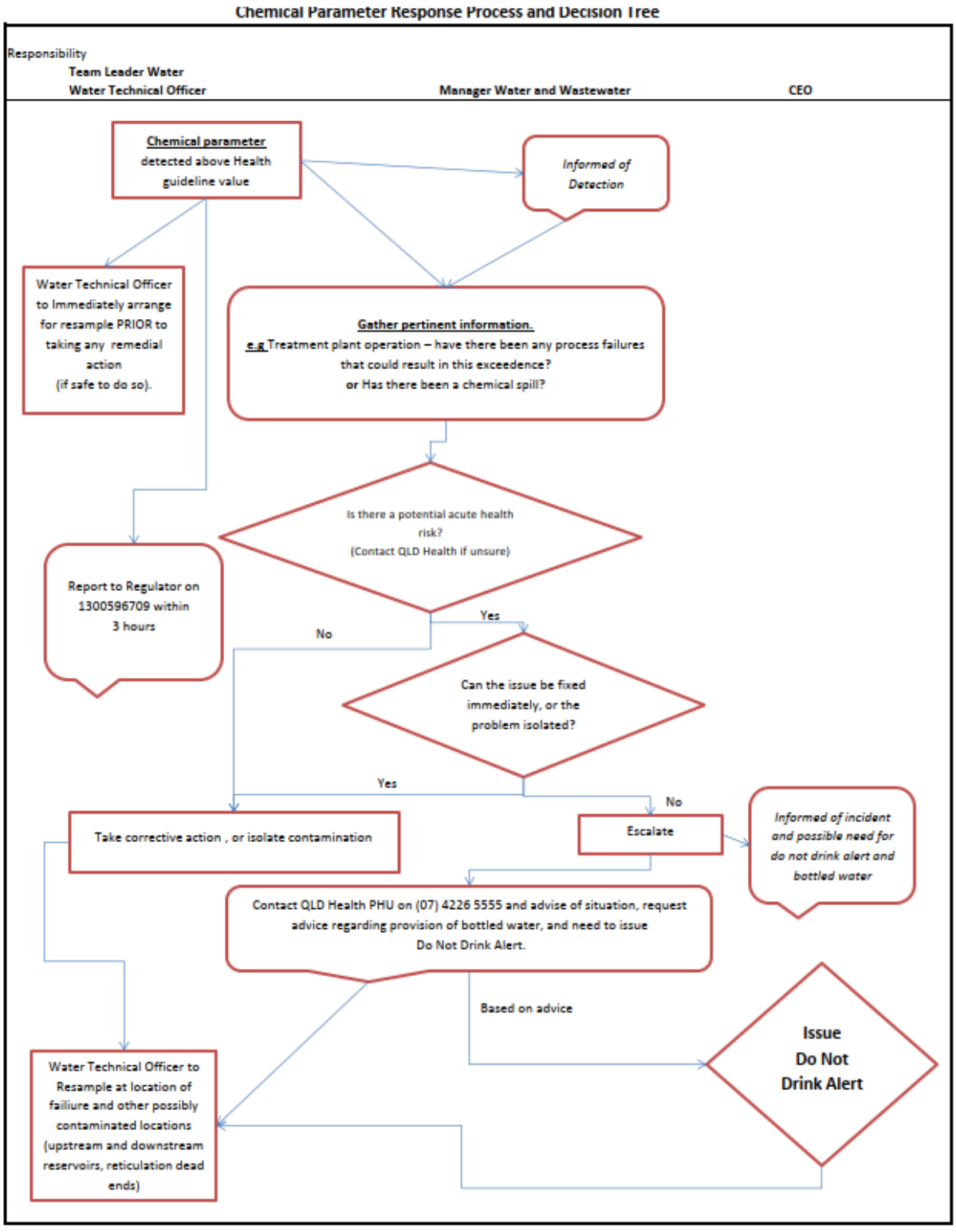


Figure 16. Chemical exceedance response protocol

Precautionary Boil Water Alert
DATE IN EFFECT

Douglas Shire Council advises that consumers in << **Delete any areas that are DEFINITELY not affected** Daintree, Whyanbeel, Rocky Point, Wonga Beach, Cassowary, Mowbray, Craiglie, Port Douglas, Mossman, Coova Beach, Newell Beach, >> should boil all drinking water until further notice.

The water treatment plant is unable to operate normally at this time.
(OR INSERT OTHER REASON)

As a precaution you are advised that water used for consumption should be brought to the boil (for example in a kettle). Water should be transferred to a clean container with a lid and refrigerated or allowed to cool before use.

Boiled or bottled water should be used for:

- Drinking,
- Preparing or cooking food or drinks,
- Washing raw foods such as fruit and vegetables
- Making baby formula,
- Preparing beverages and making ice,
- Brushing teeth,
- Babies and toddlers should be sponge bathed,
- Children should take boiled or bottled water to school.

Be careful to avoid being scalded when handling hot water.

Dishes can be washed in a dishwasher, or can be washed in hot soapy water and dried before using.

Residents can continue to shower and wash clothes as normal.

Douglas Shire Council is working hard to fix the problem.

Further information has been published on Councils website.

Boil Water Alert - *Cryptosporidium (or Giardia)* contamination
DATE IN EFFECT

Douglas Shire Council advises that consumers in << **Delete any areas that are DEFINITELY not affected** Daintree, Whyanbeel, Rocky Point, Wonga Beach, Cassowary, Mowbray, Craiglie, Port Douglas, Mossman, Coova Beach, Newell Beach, >> should boil all drinking water until further notice.

Regular monitoring has detected the presence of *Cryptosporidium / Giardia* in your water supply. These organisms may cause gastrointestinal disease.

Anyone with symptoms such as diarrhoea, abdominal pain, slight fever or vomiting should contact their doctor.

As a precaution you are advised that water used for consumption should be brought to the boil (for example in a kettle). Water should be transferred to a clean container with a lid and refrigerated or allowed to cool before use.

Boiled or bottled water should be used for:

- Drinking,
- Preparing or cooking food or drinks,
- Washing raw foods such as fruit and vegetables
- Making baby formula,
- Preparing beverages and making ice,
- Brushing teeth,
- Babies and toddlers should be sponge bathed,
- Children should take boiled or bottled water to school.

Be careful to avoid being scalded when handling hot water.

Dishes can be washed in a dishwasher, or can be washed in hot soapy water and dried before using.

Residents can continue to shower and wash clothes as normal.

Special care is advisable for certain consumers at this time - these include; people with severely weakened immune systems (the immunosuppressed), individuals receiving dialysis treatment, and aged individuals.

Please contact your doctor or 13 HEALTH for more information.

Douglas Shire Council is working hard with Queensland Health to fix the problem as soon as possible.

Further information has been published on Councils website.

Lifting of Boil Water Alert
DATE IN EFFECT

Douglas Shire Council advises that consumers in << **Delete any areas that are DEFINITELY not affected** Daintree, Whyanbeel, Rocky Point, Wonga Beach, Cassowary, Mowbray, Craiglie, Port Douglas, Mossman, Coova Beach, Newell Beach, >> no longer need to boil their water.

Please run your internal drinking water taps for 5 minutes prior to ceasing boiling water to ensure that any water remaining in your household pipes has been removed.

We apologise for the inconvenience and thank you for your understanding.

DO NOT DRINK ALERT
DATE IN EFFECT

Douglas Shire Council advises that consumers in << **Delete any areas that are DEFINITELY not affected** Daintree, Whyanbeel, Rocky Point, Wonga Beach, Cassowary, Mowbray, Craiglie, Port Douglas, Mossman, Cooya Beach, Newell Beach, >> to DO NOT DRINK tapwater until further notice.

Douglas Shire Council is concerned that the water supply may have been contaminated with (WHAT). And that the water supply may not be safe for consumption.

If you have consumed the water and are feeling unwell, contact your family doctor or Queensland Health on 13 HEALTH.

Bottled will be provided at:
LOCATION
and TIME

OR
Drinking water will be available for collection at:
LOCATION
and TIME

Douglas Shire Council is working hard with Queensland Health to fix the problem.

Further information has been published on Councils website.

Boil Water Alert – detection of *E. coli*
DATE IN EFFECT

Douglas Shire Council advises that consumers in << **Delete any areas that are DEFINITELY not affected** Daintree, Whyanbeel, Rocky Point, Wonga Beach, Cassowary, Mowbray, Craiglie, Port Douglas, Mossman, Cooya Beach, Newell Beach, >> should boil all drinking water until further notice.

Regular monitoring has detected the presence of *E. coli* bacteria in your water supply. *E. coli* itself is generally not harmful but its presence in drinking water does indicate that the water supply *could be* contaminated with organisms that could cause gastrointestinal disease.

As a precaution you are advised that water used for consumption should be brought to the boil (for example in a kettle). Water should be transferred to a clean container with a lid and refrigerated or allowed to cool before use.

Boiled or bottled water should be used for:

- Drinking,
- Preparing or cooking food or drinks,
- Washing raw foods such as fruit and vegetables,
- Making baby formula,
- Preparing beverages and making ice,
- Brushing teeth,
- Babies and toddlers should be sponge bathed,
- Children should take boiled or bottled water to school.

Be careful to avoid being scalded when handling hot water.

Dishes can be washed in a dishwasher, or can be washed in hot soapy water and dried before using.

Residents can continue to shower and wash clothes as normal.

Douglas Shire Council is working hard with Queensland Health to fix the problem.

Further information has been published on Councils website.

ELEMENT 7: EMPLOYEE AWARENESS AND TRAINING

Employee awareness

Water treatment operators are essential to ensure the safe operation of water treatment plants, and in implementing the actions identified in this plan. To engage operators, much of the development of these plans was done in conjunction with operators. It is intended that the DWQMP becomes a useful document within Council that is implemented by the operators, but equally used by managers to demonstrate the need for change and justify budgetary expenditure. It is an expectation of Council and the Coordinator Water and Wastewater that this plan is understood and implemented by relevant staff.

An additional requirement is that staff are aware of their environmental obligations. As such, this plan includes details of how staff are to ensure that they do not cause general environmental harm, nor act contrary to our integrated environmental authority.

Water treatment staff are aware of the actions that they may take at the water treatment plant intakes and into the World Heritage catchment and are also aware that discharges can impact on the Great Barrier Reef.

Employee training

Plant operators and Network (reticulation system) operators were instrumental in developing and reviewing this plan. Operators ensured that the scheme description and operational details were correct and actively participated in the risk workshop. In so doing, this ensured that they are familiar with the plan and their requirements under the plan.

Internal training for operational staff is conducted by way of Toolbox Talks. These are short group information sessions that ensure staff know their responsibilities and are made aware of any changes that affect their daily work processes and tasks.

All plant operators have Cert III in Water Operations. Assistant trainees are currently completing their Cert IIIs consistent with the National Certification Framework for water treatment operators. Douglas Shire Council maintains a list of the relevant qualifications and certifications of operational staff. It is the intent to ensure that all operators maintain competency in the appropriate units applicable to Douglas Shire Council. In addition, specific environmental training may also be considered.

ELEMENT 8: COMMUNITY INVOLVEMENT AND AWARENESS

Council is aware of the importance of keeping our customers informed of significant issues, and significant improvements. Council has engaged with our customers directly, through community meetings, and continues to update the information on our website to provide information. Council clearly states the level of service that customers can expect through our published customer service standards.

Other information is provided at http://douglas.qld.gov.au

Specific water related issues are included in our Council alerts. Council encourages two-way communication and includes relevant contact details on our webpage.

ELEMENT 9: RESEARCH AND DEVELOPMENT

Council undertakes several activities that can be considered as research and development. For example, the testing, validation, and optimisation of new equipment prior to placing it into service.

Council recognises that there is further scope to formalise activities such as the validation of existing barriers. This may become essential if the ADWG adopts microbiological health-based targets.

Health based target initial assessment.

The catchment (World Heritage Protected Area with minimal or no human activity) is conservatively rated as a Category 2 catchment based on elevated *E. coli* results in raw water.

The CCPs for these schemes ensure that we can claim the maximum allowable log reductions for ultrafiltration, and 4-log reduction for bacteria and viruses from chlorination. UV may not be necessary (except in Whyanbeel where, if UF had to be operated outside of the PDT CCP as there is only one rack, if the turbidity was <1 NTU, UV would compensate).

This will be further explored if health-based targets are required to be assessed under the Queensland legislative requirements.

ELEMENT 10: DOCUMENTATION AND REPORTING

There are numerous elements of documentation and reporting that are essential to the safe management of the drinking water supply.

Record keeping

Primarily, Douglas Shire Council uses a system called MagiQ to manage documents and records. This is essentially the same as the previous InfoExpert documentation system. MagiQ has the capability to 'publish' versions to ensure staff members only access the approved and up to date version of documents, there is also the capability to track the history of access to a document in the event of changes being made without prior approval. Records can also have comments within the version field to allow updates and review to be tracked against the version changes.

Douglas Shire Council has Administration Instructions dealing with record keeping and security. There is also a manual available regarding how to use the MagiQ system.

All documents in MagiQ are accessible by management, team members and other internal staff. A copy of the latest version and the relevant documents that apply to their work are available in hard copy, for example, on notice boards within the depot and plants.

Records, and as developed, procedures are saved into MagiQ where they receive a unique document number.

In addition to the MagiQ system, there are other methods in which records are collected and stored. At the water treatment plants, daily sheets are manually filled out to record operational parameters, and these are stored in hard copy at the WTP. WTP monthly and quarterly reports are provided to the Manager Water and Wastewater electronically and are captured in MagiQ.

Continuous online operational data is captured and stored by the SCADA system. The current system retains 12 months of data to allow operators to look at annual trends and archives all older data.

Verification monitoring data is entered weekly into MagiQ, and quarterly and annual reports are prepared by the Environmental Support Officer Water and Wastewater and signed off by the Manager. The Manager Water and Wastewater also reports quarterly to Councillors on all water matters.

All records are kept in accordance with *Public Records Act 2023* requirements.

Procedures

The key procedures for the safe operation of the Douglas Shire Council drinking water schemes are the CCP Procedures. These procedures identify the daily tasks of the operators, and the action and critical responses that are required to prevent a barrier from going out of control.

Reporting processes are the responsibility of the Team Leader Water Quality and Environmental Technical Officer and signed off by the Manager Water and Wastewater.

Cyber security

In 2015, the Queensland Audit department undertook an in depth look into Council ICT environment and operations. This included the water and wastewater systems. As a result, systems and controls were enhanced to reach the current state, as described below.

An example of the work undertaken at that time is the virtual partitioning of Council's network, such that water and wastewater systems cannot see / talk to the general voice and data network on which administrative systems and users sit. Thus, a malware infection in one system does not affect the operation and cannot move from one network to the other.

Council retains the systems integrator (Welcon) who specialise in water and wastewater systems and in particular the SCADA (Supervisory Control And Data Acquisition) computer systems Council uses to manage its plants. Welcon are primarily responsible for the configuration and maintenance of the SCADA system, as they do for many shires in FNQ. Given the current controls and systems design Council regards the water and wastewater systems to be at low risk of a cyber-attack. The controls and protections are described in overview below.

Background to Council's systems

Council maintains three water treatment plants, all managed using SCADA monitoring and control software. Council staff are responsible for the day-to-day activity, while Welcon assist with event escalation, maintenance, and troubleshooting.

None of the water treatment plants can be manually operated. However, all the water treatment plants have water reservoirs and therefore can operate for periods of hours to days without SCADA automation.

At the Mossman WTP manual control, whilst achieving full plant performance, is not possible without the use of the SCADA systems. The SCADA software is configured in a hot standby configuration/architecture on two separate servers to allow for high levels of redundancy.

Current protections

Physical Security

CCTV has been installed at all sites, as a deterrent and to assist police investigating break-ins. No break-ins have occurred in the last 6 years. Water treatment plants are secured by physical locks and keys – both to the site and the control room.

eSecurity

User Access

Access to SCADA systems can be performed remotely or by access to the servers themselves. MFA is required for remote access. Remote access is by controlled RDP – there is no network to network connectivity.

Depending upon how access is performed up to four levels of authentication / password protection is required.

Remote access is provided to a single "gateway" server from tablets. Once authenticated on the gateway server, users can access an RDP file for each plant SCADA servers. Once the user has authenticated to the plant server, they must enter a password in the SCADA software to make changes. All changes and events are logged. Passwords are set to be a minimum of 14 characters and are expired every 6 months.

Staff are required to perform continuous Cyber online training & are subject to periodic phishing test exercises.

All server / workstations have software that prevents non-Council / password protected USB memory sticks being used.

Similarly these devices are hardened so that users cannot open command prompt or execute scripts.

Firewall Protections

Council's firewall has been configured to support the partitioning of Council's network as described earlier. Only the minimum number of IP addresses and ports are permitted by the firewall to / from the SCADA network. The firewall runs an intrusion prevention module, which in addition to sending alarms and notifications, can cut off traffic if tolerances are triggered. This provides protection for common attacks such as Denial of Service.

Cyber security incidents/breaches

The Queensland government has a dedicated Cyber Security Unit (CSU) which assists agencies and to keep then secure from cyber-attacks. The CSU has an agreement with Local Government to provide

cyber security services including access to the Queensland Government Information Security Virtual Response Team (QGISVRT). Any cyber security incident or breach will be reported to the QGISVRT (see details below):
Queensland Government Information Security Virtual Response Team (QGISVRT)
Phone: - 07 3215 3951
Email: - qgisvrt@qld.gov.au
Website: - Cyber Security | Queensland Government Enterprise Architecture (qgcio.qld.gov.au)

Cyber incidents/breaches must also be reported to the Regulator.

Council has a comprehensive Cyber Incident Management procedure and framework, which should the need arise, would manage any cyber attack / breach in the SCADA environment.

Routine maintenance, backup and restoration of services

Routine maintenance

Quarterly on-site visits are performed by Welcon where SCADA software and hardware are checked and any required software upgrades/patching is performed. SCADA software updates for security vulnerabilities are very rare. The risk to Council from SCADA software vulnerabilities is considered low as there is no external integrations – all of Council's SCADA systems operate in a closed network. Traffic in and out of this closed network is tightly managed via the firewall and VPN tunnels.

Patches to operating systems are performed using Microsoft WSUS services – which is unique to the SCADA environment. Patches are applied automatically, with a frequency depending on the device. For servers the updates are configured to download and schedule the installation weekly. For workstations Windows will automatically check, download, and install updates as the patches become available.

Backup and restore/rebuild

The servers where the application and data reside have been configured with redundancy in mind, e.g. RAID disk arrays, dual power supplies. All servers are virtual machines and these are backed up daily to onsite backup servers – to allow for easy and quick complete device restores. The backups are also placed on HDDs which can be taken off site in a rotation fashion.

SCADA system configurations are backed up nightly by scripts maintained by Council's systems integrator. Backups include the Programmable Logic Controllers (PLCs) and SCADA configurations. While data in these systems is transient, the configurations seldom change. The backups allow for reconfiguration/reinstallation of any failed part of the system.

The backups are kept on the SCADA servers onsite, as well as within Welcon's secure storage network. Data is transferred using secure remote access. The Welcon storage network consists of four geographically separated online copies, plus weekly offline backups. Welcon has policies around password expiry and complexity to safeguard client's data.

Previous experience has shown that a SCADA server can be rebuilt/restored to normal operation within 24 hours. Staff within Welcon have access to client data. Each Welcon staff member has signed the appropriate non-disclosure/probity agreements.

ELEMENT 11: EVALUATION AND AUDIT

Long-term evaluation of water quality results and audit of the drinking water quality management are required to determine whether preventive strategies are effective and whether they are being implemented appropriately. These reviews enable performance to be measured against objectives and help to identify opportunities for improvement.

Long-term evaluation of results

Water quality has been assessed as part of the risk assessment process and will continue to be reviewed on an annual basis and prior to reviews, budgeting process and strategic planning process. Annual water quality summaries will be included in the DWQMP report, and this data used to inform future reviews of the DWQMP. The long-term evaluation of results will include:

- Critical control point performance
- Water quality data results
- Incident history and response
- Levels of service
- Actions against the improvement plan

Audits

Auditing is the systematic evaluation of activities and processes to confirm that objectives are being met. It includes assessment of the implementation and capability of management systems. Auditing provides valuable information on those aspects of the systems that are effective, as well as identifying opportunities for improvement.

Regulatory audits

There is a regulatory requirement to audit the DWQMP with the latest date for the audit identified in the Information Notice for the Decision approving the DWQMP. The frequency is currently every four years.

A DWQMP audit was completed in March 2025 by a consultant from Water Futures Pty Ltd, who are Exemplar Global certified drinking water quality management system auditors. The auditor submitted the audit report to the Regulator in May 2025. The purpose of the audit was to:

- Audit the monitoring and performance data provided to the regulator under the plan.
- Assess the service provider's compliance with the plan; and
- Assess the relevance of the plan in relation to the provider's drinking water service.

No non-conformances with the Act were noted during the audit. However, opportunities for improvement (OFIs) were identified. The audit noted that the Council had made excellent progress

within the audit period with respect to reducing risks and innovating in water quality management. Table 17 provides a summary of results presented against auditable elements.

Table 17. Summary of DWQMP audit results

Topic area	Compliance
Audit topic	Summary of compliance status
Verify accuracy of monitoring and performance data communicated to DRDMW	
Verification monitoring	Compliant
Operational monitoring	Compliant
Additional monitoring and performance data (if any) as provided in the Annual Report	Not applicable
Assessment of compliance with the DWQMP	
Implementation of all preventive measures for managing hazards and hazardous events (including those applied in the distribution/reticulation network).	Compliant As OFIs, Council may wish to consider: • Additional undercover storage space at the depot for large parts would be helpful to reduce degradation of parts. In the meantime, finding out from suppliers what parts can be stored outdoors, in what conditions, and for how long, would help prioritise the use of limited storage space.
Implementation of operational and maintenance procedures (including instrument calibration), including availability and currency of the procedures.	Compliant As OFIs, Council may wish to consider: Developing an evidence-based approach for extending the life of reagents and standards past their warranted expiry dates could reduce costs whilst maintaining a defensible position on their use.
Implementation of the process for managing incidents and emergencies including reporting requirements to the Regulator.	Compliant
Implementation of the operational (including CCPs, as relevant) and verification monitoring programs.	Compliant
Implementation of the risk management improvement program	Compliant
Maintaining records using the systems as described	Compliant
Assessment of compliance with DWQMP conditions	
Reporting incidents in relation to events that are beyond the control of the service provider and have the potential to impact public health and for failing to meet water quality criteria as defined in	Compliant

the approval notice, and whether preventative measures taken were adequate to control the hazard.	
Undertaking regular reviews at the frequency specified in the approval notice.	Compliant
The provision and conditions in the approval notice.	Compliant

Internal audits

Douglas Shire Council may also undertake internal audits periodically to satisfy ourselves that we are consistently and demonstrably providing safe water. Where an internal audit is undertaken, the audit outcomes will not be provided to the regulator or made public. Internal audits may address any aspect of drinking water management, for example:

- Implementation of CCPs and responses to exceedances,
- Progress against the improvement plan,
- Record keeping,
- Data collection and management, including reporting requirement,
- Creation of an SOP.

Drinking water quality management plan report

The DWQMP report will be prepared per the guideline and will be published on Council's website to provide customers information on our service.

ELEMENT 12: REVIEW AND CONTINUAL IMPROVEMENT

Review

There is a regulatory requirement to review the DWQMP biannually. The current review and amendment of the DWQMP has been conducted following the external audit of our DWQMP, even though the audit noted no non- conformances.

Council may review more frequently if we believe the DWQMP needs to be updated.

Continual improvement – risk management improvement plan

The purpose of the DWQMP is to identify and manage risks to the services. Improvements are continually being made to water treatment plants and include both larger items identified in the risk management improvement program, and smaller changes to operation or monitoring.

Where Council identifies improvements that can be made, they are implemented. As improvements are intended to reduce the risks to the schemes, this is good management practice. Over time, this will result in slight differences between the management plan and actual operations. This should be expected.

Where outcomes of the scheme-by-scheme risk assessments resulted in mitigated risks that were above medium, risk management improvement items have been identified.

These are listed in the final 3 columns of the mitigated risk assessment tables.

The items have been prioritised according to budget cycles. Where an item is required immediately, Council will undertake actions as soon as practical. Otherwise, items are identified as occurring in particular financial years, as this aligns with Council's budget cycles.

Note: items in the risk management improvement program are indicative of an action that would be suitable to manage the risk. Where alternative measures can be introduced that will similarly result in a reduction of the risk, these alternate actions may take the place the identified items.

As stated, the RMIP informs the capital and operational works planning process. This is done by using the risk assessment and its outcomes and deciding upon the appropriate actions to minimise risks into the future.

The Manager Water and Wastewater and the Coordinator Water and Wastewater are intimately involved in developing the budget and communicating it to the Council Executive and the Councillors.

The current Council is aware of how the DWQMP is developed, and the linkages of capital works projects to identified risks. It is the intent of Douglas Shire Council to continue to engage with Councillors to ensure that the risk management improvement items are prioritised. However, this is dependent on the Council, and their decisions regarding budget allocation. Where Council does not approve budget items, they will be revisited as required, but may not occur in the stated timeframe. Nonetheless, Council is committed to delivering safe drinking water.

APPENDIX A – WATER QUALITY DATA 2014-2023

Mossman treated water – WTP, reservoirs and reticulation.

Parameter	No of samples taken	Max	Average	Min	ADWG Health Guideline	No of samples exceeding ADWG
Alkalinity (mg/L)	356	22	7.9	<5		0
Colour (PCU)	955	6.5	2.93	<5		0
Copper (mg/L)	1050	0.36	0.008	<0.001	2	0
Free Chlorine (mg/L)	3689	2.2	0.7	<0.1	5	0
Iron (mg/L)	1010	0.68	<0.005	<0.005		0
Lead (mg/L)	864	1.5	<0.001	<0.001	0.01	0
Manganese (mg/L)	1000	0.015	<0.0002	<0.0002	0.5	0
pH (pH unit)	4800	10.4	7.3	5.28		0
***E. coli* (MPN/100ml or CFU/100ml)**	4297	1*		<1	Ann value nil found in 98% of samples	0
Turbidity (NTU)	1.29	0.9	0.5	<0.1	5	0

Mossman raw

Parameter	No of samples taken	Max	Average	Min
Alkalinity (mg/L)	40	12	5	<5
Calcium (mg/L)	40	0.8	0.5	0.4
Colour (PCU)	34	20	7.7	<5
Electrical Conductivity (µS/cm)	171	142	30	20
Fluoride (mg/L)	40	0.03	<0.1	0.02
Hardness (mg $CaCO_3$/L)	40	4.1	2.7	2
Magnesium (mg/L)	58	0.5	0.22	0.0006
pH (pH unit)	223	7.8	6.9	6.1
Potassium (mg/L)	40	1.2	0.87	0.08
Sodium (mg/L)	40	4.6	3.9	3
Sulphate (mg/L)	38	1.8	1	0.08
Turbidity (NTU)	181	25	0.8	<0.1
Iron (mg/L)	38	0.8	0.04	0.002
Manganese (mg/L)	40	0.002	0.001	<0.005
Total Dissolved Solids (mg/L)	36	44	30	21
Total Nitrogen (mg/L)	29	0.18	0.09	<0.05
Ammonia (mg/L)	39	0.008	0.0062	0.005
***E. coli* (MPN/100ml or CFU/100ml)**	92	579.4	26.8	0

Whyanbeel treated water – WTP, reservoirs and reticulation.

Parameter	No of samples taken	Max	Average	Min	ADWG Health Guideline	No of samples exceeding ADWG
Alkalinity (mg/L)	228	17	9.6	5		0
Colour (PCU)	251	5	<5	<1		0
Copper (mg/L)	300	0.25	0.01	<0.001		0
Free Chlorine (mg/L)	1389	1.84	0.7	<0.1	5	0
Iron (mg/L)	300	0.07	0.02	<0.005		
Lead (mg/L)	221	0.001	<0.0005	<0.0005	0.01	
Manganese (mg/L)	251	0.0007	<0.005	<0.005	0.5	
pH (pH unit)	1567	9.3	7.6	4.9		
***E. coli* (MPN/100ml or CFU/100ml)**	1399	<1		<1	Ann value nil found in 98% of samples	0
Turbidity (NTU)	48	2.42	1.26	<0.1	5	0

Whyanbeel raw

Parameter	No of samples taken	Max	Average	Min
Alkalinity (mg/L)	51	8	<5	<5
Calcium (mg/L)	39	0.5	0.4	0.18
Colour (PCU)	52	25	10.3	<5
Electrical Conductivity (µS/cm)	117	103.9	27	18.8
Fluoride (mg/L)	40	1	0.118	<0.02
Hardness (mg $CaCO_3$/L)	40	3.8	2.4	2
Magnesium (mg/L)	39	0.56	0.36	0.3
pH (pH unit)	164	7.8	6.5	5.63
Potassium (mg/L)	39	0.9	0.6	0.5
Sodium (mg/L)	39	4.7	3.5	2.8
Sulphate (mg/L)	24	1.9	1.2	0.7
Turbidity (NTU)	154	15	0.8	0
Iron (mg/L)	38	0.08	0.03	0.003
Manganese (mg/L)	40	0.001	<0.005	<0.005
Total Dissolved Solids (mg/L)	36	330	33	<0.5
Total Nitrogen (mg/L)	54	0.25	0.077	<0.05
Ammonia (mg/L)	36	0.08	0.027	<0.005
***E. coli* (MPN/100ml or CFU/100ml)**	100	2,419.6	101.8	<1

Daintree treated Bore water (2022-to date) – Water treatment and reticulation.

Parameter	No of samples taken	Max	Average	Min	ADWG Health Guideline	No of samples exceeding ADWG
Alkalinity (mg/L)	9	21	16.78	12		0
Colour (PCU)	33	<1	<1	<1		0
Copper (mg/L)	33	0.02	0.01	0.001	2	0
Free Chlorine (mg/L)	61	3.8	1.21	0.13	5	0
Iron (mg/L)	21	<0.015	<0.015	<0.015		0
Lead (mg/L)	33	0.0008	<0.0005	<0.0005	0.01	0
Manganese (mg/L)	33	0.04	<0.0002	<0.0002	0.5	0
pH (pH unit)	93	8.1	7.18	6.03		0
***E. coli* (MPN/100ml or CFU/100ml)**	86	<1	<1	<1	Annual value nil found in 98% of samples	0
Turbidity (NTU)	13	0.5	0.3	<0.1	5	0

Daintree raw – bore (2016-2023)

Parameter	No of samples taken	Max	Average	Min
Alkalinity (mg/L)	22	8	4	2.7
Calcium (mg/L)	22	52	6.5	0.1
Colour (PCU)	26	3.8	3.18	<1
Electrical Conductivity (µS/cm)	78	332	75	35.9
Fluoride (mg/L)	20	0.02	0.02	<0.02
Hardness (mg $CaCO_3$/L)	20	130	20.6	3
Magnesium (mg/L)	20	1.3	0.92	0.7
pH (pH unit)	96	7.4	5.35	4.2
Potassium (mg/L)	22	1.7	1.05	0.52
Sodium (mg/L)	22	6.6	5.7	4.9
Sulphate (mg/L)	17	1.9	1.52	1
Turbidity (NTU)	78	6.4	0.7	<0.1
Iron (mg/L)	72	0.665	0.109	0.005
Manganese (mg/L)	42	0.0338	0.0088	0.0046
Lead (mg/L)	64	0.01	0.0027	<0.0005
Total Dissolved Solids (mg/L)	22	170	55	16
Total Nitrogen (mg/L)	11	0.75	0.53	0.36
Ammonia (mg/L)	21	<0.02	<0.005	<0.005
***E. coli* (MPN/100ml or CFU/100ml)**	63	15	5.3	<1

Daintree raw – rainwater system (2020-2021)

Parameter	No of samples taken	Max	Average	Min
Alkalinity (mg/L)	5	7	<1.5	<1.5
Calcium (mg/L)	5	0.35	0.15	<0.1
Colour (PCU)	5	6.9	2.5	<1
Electrical Conductivity (µS/cm)	12	186.4	41	1.5
Fluoride (mg/L)	5	<0.1	<0.02	<0.02
Hardness (mg $CaCO_3$/L)	4	4.3	2	<1
Magnesium (mg/L)	5	0.83	0.3	<0.05
pH (pH unit)	13	6.5	5.9	5.3
Potassium (mg/L)	5	0.39	0.16	<0.015
Sodium (mg/L)	5	6.1	2.5	<0.05
Sulphate (mg/L)	4	2.1	<1	<1
Turbidity (NTU)	11	2	0.8	0.03
Iron (mg/L)	5	0.006	<0.015	<0.015
Manganese (mg/L)	5	0.0048	0.0021	0.0003
Total Dissolved Solids (mg/L)	3	21	14	2.5
Total Nitrogen (mg/L)	3	0.12	0.07	<0.1
Ammonia (mg/L)	3	<0.02	<0.02	<0.02
***E. coli* (MPN/100ml or CFU/100ml)**	9	1732.9	284.1	6.3

THM investigation results – 2014 – 2018 (information identical to DWQMP 2022)

Parameter	No of samples taken	Max	Average	Min
THM Chloroform (µg/L)	132	160	49.1	<0.5
THM Bromodichloromethane (µg/L)	132	16	6.2	<0.5
THM Bromoform (µg/L)	132	<1.0	0.5	<0.5

Daintree treated water – Water treatment and reticulation DWQMP 2022 DATA).

Parameter	No of samples taken	Max	Average	Min	ADWG Health Guideline	No of samples exceeding ADWG
Alkalinity (mg/L)	48	39	24	5		0
Colour (PCU)	97	8	<5	<5		0
Copper (mg/L)	97	0.27	0.013	0.001	2	0
Free Chlorine (mg/L)	499	1.68	0.7	<0.1	5	0
Iron (mg/L)	97	0.202	0.011	<0.005		0
Lead (mg/L)	81	0.005	<0.0005	<0.0005	0.01	0
Manganese (mg/L)	97	0.03	<0.005	<0.0002	0.5	0

pH (pH unit)	578	8.9	7.6	6.6		0
***E. coli* (MPN/100ml or CFU/100ml)**	4150	1*		<1	Ann value nil found in 98% of samples	0

Daintree raw – intake (information identical to DWQMP 2022 (site not in use))

Parameter	No of samples taken	Max	Average	Min
Alkalinity (mg/L)	31	45	22	12
Calcium (mg/L)	31	3.3	2.3	1.2
Colour (PCU)	34	45	10	<5
Electrical Conductivity (µS/cm)	91	146	80	50
Fluoride (mg/L)	31	0.06	0.02	<0.1
Hardness (mg $CaCO_3$/L)	31	20	15	9
Magnesium (mg/L)	31	2.8	2.1	1.4
pH (pH unit)	96	7.7	7	5.6
Potassium (mg/L)	31	2.2	1.3	0.9
Sodium (mg/L)	31	11	9.1	7
Sulphate (mg/L)	31	2.4	1.7	<1
Turbidity (NTU)	88	52	2.5	0.2
Iron (mg/L)	31	0.4	0.2	0.078
Manganese (mg/L)	31	0.009	<0.005	0.0008
Total Dissolved Solids (mg/L)	30	77	62	4
Total Nitrogen (mg/L)	27	0.29	0.15	<0.05
Ammonia (mg/L)	27	0.01	<0.005	<0.005
***E. coli* (MPN/100ml or CFU/100ml)**	82	770	63.1	1

APPENDIX B – DAINTREE BORE DETAILS

Bore 00241