

# Wujal Wujal Aboriginal Shire Council Drinking Water Quality Management Plan 2019



Document Status					
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## REGISTERED SERVICE PROVIDER

Service Provider: Wujal Wujal Aboriginal Council

Contact details: Via Cooktown, QLD 4895

Phone: (07) 40839100; Fax: (07) 40608250

Web: <http://www.wujalwujalcouncil.qld.gov.au>

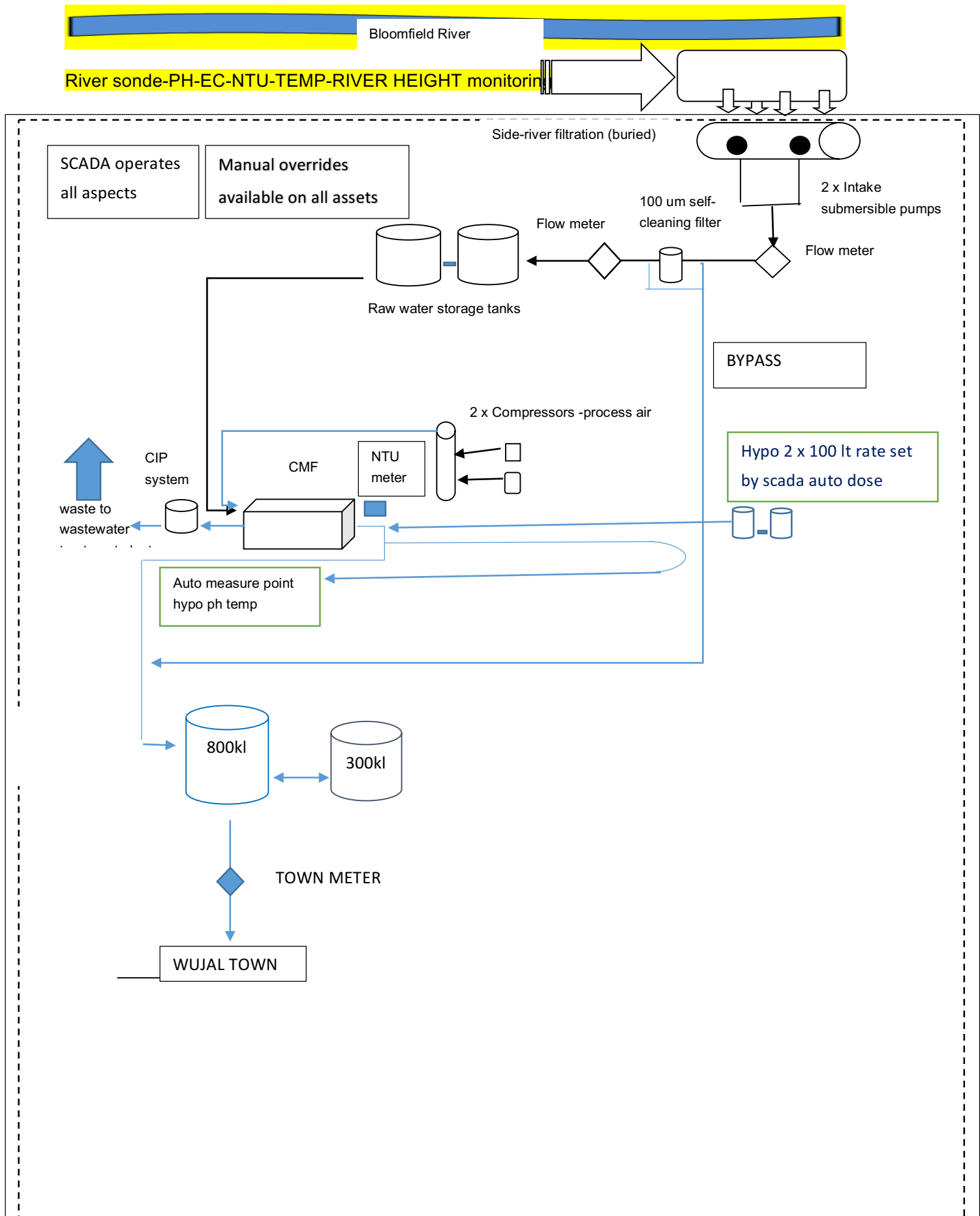
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Service details: Siemens CMF plant including ancillary equipment and town water storage

Scheme name	Operator	Communities served	Current			Projected in 10 years		
			Population	Connections	Demand kL/d	Population	Connections	Demand kL/d
Wujal Wujal	Wujal Wujal Aboriginal Shire Council	Wujal Wujal	480	116	115	680	160	170

## INFRASTRUCTURE DETAILS

### Schematics



## Water Supply Description

Water is sourced from the Bloomfield River, about 1,500 meters upstream of the community (at the tidal limit of the river). The water intake is buried in a gravel filled trench adjacent to the river. Extracted water is pre-filtered and transported to 2 raw water storage tanks from where it goes to the Continuous Micro Filtration (CMF) Water Treatment Plant. At the Plant the water is treated (filtered), after which it is chlorinated with sodium hypochlorite. Automatic backwash system and Clean in Place (CIP) system are used for cleaning the filtration unit.

Treated water is fed into 2 reservoirs from where it is gravity fed to the community. The community comprises of residential dwellings, together with community services (shop, offices, workshops, police station, health centre, kindergarten).

The river intake and reticulation system were totally replaced in 2009.

The infrastructure details and more information on the scheme are provided in the following tables.

## Source

### ***Bloomfield River***

	<b>Bloomfield River</b>
Intake details	8 m long, 200 mm diameter slotted screen, buried in a gravel filled trench adjacent to the river. The screen is joined to two 250 mm diameter casing pipes, each containing a Flygt borehole pump.
Design capacity	2 VSD pumps; one pump at 17 L/s; both pumps at 33L/s (with a 1.5 safety factor)
Servicing	Run hour and bearing condition software monitored- pumps are checked (pulled out) and serviced if required
% of supply	100
Operation	The switchboard and a standby generator for the intake pumps are located on the river bank above flood level. Intake pumps are controlled by telemetry which responds to the water levels in the raw water storage tanks (when the storage tank level is below 20% then the pumps are called for duty). A river sonde monitors EC-PH-NTU to protect against pumping salt water to the

	Treatment Plant. Salt water intrusion is only be an issue during “king tides” (around twice a year) when the sensor will shut down the pumps for around 3-4 hours.
Reliability	Good, reliable source. The average daily demand (115 kL/d) is well below the average daily flow of the river (1,450 ML/d October 2009).
Source pipeline	Underground so not susceptible to damage by vandalism, landslides, falling trees and fire & floods.
Intake pipe age range	< 10 years
Intake protection	Debris and flood protected (buried under gravel).
Water quality issues	Generally good quality water. Salt water intrusion is possible during “king tides”. Snapshot monitoring data shows high aluminium levels, 0.133 mg/L but there is no coagulation done (use of aluminium based coagulant) hence is not of major concern. Apparent colour, 17 Pt/Co units, was noted at the time of the snapshot monitoring which the pre-filtration & microfiltration would reduce. No issues with algal blooms have been observed.

## Treatment

Process	Raw water passes through a pre-filtration system prior to entering the CMF plant. The pre-filtration comprises 1 STF self-cleaning 100µ sintered stainless steel filter installed at river intake The CMF process comprises of 20 x 0.04µ filtration modules. The filtered water is then dosed with sodium hypochlorite for disinfection. Filtrate water is monitored by SCADA 24/7 for turbidity pH and TMP module integrity to specification by SCADA. PDT is performed post CIP to ensure both module and CMF valves are performing to specification.
Design capacity	21 L/s for 24 hours
Normal operations	7L/s
Chemicals added	Sodium hypochlorite (chlorination) purchased as liquid. Granular Citric Acid for CIP process.
Bypass / variation	Raw water can feed into one or both reservoirs (controlled through manual isolation valves located at the Water treatment plant). However, the bypass valve is locked – closed & has never been used or planned to be used.

[Note: µ refers to micrometres in the document].

## PRE-FILTRATION

Details	1 x 100 $\mu$ STF self-cleaning filter.
Operation	Operation is triggered manually by WTP operator (weekly). A bypass is installed so as service can be carried out during operation if required



FIG 2 -1 x 100 $\mu$  STF sintered stainless steel feed water filter at river intake.



## Raw Water Storage Tanks

Name	Tank 1 and Tank 2
Capacity	25 kL each
Material	Polyethylene
Roofed	Yes
Vermin-proof	Yes
Runoff from roof	Directed away, opening on top has raised lip which is then securely covered.
Cleaning	Cleaned in 2016.
Filling	Telemetry controlled when reservoir reaches 20% capacity, intake pumps start operation.



FIG 3 -Raw water storage tanks



## Continuous Membrane Filtration (CMF)

Details	Contains 20 x 0.04µ filtration filters.
Operation	The CMF uses hollow fibre membranes in a self-cleaning system (backwash process). The backwashing is started every 35 minutes or if the trans-membrane pressure (TMP) exceeds 25. kPa (control board). Air supplied by a side channel blower is fed down the hollow centre of the fibre and pressurises the module. The shell side of the module is vented and the pressurised air jets through the fibre pores, percolation removes the built-up solids from the outer surface of the fibres. Feed liquid then flows through the module flushing the solids to backwash drain.
Process	Filtration takes place from the outer surface of the fibre to the hollow inner core. Feed water passes through the porous wall of the fibres while the solids in the feed stream are retained on the outside of the fibre wall. The membrane removes solids larger than 0.04 micrometres (bacteria are typically larger than one micrometre).

## CLEANING IN PROCESS (CIP) SYSTEM

Purpose	To remove the build-up of contaminants that cannot be completely removed by the backwashing process alone.
Operation	The CIP backwashing is placed on a timer and brings up an alarm (advice) after every 250 hours to perform a clean. The CIP process is then started manually through the press of a button.
Process	The Clean-In-Place (CIP) system eliminates the need to dismantle the components to clean them. The CMF is cleaned by circulating sodium hypochlorite solution around the CMF modules and pipework.



The CMF system FIG- 4

## Disinfection

Location	After CMF filtration
Type	Injection
Target residual level	0.5 mg/L to 1.0 mg/L in the reticulation network
Duty / standby	2 Grundfos pumps. Alternate.
Dosing arrangement	Simulated detention pipe automated metering and dosing
Chlorine storage and turnover	Sodium hypochlorite is purchased as 10% w/v available chlorine. Generally, more concentrated solutions (>13%) are instable and can form chlorate. The chlorine containers are stored in a correctly bunded chemical storage room indoors so that no direct sunlight contacts the containers. There is generally 2 months of chlorine stock available at hand. High quality chlorine is purchased from a Cairns supplier .
Alarms	visual on pumps and remote via SCADA

All pumps and chlorinators are serviced annually in-house. The compressors are serviced quarterly in-house as well but council is currently seeking an alternative 6 monthly “one service provider” arrangement.

## Distribution and Reticulation

### Reservoirs

Name	Grey and Green reservoirs
Capacity	800kL and 300kL respectively.
Material	Concrete
Roofed	Yes
Vermin-proof	Yes
Runoff from roof	Directed away, opening on top has raised lip which is then securely covered.
Cleaning	Cleaned in 2010.
Filling	Controlled through electronic pressure transducer in green tank, which send telemetry to CMF plant to start and shut.

### Pipes

Pipe material(s)	uPVC.
Age range	< 9 years
Length of mains	5.3 km
Issues with dead ends	No
High pressure issues	No
Low pressure issues	No
Back flow issues	No. All houses are metered with non-return valves.
Number of reticulation pumps	None, system is gravity fed from the two reservoirs.
Flushing of towns mains	Monthly (through hydrants and scours)
Repair of leaks and bursts	As required. Reactive maintenance



## KEY STAKEHOLDERS

Organisation	Relevance	How the stakeholder is engaged
Wujal Wujal community	Consumers or customers	Informed of water quality issues when required through mailbox posts and radio. Being a small community all consumers are informed simultaneously including vulnerable consumers such as the hospital. Council has an updated list of the critical/vulnerable consumers that may be impacted and will be informed during water quality incidents.
Cairns supplier	Good quality chemicals, availability and supply of stock	Provider has confidence in chemical supplier as it is a reputable company.
Aqua Manage	Audit of CMF plant and filters for condition and advice, every year.  CMF plant is serviced every 6 months	Contracted for 6 monthly on-site service & check for operational inspection per manufacturers warrantee compliance specification including sonic testing of modules and downloading of plc snapshot.
Electricity company	For pumping water from river	Ergon company agreement with Government for essential services.
Office of Water Supply Regulator (OWSR) (DEWS)	Regulator	Consulted during development of DWQMP, water quality incidents reported to OWSR.  1300 596 709 = OWSR
Council	Overall management, budget and finances	Kept up to date and informed of water operations. Approval for DWQMP.
Tropical Public Health Services Cairns	Health regulator	Provides advice for drinking water incidents when required.
Cairns Regional laboratory	Verification testing	Provides results for verification monitoring. Samples collected and sent to them for analysis on a monthly basis
Factor UTB	SCADA integrators	Provision of SCADA and telemetry ongoing maintenance.

## OPERATIONAL & VERIFICATION MONITORING

### Water Quality Information

The water quality results for the parameters tested are provided below.

Year	Location	Parameter	Unit	No. of samples	MinValue	MaxValue
2018	Reticulation	Turbidity	NTU	12	<1	1
2018	Reticulation	pH	pH Units	12	7.2	7.4
2018	Reticulation	Chlorine (free)	mg/L	12	0.2	2.8
2018	Reticulation	Total coliforms	cfu/100mL	8	0	11
2018	Reticulation	HPC	cfu/100mL	8	0	100
2018	Reticulation	E.coli	cfu/100mL	8	<1	<1

The results show that the treatment process is well managed. The turbidity and free chlorine are controlled.

Free chlorine & turbidity are currently monitored week days by the operational team. pH is monitored 24/7 via SCADA. Previously all three parameters were monitored on SCADA while chlorine residual was measured week days by operational team. Previous monitoring points were the Technical services workshop & the Art centre.

The monitoring point locations have been changed to reflect the 'whole' reticulation systems' chlorine residual & turbidity measurements. They are identified below:

- Exit of the treated water storage site – first point after treatment
- HAAC (Health & aged care facility) – vulnerable consumer
- Technical services workshop – mid point in reticulation system
- Kindergarten – vulnerable consumer
- Art centre – end of reticulation line



**The procedure for sampling, routine analysis & transportation of the verification monitoring for e.coli for Wujal Wujal is as follows.**

Grab samples are collected monthly by operational staff from the following locations using the recommended ADW sampling methods.

- Exit of the treated water storage site - first point after treatment
- HAAC (Health & aged care facility) – vulnerable consumer
- Technical services workshop – middle point in reticulation system
- Kindergarten – vulnerable consumer
- Art centre – end of reticulation line

Arrangements are made prior (day before) with the Cairns Regional laboratory & the local freight transporter (Hinterland Aviation) to advise our intention.

The samples are collected, stored in chilled eski/s with required supporting documentation & delivered to the freight transporter who then transports the samples to Cairns whereby a courier collects and delivers the samples to the Cairns Regional laboratory within the required timeframe.

The laboratory communicates the results to council via electronic format.

The results are then interpreted & if no action is required, the results are stored electronically & as a hard copy.

There has been no detection of E.coli in the Wujal Wujal treated water supply to date, which testifies to the effectiveness of the treatment process. The total coliforms and heterotrophic plate count are measured as additional checks for the cleanliness of the system and aimed to be kept as low as possible.

## Operational Monitoring

The operational monitoring for Wujal Wujal contains a planned sequence of measurements and observations to ensure that the system is operating within the set performance limits and the process elements are controlled.

The process step where testing is done, the parameters tested and the logic for testing the parameter is stated below:

### **Water Sampling and Result Analysis:**

All operational monitoring is done by SCADA and the operations team in-house using the HACH or Palintest field test (chlorine and turbidity) portable meters. pH is monitored 24/7 by SCADA. The in-house equipment is checked for calibration by the operations staff and sent for servicing to Palin Test or HACH if the calibration is out of range.

The operations team act upon the operational monitoring parameters as described above (action if target/critical limit is exceeded). The Essential Services Officer assesses and analyses the water quality results as they become available, while keeping an overview of all monitoring and excursions.

Operations staff have received on the job training and certification on correct sampling, analysis and testing procedures for microbiological, chemical and other parameters by service providers, Cairns Tropical Public Health services and the Cairns regional laboratory.

**Visual Checks, Observations and Inspections:**

Visual inspections and checks (observations) are also conducted as part of the operational monitoring to ensure that preventive measures function as required and that total reliance is not only on water quality testing.

The visual checks and inspections done include:

- Fence integrity around the river intake - weekly by operations team.
- Chlorinators are working properly - daily by operations team.
- Reservoir levels - daily by operations team
- Compressors - daily by operations team
- Rainfall and temp
- Daily water treatment plant logs completed
- Raw water 24 hr pumped volumes
- 

## Verification Monitoring

The verification monitoring for Wujal Wujal is used to confirm that safe water is delivered to customers in compliance with the ADWG and Public Health Act. The verification monitoring also verifies that the preventive measures stated in the DWQMP are functioning effectively.

The verification monitoring as also done by the operations team on a monthly basis.

Operational staff have received on the job training on correct sampling techniques by the Cairns Tropical Public Health representative.

The parameter tested and the logic for testing the parameter is stated below:

- *E. coli* - indicator for recent faecal contamination (harmful bacteria) and treatment efficiency.
- Total Coliforms - indicates system integrity, treatment effectiveness or post treatment ingress.

\*There is no guideline value for this parameter but as low as possible.

- Raw water at intake:
- *E. coli* - source water characteristics

## Monitoring & sample locations

Treated water storage exit point, HAAC, Technical Services workshop, Kindergarten & Art centre.

- Free chlorine – ensure sufficient free chlorine is maintained in the system, ensure that chlorinator is working properly.
- Turbidity - ensure it is within aesthetic limits, ensure within guideline operational range for disinfection purposes (relevant also to CMF operation). Guideline <1 to 1 NTU.
- pH - to check pH range. (SCADA monitoring).
- The tables following summarises the operational monitoring, with target and critical limits and how excursions are managed.

Parameter	ADWG or regulation value	Associated Hazard	Frequency  5 locations as stated above		Analysing authority	Response to exceedances
<i>E. coli</i>	< 1 cfu/100mL	Bacteria (harmful)	Monthly	Monthly	Cairns laboratory	Report to WSR.  Re-sample using NATA certified lab – Cairns laboratory  Investigate cause and rectify.  Adjust chlorine dose rate.
Total coliforms	NA (as low as possible)	System integrity, treatment effectiveness, post treatment ingress	Monthly	Monthly	Cairns laboratory	Investigate cause and rectify such as flushing.  Adjust chlorine dose rate.

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Process step / location in system	Parameter	Associated hazard	Sampling			Target limit	Action if target limit is not met	Critical limit	Action if critical limit is exceeded
			Frequency	Method	Analysis				
Reticulation  Treated water storage exit, HAAC, Technical services workshop, Kindergarten & Art centre	<i>E. coli</i>	Bacteria (harmful)	monthly	Grab	Cairns laboratory	<1	Boil alert resample use NATA lab	1	Report LV 3 action
Reticulation:  Treated water storage exit point, HAAC, Technical services workshop, Kindergarten & Art centre	Free chlorine	Bacteria (harmful) and chlorine	Daily	In situ Palintest or HACH portable	In-house	0.5 to 1 mg/L	Re-sample.  Re-adjust the dose rate	<0.2mg/L to 5mg/L.	Re-sample.  Re-adjust the dose rate. Ensure free chlorine level is within target range.  If >5mg/L then flush system and report to OWSR.
Reticulation:  Treated water storage exit,	Turbidity	Turbidity	Daily	In situ Palintest or HACH portable	In-house	<1NTU.	Re-sample.  Investigate cause and rectify. For e.g. check for breaks and repairs.	>5NTU	Re-sample.

## Wujal Wujal Aboriginal Shire Council Drinking Water Quality Management Plan 2017

Process step / location in system	Parameter	Associated hazard	Sampling			Target limit	Action if target limit is not met	Critical limit	Action if critical limit is exceeded
			Frequency	Method	Analysis				
HAAC, Technical services workshop, Kindergarten & Art centre							Check CMF plant is working properly.  Ensure free chlorine level is within target range.		Shut down plant. Investigate cause and rectify.
	pH	Optimum pH	24/7	SCADA	In-house	6.5-8.5	Assess using expert intervention.  Calibration of pH probe to ensure accuracy.	<5 to 9	stop plant -investigate (trigger would indicate catastrophic environmental event)

## OPERATION AND MAINTENANCE PROCEDURES

The following table provides the list of documented procedures used by the Wujal Wujal Provider.

Procedure	Version date	Comments
Operation and maintenance manual as supplied by manufacturer US filters covers in detail CMF operation, including backwashing, CIP clean, complete operational philosophy and problem solving. Select instructions from this manual are positioned on the wall of the plant near entry door. They include CIP and start stop directions also emergency directions for operation and distribution plus emergency contact details	Provided by Aquamanage	Provided by Aquamanage
How to report drinking water incidents	As per DWQMP guideline	Updated version (November 2018).
Collecting water samples for bacteriological examination	2019	Provided by Cairns Tropical Health Service
WTP daily log (for recording CMF plant operations)	2019	Aquamanage CMF daily log sheets
Chlorine log (includes turbidity and pH). 24/7/SCADA  Manual for using portable Palintest chlorine & turbidity instrument.	2019  2019	Verification testing daily y WWASC operational team  Recently provided
Manual for using the HACH /Palintest Field Kit	2019	WWASC Operational team
Manual and MPN chart IDEXX E.coli/coliform check	2019	WWASC Operational team

**The Essential Services Officer is responsible for revision of procedures and recording log sheets.**

The following list identifies the Standard Operating procedures currently in use:

- WWSC 1: Chlorine dosing pump manual bleed procedure.
- WWSC 2: Chlorine dosing pump operation
- WWSC 3: Free chlorine reference sheet
- WWSC 4: Free chlorine outcome guide
- WWSC 5: Free chlorine test procedure (Field)
- WWSC 6: Turbidity test guideline & procedure (Field)
- WWSC 7: Microbiological test results guideline
- WWSC 8: Refill chlorine storage tank procedure
- WWSC 9: WTP Clean in Place (CIP) procedure
- WWSC 10: Scintered filter clean procedure
- WWSC 11: WTP & reservoir valve layout
- WWSC 12: WTP 1 – Normal operations
- WWSC 13: WTP 2 – Bypass water treatment (Emergency ONLY)
- WWSC 14: WTP 3 – Direct water from storage tanks to Community
- WWSC 15: WTP 4 – Start up procedure
- WWSC 16: WTP 5 – Shutdown procedure
- WWSC 17: Aquamanage WTP – Daily log sheets
- WWSC 18: Boil Water Alert
- WWSC 19: Collecting water samples for bacteriological examination

The operations and maintenance procedures, checklists and log sheets are accessible by all operational staff as hard copies and are available at the laboratory & in Technical services office. Digital copies are stored in council hard drive.



### **Process for implementing the procedures**

Ensuring that operational procedures are carried out appropriately is the responsibility of the operators and the Essential Services Co-ordinator. Staff members are trained in procedures relevant to their role through induction and on the job training and guidance by the Essential Services Co-ordinator. Staff also have Certificate III for Water and Waste operations.

It is the responsibility of the Essential Services Co-ordinator to ensure that the procedures are understood and implemented by operational staff. To ensure staff understand and adhere to procedures, the Essential Services Co-ordinator holds “toolbox” meetings daily (every morning) to discuss the days program and any issues arising. Site inspections are also done to check and ensure that procedures are been followed and to identify any emerging issues.

## CUSTOMER SERVICES

Wujal Wujal Council has a Customer Services Standards (2009). The Standards provide details of responsibilities, customer services, performance targets and contact details for system faults and complaints.

There have been no formal complaints lodged in the past 8 years. The process for receiving and acting upon complaints is as follows.

Upon receiving a complaint (telephone call to the Water and Sewage office), the consumer is requested to fill in the Service Complaints/Request/Action form. The complaint is actioned and resolved and the complainant informed of the resolution. The form is completed with resolution details and filed in the office.

The actions taken for resolution depends on the complaint made.

Monitoring of the reticulation line determines if flushing is required.

Being a small community, all consumers are informed simultaneously through mailbox posts & radio announcements.

If necessary, a boiled water alert is issued.

## CATCHMENT CHARACTERISTICS

### Summary Description

The Wujal Wujal community is situated along the Bloomfield River, about 80km South of Cooktown. The water supply intake from the Bloomfield River is about 1,500m upstream of the community.

Bloomfield River falls in the Daintree Basin (see map below) but is a separate catchment or sub-catchment that drains to the Coral Sea. Wujal Wujal Aboriginal Shire Council holds a water licence from the Bloomfield River for 171 ML/annum to supply Wujal Wujal Township.

### Source Water

Bloomfield River has remained unchanged for many generations without any recorded cumulative public health risks associated with metals or mineral ingestion via a drinking water vector. And as there are no issues shown in existing data with trace metals of health concern (such as arsenic, fluoride, manganese); results are significantly below health limit concern.

An annual source water monitoring program is considered not necessary due to recent past source water testing . Events remain unchanged.

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In 2016 as part of an upgrade program, council made the decision to install a permanent river monitoring station allowing river source point long term monitoring and DATA acquisition.

Installed June 2017 the river monitoring via sonde collects base data 24/7 & enables long term forecasting of changes to source water which may affect water properties uptake of minerals.

Refer to Fig - 5




FIG-5

# Wujal Wujal Aboriginal Shire Council Drinking Water Quality Management Plan 2019

## Snapshot Monitoring Source Water Results (April 2019)

Snapshot Monitoring of the source water quality was conducted during April 2019 by WWASC to assist in the identification of possible hazards from the catchment. Results are tables below:



Client: Wujal Wujal Aboriginal Shire Council

Project No: 096292

Report ID: 32493

Date Issued: 24-Apr-2019

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Intake Pump

LRN: 695409

Date Sampled: 09-04-2019 8:15am

Intake Pumps

Received at Lab: 09-04-2019 01:20pm

Method	Analyte	Result	Guideline	LOR	Date Started
<b>Organics</b>					
090853	Organochlorine Pesticides (ult)	Aldrin	<0.010 µg/L		
	Organochlorine Pesticides (ult)	alpha-BHC	<0.010 µg/L		
	Organochlorine Pesticides (ult)	beta-BHC	<0.010 µg/L		
	Organochlorine Pesticides (ult)	delta-BHC	<0.010 µg/L		
	Organochlorine Pesticides (ult)	4,4'-DDD	<0.010 µg/L		
	Organochlorine Pesticides (ult)	4,4'-DDE	<0.010 µg/L		
	Organochlorine Pesticides (ult)	4,4'-DDT	<0.010 µg/L		
	Organochlorine Pesticides (ult)	DDT (total)	<0.010 µg/L		
	Organochlorine Pesticides (ult)	Dieldrin	<0.010 µg/L		
	Organochlorine Pesticides (ult)	alpha-Endosulfan	<0.010 µg/L		
	Organochlorine Pesticides (ult)	beta-Endosulfan	<0.010 µg/L		
	Organochlorine Pesticides (ult)	Endosulfan sulfate	<0.010 µg/L		
	Organochlorine Pesticides (ult)	Endosulfan (sum)	<0.010 µg/L		
	Organochlorine Pesticides (ult)	Endrin	<0.010 µg/L		
	Organochlorine Pesticides (ult)	Endrin aldehyde	<0.010 µg/L		
	Organochlorine Pesticides (ult)	Endrin ketone	<0.005 µg/L		
	Organochlorine Pesticides (ult)	Heptachlor	<0.005 µg/L		
	Organochlorine Pesticides (ult)	Heptachlor epoxide	<0.010 µg/L		
	Organochlorine Pesticides (ult)	Hexachlorobenzene (HCB)	<0.010 µg/L		
	Organochlorine Pesticides (ult)	gamma-BHC	<0.010 µg/L		
	Organochlorine Pesticides (ult)	Methoxychlor	<0.010 µg/L		
	Organochlorine Pesticides (ult)	cis-Chlordane	<0.010 µg/L		
	Organochlorine Pesticides (ult)	trans-Chlordane	<0.010 µg/L		
	Organochlorine Pesticides (ult)	Total Chlordane (sum)	<0.010 µg/L		
	Organochlorine Pesticides (ult)	Oxychlordane	<0.010 µg/L		
090853	Organophosphate Pesticides (ult)	Acaphate	<0.5 µg/L		
	Organophosphate Pesticides (ult)	Azinphos Methyl	<0.02 µg/L		
	Organophosphate Pesticides (ult)	Azinphos-ethyl	<0.02 µg/L		
	Organophosphate Pesticides (ult)	Bensulide	<0.1 µg/L		
	Organophosphate Pesticides (ult)	Bromophos-ethyl	<0.10 µg/L		
	Organophosphate Pesticides (ult)	Carbophenothion	<0.02 µg/L		
	Organophosphate Pesticides (ult)	Chlorfenvinphos (Z)	<0.02 µg/L		

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Project No: 096292  
Report ID: 32493  
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Intake Pump

LRN: 695409

Date Sampled: 09-04-2019 8:15am

Intake Pumps

Received at Lab: 09-04-2019 01:20pm

Method	Analyte	Result	Guideline	LOR	Date Started
695409 Organophosphate Pesticides (ult)	Chlorpyrifos	<0.02 µg/L			
Organophosphate Pesticides (ult)	Chlorpyrifos-methyl	<0.2 µg/L			
Organophosphate Pesticides (ult)	Coumaphos	<0.01 µg/L			
Organophosphate Pesticides (ult)	Demeton-O	<0.02 µg/L			
Organophosphate Pesticides (ult)	Demeton-O & Demeton-S	<0.02 µg/L			
Organophosphate Pesticides (ult)	Demeton-S	<0.02 µg/L			
Organophosphate Pesticides (ult)	Demeton-S-methyl	<0.02 µg/L			
Organophosphate Pesticides (ult)	Diazinon	<0.01 µg/L			
Organophosphate Pesticides (ult)	Dichlorvos	<0.20 µg/L			
Organophosphate Pesticides (ult)	Dimethoate	<0.02 µg/L			
Organophosphate Pesticides (ult)	Disulfoton	<0.05 µg/L			
Organophosphate Pesticides (ult)	ENP	<0.05 µg/L			
Organophosphate Pesticides (ult)	Etihion	<0.02 µg/L			
Organophosphate Pesticides (ult)	Ethionophos	<0.01 µg/L			
Organophosphate Pesticides (ult)	Fenamiphos	<0.01 µg/L			
Organophosphate Pesticides (ult)	Fenchlorphos (Ronnell)	<10 µg/L			
Organophosphate Pesticides (ult)	Fenitrothion	<2 µg/L			
Organophosphate Pesticides (ult)	Fensulfthion	<0.01 µg/L			
Organophosphate Pesticides (ult)	Fenthion	<0.05 µg/L			
Organophosphate Pesticides (ult)	Formothion	<20 µg/L			
Organophosphate Pesticides (ult)	Fosetyl Aluminium	<10 µg/L			
Organophosphate Pesticides (ult)	Malathion	<0.02 µg/L			
Organophosphate Pesticides (ult)	Metidathion	<0.1 µg/L			
Organophosphate Pesticides (ult)	Mevinphos	<0.02 µg/L			
Organophosphate Pesticides (ult)	Monocrotophos	<0.02 µg/L			
Organophosphate Pesticides (ult)	Nafalofos	<1.0 µg/L			
Organophosphate Pesticides (ult)	Omethoate	<0.01 µg/L			
Organophosphate Pesticides (ult)	Parathion	<0.2 µg/L			
Organophosphate Pesticides (ult)	Parathion-methyl	<2.0 µg/L			
Organophosphate Pesticides (ult)	Phorate	<0.1 µg/L			
Organophosphate Pesticides (ult)	Pirimphos-ethyl	<0.01 µg/L			
Organophosphate Pesticides (ult)	Pirimphos-methyl	<0.01 µg/L			
Organophosphate Pesticides (ult)	Profenofos	<0.01 µg/L			
Organophosphate Pesticides (ult)	Prothiofos	<0.1 µg/L			



Client: Wujal Wujal Aboriginal Shire Council

Project No: 096292  
Report ID: 32493  
Date issued: 24-Apr-2019  
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Intake Pump

LRN: 695409

Date Sampled: 09-04-2019 8:15am

Intake Pumps

Received at Lab: 09-04-2019 01:20pm

Method	Analyte	Result	Guideline	LOR	Date Started
695409 Organophosphate Pesticides (ult)	Pyrazophos	<0.1 µg/L			
Organophosphate Pesticides (ult)	Sulfotep	<0.005 µg/L			
Organophosphate Pesticides (ult)	Sulprofos	<0.05 µg/L			
Organophosphate Pesticides (ult)	Temaphos	<0.02 µg/L			
Organophosphate Pesticides (ult)	Terbufos	<0.01 µg/L			
Organophosphate Pesticides (ult)	Tetrachlorvinphos	<0.01 µg/L			
Organophosphate Pesticides (ult)	Thiometon	<0.5 µg/L			
Organophosphate Pesticides (ult)	Triazophos	<0.005 µg/L			
Organophosphate Pesticides (ult)	Trichlorfon	<0.02 µg/L			
Organophosphate Pesticides (ult)	Trichlorfonate	<0.5 µg/L			
Organophosphate Pesticides (ult)	Abamectin	<0.1 µg/L			
Organophosphate Pesticides (ult)	All other	All other below reporting limit - µg/L see attached report			
<b>Microbiology</b>					
695411 Heterotrophic Plate Count (2)	Heterotrophic Plate Count	1100 CFU/mL	<10		09-04-2019
695411 Coliforms	E. coli	67 CFU/100mL	<1		09-04-2019
Coliforms	Total coliforms	10000 CFU/100mL	<1		09-04-2019
<b>Metals</b>					
695412 ICPSM Metals - Total	ICPSM Aluminium	0.133 mg/L	<0.015		12-04-2019
ICPSM Metals - Total	ICPSM Antimony	<0.001 mg/L	<0.001		12-04-2019
ICPSM Metals - Total	ICPSM Arsenic	0.0005 mg/L	<0.0002		12-04-2019
ICPSM Metals - Total	ICPSM Barium	0.004 mg/L	<0.002		12-04-2019
ICPSM Metals - Total	ICPSM Boron	<0.05 mg/L	<0.05		12-04-2019
ICPSM Metals - Total	ICPSM Cadmium	<0.0001 mg/L	<0.0001		12-04-2019
ICPSM Metals - Total	ICPSM Chromium	0.0003 mg/L	<0.0002		12-04-2019
ICPSM Metals - Total	ICPSM Copper	0.002 mg/L	<0.001		12-04-2019
ICPSM Metals - Total	ICPSM Iron	0.240 mg/L	<0.008		12-04-2019
ICPSM Metals - Total	ICPSM Lead	<0.0005 mg/L	<0.0005		12-04-2019
ICPSM Metals - Total	ICPSM Manganese	0.0070 mg/L	<0.0002		12-04-2019
ICPSM Metals - Total	ICPSM Molybdenum	<0.0005 mg/L	<0.0005		12-04-2019
ICPSM Metals - Total	ICPSM Nickel	0.0005 mg/L	<0.0005		12-04-2019
ICPSM Metals - Total	ICPSM Selenium	<0.002 mg/L	<0.002		12-04-2019
ICPSM Metals - Total	ICPSM Silver	<0.0002 mg/L	<0.0002		12-04-2019

# Wujal Wujal Aboriginal Shire Council Drinking Water Quality Management Plan 2019



Client: Wujal Wujal Aboriginal Shire Council

Project No: 096292

Report ID: 32493

Date Issued: 24-Apr-2019

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Intake Pump

LRN: 695409

Date Sampled: 09-04-2019 8:15am

## Intake Pumps

Received at Lab: 09-04-2019 01:20pm

Method	Analyte	Result	Guideline	LOR	Data Started
095412 ICPMS Metals - Total	ICPMS Zinc	0.010 mg/L		<0.008	12-04-2019
095410 ICPOES Metals - Total	ICPOES Silicon	9.7 mg/ L SiO2		<0.2	10-04-2019
ICPOES Metals - Total	Calcium	0.66 mg/L		<0.1	10-04-2019
ICPOES Metals - Total	Magnesium	0.96 mg/L		<0.05	10-04-2019
ICPOES Metals - Total	Potassium	0.65 mg/L		<0.015	10-04-2019
ICPOES Metals - Total	Sodium	5.2 mg/L		<0.05	10-04-2019
ICPOES Metals - Total	Total Hardness	5.7 mg CaCO3 / L		<1	10-04-2019
095412 Mercury		<0.06 µg/L		<0.06	12-04-2019
<b>General Chemistry</b>					
095410 Solids - Total Dissolved	Total Dissolved Solids	40 mg/L		<1	09-04-2019
<b>Physical Properties</b>					
095410 Colour	Apparent Colour	17 Pt/Co units		<1	11-04-2019
095410 EC, pH, Alkalinity, Turbidity	Electrical Conductance	41 µS/cm		<1	09-04-2019
EC, pH, Alkalinity, Turbidity	pH	7.1		<0.1	09-04-2019
EC, pH, Alkalinity, Turbidity	Bicarbonate Alkalinity	6.5 mg CaCO3 / L		<1.5	09-04-2019
EC, pH, Alkalinity, Turbidity	Carbonate Alkalinity	<1.5 mg CaCO3 / L		<1.5	09-04-2019
EC, pH, Alkalinity, Turbidity	Total Alkalinity	6.5 mg CaCO3 / L		<1.5	09-04-2019
EC, pH, Alkalinity, Turbidity	Turbidity	3.9 NTU		<0.1	09-04-2019
<b>Nutrients and Anions</b>					
095410 Anions - Fluoride	Fluoride	0.02 mg/L		<0.02	11-04-2019
095410 Anions	Sulphate	1.1 mg/L		<1	12-04-2019
Anions	Chloride	8.2 mg/L		<0.1	12-04-2019
095410 Free Nutrients	Ammonia	<0.02 mg/L N		<0.02	09-04-2019
Free Nutrients	Total Oxidised Nitrogen	0.03 mg/L N		<0.01	09-04-2019
Free Nutrients	Nitrite	<0.01 mg/L N		<0.01	09-04-2019
Free Nutrients	Nitrate	0.03 mg/L N		<0.01	09-04-2019

A check of the raw water test results against the ADWG criteria indicates there is no exceedance or out of range results that exceed the criteria.

**Basin-wide characteristics:**

Characteristics	Details
Daintree Basin Area	2,106.72 km <sup>2</sup>
Sub-catchments	Three sub-catchments - the Daintree River and tributaries, the Bloomfield River and Saltwater Creek (including Little Falls Creek).
Main townships	Daintree and Wujal Wujal
Consumptive water use	Most consumptive water use occurs to the south of the Daintree River, especially in the area around Whyanbeel/Miallo where there are large areas under sugar cane. In the world heritage and national park areas, particularly north of the Daintree River, large numbers of tourists experience the natural environment including the pristine streams. This ecotourism is a mainstay of the local economy.
World Heritage Area	90 per cent of the Daintree River catchment is included in the Wet Tropics World Heritage Area, above the influence from water extraction.
Rainfall	Average annual rainfall varies across the catchment from around 1300 to 2000 mm in the drier, far western part of the catchment, to the extremely wet coastal areas of rainforest which can receive more than 4000 mm in a year.

There is no farming or industrial processes in the Wujal Wujal community or Bloomfield sub-catchment. There is presence of cattle and pigs in the upper catchment, above the intake point. The sewage system is reticulated (north side of community through gravity and south side connected to the gravity system by a series of small pumps wells) and treated to tertiary level (chlorination and UV light). Effluent disposal is through drip irrigation (underground pipes) to the land south side of the river. The sewage treatment plant is located a considerable distance away from the intake point.



## Bloomfield catchment

Characteristics	Details
WujalWujal local government area	11.68 km <sup>2</sup> (exact area of Bloomfield River catchment is not known)
Topography	Hilly area. Intake point in the Bloomfield valley, however, at higher level than the community.
Soil type geology	<p>Hodgkinson Formation: In this area the formation consists of fractured mudstones and siltstones. There are fine grained clayey soils and weathered rock up to 30m below ground level. The fractures in these rocks are generally fine to begin with and, when combined with the weathered material, limit the ability to transmit water.</p> <p>Bloomfield Alluvium: The alluvium in this area is confined to a relatively narrow valley floor adjacent to the river and bounded by steep hill sides consisting of the aforementioned Hodgkinson Formation. The catchment of the Bloomfield is dominated by these fine grained rocks, which means the alluvium derived is predominately fine grained and clayey. This is not conducive to good groundwater supplies.</p>
Incidence of major flooding	River floods but water does not come into town. Water treatment plant is located uphill from community houses. The infrastructure associated with the intake (river) water is in the process of being relocated above the present location due to recent flood events which impacted the infrastructure.
Incidence of major bushfires	No incidences
Land use	Residential rural
Agriculture, industry, mining, farming	No
Potential sources of microbial and chemical contamination in the catchment	<p>Microbial – surface runoff containing faeces of animals (cattle and pigs) and birds; dead animals; sub-surface flow from irrigated land into river and backflow upstream (extremely rare); recreational activities (swimming)</p> <p>Chemical – Pesticide spraying by Provider on access road to intake and by Council for general weed control.</p> <p>Radiological - not suspected</p>

Wujal Wujal Aboriginal Shire Council Drinking Water Quality Management Plan 2019

Below is a map showing the location & spread of the Daintree catchment & Wujal Wujal.



## HAZARDS, HAZARDOUS EVENTS IDENTIFICATION & RISK ASSESSMENT

Assessment of Risk Methodology The methodology used for the risk assessment has been adopted from the OWSR Preparing a Drinking Water Quality Management Plan Supporting Information (Sept 2010). Maximum risk assumes no preventive measures in place (i.e. no treatment is done); and residual risk includes the existing preventive measures.

Likelihood	Descriptors
Rare	Occurs less than or equal to once every 5 years
Unlikely	Occurs more often than once every 5 years and up to once per year
Possible	Occurs more often than once per year and up to once a month (12/yr)
Likely	Occurs more often than once per month (12/yr) and up to once per week (52/yr)
Almost Certain	Occurs more often than once per week (52/yr)

Consequence	Descriptors
Insignificant	Isolated exceedence of aesthetic parameter with little or no disruption to normal operation
Minor	Potential local aesthetic, isolated exceedence of chronic health parameter
Moderate	Potential widespread aesthetic impact or repeated breach of chronic health parameter
Major	Potential acute health impact, no declared outbreak expected
Catastrophic	Potential acute health impact, declared outbreak expected

### Acceptable Risk

Medium (6) residual risks are considered as acceptable risks and have appropriate control measures to manage the risks for continuous improvement. Unacceptable risks have been associated with an Improvement action.

Likelihood	Consequence	Consequence	Consequence	Consequence	Consequence
	Insignificant	Minor	Moderate	Major	Catastrophic
<b>Almost certain</b>	Medium (6)	High (10)	High (15)	Extreme (20)	Extreme (25)
<b>Likely</b>	Medium (5)	Medium (8)	High (12)	High (16)	Extreme (20)
<b>Possible</b>	Low (3)	Medium (6)	Medium (9)	High (12)	High (15)
<b>Unlikely</b>	Low (2)	Low (4)	Medium (6)	Medium (8)	High (10)
<b>Rare</b>	Low (1)	Low (2)	Low (3)	Medium (5)	Medium (6)

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

## Hazard identification and risk assessment team

Name	Position	Expertise & system knowledge
Victor Mills	Director of Works & Building Services	20 years plus local government experience.  Good understanding of system, hazards & hazardous events.
Michelle Barath	Acting Compliance officer	Water & Wastewater Certificate 3; Bachelor of Science, Biology; Diploma Water operations; Understanding of system, hazards & hazardous events & operational philosophy; 16 years experience with wastewater/water operations.
Rodney Denman	Water & sewage operator	Water & wastewater Certificate 3 with 10 years operational experience. Understanding of system, hazards & hazardous events.
Johnathon Bassini	Water & sewage operator	Water & wastewater Certificate 3 with 2 years experience with water operations. Understanding of system, hazards & hazardous events.
Lucas Creek	Trainee water & sewage operator	4 months trainee experience in water & wastewater operations.

# ***Bloomfield River HAZARD IDENTIFICATION, RISK ASSESSMENT AND UNCERTAINTY MATRICES***

## ***Catchment and source infrastructure***

Hazard	Hazardous event	Max risk			Existing preventive measures / barriers	Res risk			Uncertainty	Risk management improvement action
		Consequence	Likelihood	Risk level		Consequence	Likelihood	Risk level		
Bacteria & protozoa contamination (cryptosporidia & giardia - harmful)	Surface runoff (rainfall) containing waste and cattle and pig's faeces	Major	Possible	High (12)	Side-river buried gravel filter.  Pre-filtration 1x100µ automatic  CMF plant with 0.04µ filters.  Disinfection through chlorination.  Turbidity & free chlorine monitoring checked weekdays at five locations in distribution system to ensure adequate	Major	Rare	Medium (5)	Confident	Formulate and maintain records  CMF unit serviced 6 monthly. Records to indicate TMP/PDT status. (Service previously periodically 12 monthly).  PDT performed every 12 hours (automatic) to monitor membrane integrity.  UV system addition proposed 2019.

# Wujal Wujal Aboriginal Shire Council Drinking Water Quality Management Plan 2019

Hazard	Hazardous event	Max risk			Existing preventive measures / barriers	Res risk			Uncertainty	Risk management improvement action
		Consequence	Likelihood	Risk level		Consequence	Likelihood	Risk level		
					disinfection & documented.					
Bacteria & protozoa contamination - harmful	Access to people – community and tourists (recreational swimming)	Major	Possible	High (12)	Side-river buried gravel filter.  100 um pre-filtration  CMF plant with 0.04µ filters.  Disinfection using chlorination.  Turbidity & free chlorine monitored in distribution system to ensure adequate disinfection.  Monthly laboratory verification monitoring for microbial presence	Major	Rare	Medium (5)	Confident	Monthly laboratory verification monitoring for microbial presence.  CMF unit serviced 6 monthly. Records to indicate TMP & PDT status.  UV system addition proposed 2019.
Pesticide and herbicide residues	Spraying around access road to intake and near pump shed for weed control (by	Moderate	Possible	Medium (9)	Pesticide and/or herbicide application is done per best practice	Minor	Unlikely	Low (1)	Reliable	Annual raw water verification by Cairns laboratory for herbicide & pesticide residues.



# Wujal Wujal Aboriginal Shire Council Drinking Water Quality Management Plan 2019

Hazard	Hazardous event	Max risk			Existing preventive measures / barriers	Res risk			Uncertainty	Risk management improvement action
		Consequence	Likelihood	Risk level		Consequence	Likelihood	Risk level		
	water operations) and around by Council.				(not during rainy or windy periods).  Council has in place regulation for application practice.  Minimum amount sprayed to ensure no over dosing or negative impact on river source and the environment.					
Nitrate	Surface runoff (rainfall) containing human and animal waste	Moderate	Possible	Medium (9)	Snapshot monitoring data shows no nitrate presence.	Minor	Unlikely	Low (4)	Reliable	Annual snapshot monitoring
Turbidity	Surface runoff. Aesthetic and possibility to shield bacteria from chlorination.	Major	Possible	High (12)	Side-river buried gravel filter.  Pre-filtration 100µ CMF plant with 0.04 µ filters to remove protozoa cysts.	Minor	Unlikely	Low (4)	Confident	Turbidity probe at CMF unit is calibrated 6 monthly.  Council currently seeking expressions of

# Wujal Wujal Aboriginal Shire Council Drinking Water Quality Management Plan 2019

Hazard	Hazardous event	Max risk			Existing preventive measures / barriers	Res risk			Uncertainty	Risk management improvement action
		Consequence	Likelihood	Risk level		Consequence	Likelihood	Risk level		
					Turbidity is monitored weekdays & documented. Response initiated if required.					interest for one service provider to service & maintain all equipment periodically.
Cyanobacteria toxins	Algal blooms caused by stratification, eutrophication.	Moderate	Possible	Medium (9)	River is perennial. No history of algal blooms.	Rare	Insignificant	Low (1)	Reliable	None in place, unlikely to occur.
No water or low flow water to treatment plant	Side-river filter (buried in gravel) blockage	Moderate	Possible	Medium (9)	Side-river gravel filtration renewed in 2010 (new system).  Buried manifold.	Minor	Possible	Medium (6)	Reliable	Daily visual check of flow meter. Any issues reported to supervisor for reactive action.  Council currently sourcing "one stop shop" service provider to service filter & intake pumps.
No water or low flow water to treatment plant	River intake pumps fail	Moderate	Possible	Medium (9)	2 pumps.  Pumps are electronically monitored.	Minor	Unlikely	Low (4)	Confident	Daily visual check of pump operation  Council currently sourcing "one stop shop" service

# Wujal Wujal Aboriginal Shire Council Drinking Water Quality Management Plan 2019

Hazard	Hazardous event	Max risk			Existing preventive measures / barriers	Res risk			Uncertainty	Risk management improvement action
		Consequence	Likelihood	Risk level		Consequence	Likelihood	Risk level		
					In-house capacity to repair or change pumps as required.					provider for repair or change issues (Reactive)
No water or low flow water to treatment plant	No electricity	Moderate	Possible	Medium (9)	Back-up generator on site which is maintained well.  Government agreement with Ergon (electricity company) for fixing and providing power to essential services with urgency and priority.	Minor	Unlikely	Low (4)	Confident	Develop Mechanic maintenance record log to be displayed of external tag.
Metals of concern (As, F, Mn)	Natural geology	Minor	Rare	Low (2)	Not naturally present in excessive concentration as from snapshot monitoring data.	Minor	Rare	Low (2)	Estimate	Annual raw water monitoring.
Radionuclides	Natural geology	Minor	Rare	Low (2)	Not naturally present.	Minor	Rare	Low (2)	Estimate	Annual raw water monitoring by Cairns laboratory.

# Wujal Wujal Aboriginal Shire Council Drinking Water Quality Management Plan 2019

Hazard	Hazardous event	Max risk			Existing preventive measures / barriers	Res risk			Uncertainty	Risk management improvement plan
		Consequence	Likelihood	Risk level		Consequence	Likelihood	Risk level		
No water available for treatment	Equipment failure due to flood damage	Major	Rare	Medium (5)	Electrical infrastructure situated above historical flood level	Moderate	Unlikely	Medium (6)	Confident	Raise infrastructure above current level
Turbidity (overload on CMF plant)	Rainfall periods causing turbid water.	Moderate	Possible	Medium (9)	Side-river buried gravel filter.  Pre-filtration 100µ. CMF plant with 0.04 µ filters	Minor	Unlikely	Low (4)	Reliable	River pumps turned OFF prior to forecasted rainfall events.  Pre filtration filter manually cleaned when required
Turbidity (overload on CMF plant)	100µ pre-filter fail	Moderate	Possible	Medium (9)	Replacement parts on hand. Operational team able to service filter as required.	Minor	Unlikely	Low (4)	Confident	Council currently seeking expressions of interest for “one stop shop” service provider to periodically service & maintain equipment

# Wujal Wujal Aboriginal Shire Council Drinking Water Quality Management Plan 2019

## Raw water storage tanks

Hazard	Hazardous event	Max risk			Existing preventive measures / barriers	Res risk			Uncertainty	Risk management improvement plan
		Consequence	Likelihood	Risk level		Consequence	Likelihood	Risk level		
Bacteria (harmful)	No cover / not vermin proofed (overflow pipes)	Major	Possible	High (12)	Well covered and sealed.  CMF plant with 0.04µ filters.  Disinfection through chlorination.  Report any issues to supervisor.	Minor	Rare	Low (2)	Confident	6 monthly visual check to ensure no damage.
Bacteria (harmful)	Seepage through roof cover	Major	Possible	High (12)	Entry point with raised lip and secured cover.  CMF plant with 0.04µ filters.  Disinfection through chlorination.	Minor	Rare	Low (2)	Confident	Annual visual check to ensure integrity of covers.  Reactive response if required.
Bacteria (harmful)	Tank condition and integrity (cracks) enabling ingress	Major	Possible	High (2)	Tanks in excellent condition.	Insignificant	Rare	Low (1)	Confident	Visual check to ensure integrity of tanks.

# Wujal Wujal Aboriginal Shire Council Drinking Water Quality Management Plan 2019

Hazard	Hazardous event	Max risk			Existing preventive measures / barriers	Res risk			Uncertainty	Risk management improvement plan
		Consequence	Likelihood	Risk level		Consequence	Likelihood	Risk level		
					Visual checks, reactive response if required					
Turbidity (can lead to bacterial shielding from chlorine).	No periodic cleaning (sludge layer) of	Moderate	Possible	Medium (9)	<p>Outflow pipe to CMF is 3 inches above the bottom of the tank.</p> <p>Weekday turbidity &amp; chlorine monitoring.</p> <p>Side-river buried gravel filter.</p> <p>Pre-filtration 1 x 100µ</p> <p>CMF plant with 0.04µ filters.</p> <p>Disinfection through chlorination.</p>	Minor	Unlikely	Low (4)	Reliable	<p>Develop periodic cleaning schedule.</p> <p>Monthly verification monitoring by Cairns laboratory.</p>

# Treatment process

Hazard	Hazardous event	Max risk			Existing preventive measures / barriers	Res risk			Uncertainty	Risk management improvement plan
		Consequence	Likelihood	Risk level		Consequence	Likelihood	Risk level		
CMF Turbidity breakthrough TMP differential low	Filters not clean  Module failure	Moderate	Possible	Medium (9)	The automatic backwash process is in place. TMP & turbidity SCADA monitored 24/7.  CIP cleaning is done as required.  Turbidity monitored weekdays in reticulation lines.  Pre-filtration process to reduce load.  Disinfection through chlorination.	Minor	Unlikely	Low (4)	Confident	Any issues reported to supervisor.  Daily CMF operational log now in use to help determine any issues. Service provider available 24/7 to advise operational team of direction for corrective action.
CMF unit, compressors (that are required for CMF operation) & disinfection	Failure of equipment due to irregular periodical maintenance	Major	Unlikely	Medium (8)	6 monthly service agreements for individual units.	Minor	Possible	Medium (6)	Confident	Council is currently seeking expressions of interest for one service provider to maintain & service all equipment used

# Wujal Wujal Aboriginal Shire Council Drinking Water Quality Management Plan 2019

Hazard	Hazardous event	Max risk			Existing preventive measures / barriers	Res risk			Uncertainty	Risk management improvement plan
		Consequence	Likelihood	Risk level		Consequence	Likelihood	Risk level		
system currently have individual service providers for maintenance requirements										for water treatment on a regular basis.
Turbidity breakthrough  TMP differential low	Backwash process fails  TMP out of pre-set range	Moderate	Possible	Medium (9)	Failure is actioned.  CIP cleaning is done.  Compressor is serviced quarterly  Pre-filtration process to reduce load.  Disinfection through chlorination.  Daily visual check of CMF performance & daily turbidity monitoring in place. CMF daily log records currently in use to assist with	Minor	Unlikely	Low (4)	Confident	CMP service provider able to provide assistance 24/7 if required.



# Wujal Wujal Aboriginal Shire Council Drinking Water Quality Management Plan 2019

Hazard	Hazardous event	Max risk			Existing preventive measures / barriers	Res risk			Uncertainty	Risk management improvement plan
		Consequence	Likelihood	Risk level		Consequence	Likelihood	Risk level		
					any operational issues.					
Turbidity breakthrough  TMP differential low	CIP process fails	Moderate	Possible	Medium (9)	corrective actions (manual backwash & CIP)  CMF service provider able to assist operational team 24/7 via phone.  Pre-filtration process to reduce load.  Disinfection through chlorination.	Minor	Unlikely	Low (4)	Confident	CMF service provider able to assist operational team by phone to assist with troubleshooting & corrective action.
Harmful bacteria or protozoa presence	Filter breakthrough	Catastrophic	Possible	High (15)	The automatic backwash process is in place.  12 hour frequency PDT to determine membrane integrity.  CIP cleaning is done when required & TMP checked	Major	Rare	Medium (5)	Confident	Inhouse colisure test by operational team if suspected.  Monthly verification monitoring by Cairns laboratory.  UV treatment system proposed during 2019

# Wujal Wujal Aboriginal Shire Council Drinking Water Quality Management Plan 2019

Hazard	Hazardous event	Max risk			Existing preventive measures / barriers	Res risk			Uncertainty	Risk management improvement plan
		Consequence	Likelihood	Risk level		Consequence	Likelihood	Risk level		
					Disinfection through chlorination.  CMF service frequency every 6 months.  Daily check of CMF unit by operational team.					
No treated water available	Plant shutdown due to process failure (CIP failure, backwash failure, pump failure, compressor failure)	Moderate	Possible	Medium (9)	Daily inspection of plant functions by operational staff.  Fault alarm shows up on screen at SCADA plant for corrective actions.  Audit done every year of the CMF plant by service provider. 6 monthly service on CMF unit.  Reservoir capacity sufficient to supply water for up to 7 days until urgent repairs are done.	Minor	Unlikely	Low (4)	Reliable	CMF service provider able to provide urgent assistance if required.  Critical spares available onsite.  Daily level check of treated water storage tanks, target is 80% capacity.

## Wujal Wujal Aboriginal Shire Council Drinking Water Quality Management Plan 2019

Hazard	Hazardous event	Max risk			Existing preventive measures / barriers	Res risk			Uncertainty	Risk management improvement plan
		Consequence	Likelihood	Risk level		Consequence	Likelihood	Risk level		
No treated water available	Plant shutdown due to no electricity	Moderate	Possible	Medium (9)	Standby generator at the treatment plant compound able to respond to power outage.  Reservoir capacity sufficient to supply water for up to 7 days until urgent repairs are done.	Minor	Unlikely	Low (4)	Reliable	Daily level check of treated water storage tanks, target is 80%.

## Disinfection process

Hazard	Hazardous event	Max risk			Existing preventive measures / barriers	Res risk			Uncertainty	Risk management improvement plan
		Consequence	Likelihood	Risk level		Consequence	Likelihood	Risk level		
Chlorine	Over dosing	Moderate	Possible	Medium (9)	Free chlorine monitored 24/7 by SCADA & daily monitoring of reticulation line by operational staff.	Minor	Unlikely	Low (4)	Confident	Flushing & monitoring of reticulation line to reduce chlorine concentration to compliance target.

# Wujal Wujal Aboriginal Shire Council Drinking Water Quality Management Plan 2019

Hazard	Hazardous event	Max risk			Existing preventive measures / barriers	Res risk			Uncertainty	Risk management improvement plan
		Consequence	Likelihood	Risk level		Consequence	Likelihood	Risk level		
Chlorine	Under dosing	Moderate	Possible	Medium (9)	Free chlorine monitored 24/7 by SCADA & week day monitoring of the reticulation line by operational staff	Minor	Possible	Medium (6)	Confident	Weekday monitoring of the reticulation line at 5 locations to ensure residual in system.  Increase chlorine dose rate on SCADA
Bacteria (harmful)	Under dose of chlorine / no chlorine caused by pipe burst (injector line) and equipment breakdown.	Catastrophic	Possible	High (15)	2 pumps available.  Daily chlorine logged via SCADA & week day monitoring by operational team.  Daily visual check by operators- manual adjustments.  CMF plant with 0.04µ filters.  TMP checked daily	Major	Rare	Medium (5)	Confident	Duty/Standby pump arrangement to be implemented.  Weekday monitoring of chlorine residual in community reticulation line.
Bacteria (harmful)	Insufficient contact time	Catastrophic	Possible	High (15)	Sufficient mixing and contact time available through presence of the 2	Major	Rare	Medium (5)	Confident	Weekday monitoring of chlorine residual in reticulation line.

# Wujal Wujal Aboriginal Shire Council Drinking Water Quality Management Plan 2019

Hazard	Hazardous event	Max risk			Existing preventive measures / barriers	Res risk			Uncertainty	Risk management improvement plan
		Consequence	Likelihood	Risk level		Consequence	Likelihood	Risk level		
					reservoirs. > 30 minutes before water reaches first customer.					
Disinfection by-products (THM)	High organic content of raw water	Moderate	Possible	Medium (9)	CMF plant.  Pre-filtration  Chlorine dose optimised to keep residual low (target 0.5mg/L to 1 mg/L in the network).	Minor	Possible	Medium (6)	Estimate	Raw water tested annually
Chlorate	Chlorine stock storage and turnover	Moderate	Possible	Medium (9)	Sodium hypochlorite is purchased as 10% w/v available chlorine. The chlorine containers are stored indoors so that no direct sunlight contacts the containers. High quality chlorine is sourced from Cairns supplier to ensure frequent turnover & reliable quality.	Minor	Unlikely	Low (4)	Estimate	Consideration of chemical storage area to be insulated & airconditioned to provide better storage conditions which would assist with quality & preservation

# Wujal Wujal Aboriginal Shire Council Drinking Water Quality Management Plan 2019

## Reservoirs

Hazard	Hazardous event	Max risk			Existing preventive measures / barriers	Res risk			Uncertainty	Risk management improvement plan
		Consequence	Likelihood	Risk level		Consequence	Likelihood	Risk level		
Bacteria (harmful)	No cover / not vermin proofed (overflow pipes)	Major	Possible	High (12)	Well covered and sealed.	Major	Rare	Medium (5)	Confident	Visual monitoring by operational staff to ensure integrity of reservoirs.
Bacteria (harmful)	Seepage through roof cover	Major	Possible	High (12)	Entry point with raised lip and secured cover.	Major	Rare	Medium (5)	Confident	Visual monitoring by operational staff to ensure integrity is maintained.
Bacteria (harmful)	Reservoir condition and integrity (cracks) enabling ingress	Major	Possible	High (12)	Reservoirs in very good condition.	Major	Rare	Medium (5)	Confident	Visual monitoring by operational staff to ensure integrity is maintained.
Bacteria (harmful)	Low turnover, long detention	Major	Possible	High (12)	Reservoir filling is controlled through telemetry hence turnover is ensured.	Major	Rare	Medium (5)	Confident	Daily visual check of reservoir level by operational staff.  Regular flushing of reticulation system
Turbidity (can lead to bacterial shielding from chlorine)	No periodic cleaning (sludge layer) / High chlorine demand	Major	Possible	High (12)	Reservoirs have been cleaned in 2010. CMF plant to reduce turbidity significantly.	Major	Rare	Medium (5)	Reliable	Investigate cleaning program for reservoirs.

# Wujal Wujal Aboriginal Shire Council Drinking Water Quality Management Plan 2019

## Reticulation

Hazard	Hazardous event	Max risk			Existing preventive measures / barriers	Res risk			Uncertainty	Risk management improvement plan
		Consequence	Likelihood	Risk level		Consequence	Likelihood	Risk level		
Bacteria (harmful)	Pipe breaks / main breaks (age, pressure)	Major	Possible	High (12)	<p>All pipes &lt; 10 years old (new).</p> <p>All digging or excavation authorised by water supplier.</p> <p>Reactive maintenance.</p> <p>Free chlorine is maintained at 0.5mg/L to 1 mg/L throughout the system.</p>	Minor	Unlikely	Low (4)	Reliable	<p>Regular flushing of reticulation system.</p> <p>Reactive response to breaks.</p>
Bacteria (harmful)	Low or negative pressure / backflow	Major	Possible	High (12)	<p>System is always pressurised (no history of issues).</p> <p>All household meters have non-return valves present.</p> <p>Free chlorine is maintained at 0.5mg/L to 1 mg/L</p>	Minor	Rare	Low (2)	Confident	No historical records to indicate possibility of previous issues.

# Wujal Wujal Aboriginal Shire Council Drinking Water Quality Management Plan 2019

Hazard	Hazardous event	Max risk			Existing preventive measures / barriers	Res risk			Uncertainty	Risk management improvement plan
		Consequence	Likelihood	Risk level		Consequence	Likelihood	Risk level		
					throughout the system.					
Bacteria (harmful)	Dead end storages, long detention	Major	Possible	High (12)	No dead end storages or long detention times.  Free chlorine is maintained at 0.5mg/L to 1 mg/L throughout the system.	Minor	Rare	Low (2)	Confident	Regular flushing of reticulation system
Turbidity	Pipe breaks / main breaks (age, pressure)	Moderate	Possible	Medium (9)	All digging or excavation authorised by water supplier.  Reactive maintenance.	Minor	Unlikely	Low (4)	Reliable	Reactive maintenance & response. Isolation points in distribution line defined.
No water	Pipe breaks / main breaks (age, pressure)	Moderate	Possible	Medium (9)	All digging or excavation authorised by water supplier.  Reactive maintenance.	Minor	Unlikely	Low (4)	Confident	Reactive response & maintenance.



# Whole of Service

Hazard & Hazardous event	Max risk			Existing preventive measures / barriers	Res risk			Uncertainty	Risk management improvement plan
	Consequence	Likelihood	Risk level		Consequence	Likelihood	Risk level		
Poor chemical (chlorine/citric acid ) quality - ineffective disinfection and CIP cleaning.	Major	Rare	Medium (5)	Chemical purchased from reputable supplier in Cairns.  Good turnover to ensure product quality  Provider has confidence in chemical supplier.	Insignificant	Rare	Low (1)	Confident	Week day monitoring of chlorine residual in reticulation line. Target residual between 0.5 & 1 mg/L.
No chemical - no disinfection leading to presence of harmful bacteria	Major	Rare	Medium (5)	Visual checks for stock at hand.  SCADA monitoring.	Insignificant	Rare	Low (1)	Confident	Regular check by operational team to ensure adequate supply. Sourced locally (Cairns). minimum transport time ensures sufficient quantities on hand.
Untrained staff (formally) - no or poor water treatment leading to presence of harmful bacteria and water of poor aesthetic quality	Catastrophic	Possible	High (15)	Existing staff have Water and Wastewater Certificate III.	Minor	Unlikely	Low (4)	Confident	Provide formal training for the new staff on board .

# Wujal Wujal Aboriginal Shire Council Drinking Water Quality Management Plan 2019

Hazard & Hazardous event	Max risk			Existing preventive measures / barriers	Res risk			Uncertainty	Risk management improvement plan
	Consequence	Likelihood	Risk level		Consequence	Likelihood	Risk level		
				On the job training. Experience.  Supervision and guidance by Manager.					Ongoing supervision by Manager.  New staff to complete Cert. 3.  Existing staff to complete SCADA training
Lack of written standard operation & maintenance procedures – can lead to poor quality or no water.	Major	Likely	High (16)	On the job training. Experience.  Supervision and guidance by Manager.	Moderate	Possible	Medium (9)	Confident	Review existing SOPs and develop SOPs for all relevant procedures.
Vandalism and terrorism - introduction of harmful bacteria or toxic chemicals	Major	Rare	Medium (5)	Well fenced and secured treatment plant facility.  Visual checks by operators.	Minor	Rare	Low (2)	Confident	Daily check upon exiting to ensure facilities are secured
Electricity shut down - no water and treatment process	Moderate	Rare	Low (3)	Standby generators (river intake and treatment plant).	Minor	Rare	Low (2)	Confident	Regular maintenance check of generators by inhouse service person.

# Wujal Wujal Aboriginal Shire Council Drinking Water Quality Management Plan 2019

Hazard & Hazardous event	Max risk			Existing preventive measures / barriers	Res risk			Uncertainty	Risk management improvement plan
	Consequence	Likelihood	Risk level		Consequence	Likelihood	Risk level		
				Ergon company agreement with Government for essential services.  2 large reservoirs providing relief for short term.					Reservoir capacity available for 7 days, levels checked daily & maintained at target of 80%.
Staff safety (chemical handling) - injured staff or absent staff.	Major	Rare	Medium (5)	Safety equipment (PPE) used by staff.  On the job training.  Staff experience.	Minor	Rare	Low (2)	Confident	PPE checked to ensure integrity  Lifting devices available for moving heavy equipment.
Cyber security – Data security	Moderate	Rare	Low (3)	Primary access control by service providers  Service providers' implementation of anti-virus software	Moderate	Rare	Low (3)	Certain	Report suspicious events to service provider  Operational staff perform daily monitoring, is a verification check with SCADA data.

## Risk Management Improvement Program

The proposed improvement actions from the hazard identification & risk assessment matrices have been identified.

### **Immediate (Up to 4 weeks)**

- Standard Operating Procedures developed & located at Treatment Plant.
- Monthly verification monitoring by Cairns laboratory from 5 identified locations in the distribution (reticulation) line.
- 12 hour automatic Pressure Decay Test (PDT) implemented on CMF plant to monitor membrane integrity.
- CMF plant daily log sheets populated by operational team to assist with identifying any issues that could arise.
- Water Treatment plant operational staff to complete SCADA training, Public Health and Water chemistry training (delivered by TPHS) and CMF operational and maintenance training (delivered by Aquamanage).

### **Short term (Up to 6 months)**

- Council seeking expressions of interest for a “single” service provider to service & maintain equipment & infrastructure.
- Co-ordinate 6 month service program on CMF plant (previous 12 monthly service).
- Install Ultra Violet disinfection system compatible with existing water treatment plant supply & demand flow rate and link to SCADA. Proposed UV system will improve adherence with proposed health based targets and provide an additional pathogen log reduction of 4.0 on top of current targets.
- Reconfigure chlorine dosing system at water treatment plant to be true duty standby and linked to chlorine analyser with auto trim linked to SCADA.
- Improve/upgrade SCADA to achieve improved performance for operational, reporting and early warning outcomes.

### **Long term (More than 6 months)**

- Investigate insulating & air-conditioning of the chemical storage area to assist with preservation of chlorine.
- Connection of treated water supply pipeline to southside residences.
- Investigate options for improving circulation of chlorinated water in reservoirs.
- Raise infrastructure associated with intake pump at river above current historical flood levels.

## MANAGEMENT OF INCIDENTS AND EMERGENCIES

The process for managing drinking water incidents and emergencies are described in the tables below. The first table provides the overview (alert level, description, key response and positions responsible). The second table gives the summary of actions and procedures.

All level 1 and 2 alerts are notified to the Essential Services Officer, who remains on call by mobile phone (0488961322). The operational staff have received on the job training on incident and emergency response protocols in order to operate as required, with overall supervision and management provided by the Essential Services Officer.

### Management of Incident and Emergency Levels – Overview

Alert Level	Description	Key management response(s)	Position(s) responsible
Level 3: Emergency	<ul style="list-style-type: none"> <li>outbreak of waterborne disease</li> <li>major event (something that has happened or is likely to happen, in relation to a drinking water service that may have an adverse effect on public health, and is unable to be controlled using normal procedures (e.g. terrorism, deliberate contamination of treated water, source water where treatment is ineffective)</li> <li>declared disaster or emergency by the Council or state/national government</li> </ul> <p><i>Requires coordination across the Council departments and is likely to require external resourcing and support from Stakeholders and or agencies, such as Aqua manage, Office of the Water Supply Regulator, Cairns Tropical Health Services, local disaster management groups, emergency responders QFRS, Police</i></p>	<p>Activate disaster management plan if appropriate</p> <p>Activate incident response and reporting protocols.</p> <p>Request advice from Aqua manage or Cairns Tropical Health Services or other experts as appropriate to regain control.</p> <p><i>Refer to summary of actions and procedures</i></p>	<p>CEO.</p> <p>Manager Technical Services is part of the response team.</p>
Level 2: Incident	<ul style="list-style-type: none"> <li>non-compliance (typically against the ADWG values)</li> <li>minor event. Examples include natural disaster (flood, drought), bushfire, inability to operate system within acceptable operational limits but where rectification is likely prior to unsafe water delivered.</li> </ul> <p><i>Incident is managed within the team responsible for drinking water operations and management in line with the Wujal Wujal DWQM Plan. In some cases, it may require coordination across the Council departments and external resources and support, such as from OWSR &amp; Cairns Tropical Health Services.</i></p>	<p>Activate drinking water incident response and reporting protocols.</p> <p>Ensure all control measures identified in the DWQM Plan are functioning effectively.</p> <p><i>Refer to summary of actions and procedures</i></p>	<p>Manager Technical Services</p> <p>Essential Services Officer</p>

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Level 1: Operational exceedance	<ul style="list-style-type: none"> <li>Exceedances of operational limits (as per the operational monitoring section of the Plan).</li> <li>Parameter with no ADWG guideline value.</li> </ul> <p><i>Incident is managed within the water operations team. An incident is not declared and the issue can be managed in line with the DWQM Plan.</i></p>	<p>Ensure all operational steps identified in the DWQM Plan are functioning effectively.</p> <p>Check and act upon operations records.</p> <p>Incident response and reporting protocols on standby.</p> <p><i>Refer to summary of actions and procedures</i></p>	Operator under guidance from Essential Services Officer
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### Management of Incident and Emergency Levels – Summary of Actions and Procedures

Alert Level	Key management response(s)	Brief summary of actions	Documented Plans & Procedures
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## Wujal Wujal Aboriginal Shire Council Drinking Water Quality Management Plan 2019

Level 3: Emergency	<p>Activate incident response and reporting protocols.</p> <p>Request advice from Aqua manage, Cairns Tropical Health Services &amp; other experts as appropriate to regain control.</p> <p>Activate disaster management plan if appropriate</p>	<ul style="list-style-type: none"> <li>• CEO to notify Council and assemble team</li> <li>• Coordinate notification, investigation and response of water related aspects</li> <li>• Consider what community notification / messaging is needed (e.g. do not drink alert, boil water alert or bottled/emergency water distribution)</li> <li>• Coordinate community messaging, for e.g. boil water alert, do not drink alert as required</li> <li>• Notify OWSR as soon as practicable</li> </ul>	Disaster management plan, including communications protocols.
Level 2: Incidents	<p>Activate drinking water incident response and reporting protocols.</p> <p>Ensure all control measures identified in the DWQM Plan are functioning effectively.</p>	<ul style="list-style-type: none"> <li>• Essential Services Officer to inform the Manager Technical Services.</li> <li>• Report incident to OWSR within the required timeframe</li> <li>• Ensure all control measures identified in the DWQM Plan are functioning effectively.</li> <li>• Commence investigation to determine cause if not traceable through the DWQM Plan</li> <li>• Arrange for re-samples to be taken where required</li> <li>• Instigate immediate remediation actions, including isolation of affected area where possible</li> <li>• Review associated laboratory reports and operational records.</li> <li>• In case of customer complaints, coordinate investigation and resolution, including obtaining water samples where required</li> <li>• Disaster management plan is on standby if the need arises.</li> </ul>	<p>Incident response and reporting protocols (i.e. WSR Water Quality and Reporting Guideline).</p> <p>Wujal Wujal DWQM Plan.</p>
Level 1: Operational exceedance	<p>Ensure all operational steps identified in the DWQM Plan are functioning effectively.</p> <p>Check and act upon operations and maintenance records.</p> <p>Incident response and reporting protocols on standby.</p>	<ul style="list-style-type: none"> <li>• Operations staff to notify Essential Services Officer.</li> <li>• Review operations and maintenance records for anomalies</li> <li>• Commence investigation to determine cause, if not identifiable through operational records</li> <li>• Instigate immediate remediation actions</li> <li>• Ensure all control measures identified in the DWQM Plan are functioning effectively.</li> <li>• Increase operational monitoring frequency where required</li> <li>• Ensure incident response and reporting protocols are on standby if the need arises.</li> </ul>	<p>Operations and maintenance procedures</p> <p>Wujal Wujal DWQM Plan.</p>

## SERVICE WIDE SUPPORT – INFORMATION MANAGEMENT

## Water Quality Information

ESO supervisor collates all data received from operators. Data is sourced from SCADA and onsite laboratory testing.

Water quality data from the Cairns laboratory is received electronically in their laboratory reporting format and stored electronically in the Technical Services Manager's computer from where it is printed in hard copies and forwarded to the Essential Services Officer and to Council (part of monthly report for essential services). The operational monitoring data is recorded on log sheets and filed.

All verification testing results required under our operating licence will be electronically submitted to DNRME quarterly and annually using the prescribed reporting template.

## Process for incident reporting

The incident response and reporting protocols (mentioned earlier under the management of incident and emergencies section) have been adopted from the WSR Drinking Water Service Provider Monitoring and Reporting Requirement guidelines. The documented procedure "How to report drinking water quality incidents" is followed.

This is summarised as follows:

Incident	Reporting requirements (to OWSR)
Detection of <i>E. coli</i> , detection of a pathogen, failure to meet ADWG health guideline values	By telephone within 3 hours of receipt of test results
Radiological (exceed levels described in the notice)	By telephone within 3 hours of receipt of test results
Parameters with no ADWG guideline value	Written confirmation within 24 hours
An event likely to affect water quality	By telephone as soon as practicable



## DWQMP AUDIT FINDINGS AND STATUS

<i>Item</i>	<i>Recommendation or OFI</i>	<i>Action</i>	<i>Status of actions</i>	<i>Responsible Officer/Position</i>
<b>ADWG component:</b> Ensure monitoring data is representative & reliable	Recommendation	Training in use of portable Palintest/HACH kits for daily monitoring.  Regular calibration of in situ probes.	Weekday monitoring using portable Palintest/HACH kits in situ. from 5 locations. (refer to Water Quality information section for locations).  (Previously monitored from two locations in retic.line.)	WWASC ESO & operational staff
<b>Short term evaluation of results.</b> Establish procedures for the daily review of DWQ monitoring data & consumer satisfaction	Recommendation	Currently being reviewed & implemented by WWASC operational staff.	Operational staff review daily monitoring data & implement response actions if required, ongoing & in progress.	WWASC ESO & operational staff
<b>Incident &amp; emergency response protocols:</b> Train employees & regularly test emergency response plans	Recommendation	Currently in progress  Training currently being implemented by Cairns THS  Refer to Management of incidence & response section.	In progress	WWASC ESO & operational staff
Investigate any incidents or emergencies & revise protocols if necessary	Recommendation	Currently being reviewed	Implemented & ongoing	WWASC ESO & operational staff

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<i>Item</i>	<i>Recommendation or OFI</i>	<i>Action</i>	<i>Status of action</i>	<i>Responsible officer/position</i>
<b>Corrective action:</b> Establish & document procedures for corrective action in response to non - conformance or consumer feedback	Recommendation	Currently being reviewed	Implemented & ongoing	WWASC ESO & operational staff
<b>Employee awareness &amp; involvement:</b> develop mechanisms & communication procedures to increase employees awareness of/& participation in DWQMP	Recommendation	Cairns TPHS Safe Drinking water Project which involves educational training of operational staff in DWQ management currently in progress.  Aquamanage provided WTP operational training to staff.	Implemented & ongoing	WWASC ESO, Cairns TPHS & operational staff.  Aquamanage.
<b>Management of documentation &amp; records:</b> Document information pertinent to all aspects of DWQ management	Recommendation	Provide specific SOP's & specific location of hard copies of daily results to be digitised	Specific SOP's & specific location of hard copy of daily results implemented.  Hard copy monitoring results digitised weekly.	WWASC ESO & operational staff
Establish a records management system & ensure that employees	Recommendation	Training in progress	Record management system established.	WWASC ESO & operational team

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are trained to fill out records			Employees are trained to fill out records.	
<b><i>Item</i></b>	<b><i>Recommendation</i></b>	<b><i>Action</i></b>	<b><i>Status of action</i></b>	<b><i>Responsible officer/position</i></b>
<b><i>Reporting:</i></b> Establish procedures for effective internal & external reporting	Recommendation	Being reviewed	Implemented & ongoing	WWASC ESO & operational staff