



Cook Shire
COUNCIL

Overarching
Drinking Water Quality Management Plan

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Overarching Cook Shire Council DWQMP

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+ GLOSSARY

Term	Definition
ADWG	Australian Drinking Water Guidelines 2011
CSC	Cook Shire Council
DWQMP	Drinking Water Quality Management Plan
PHR	Public Health Regulation 2005
RMIP	Risk Management Improvement Program
QH	Department of Health Queensland
WSR	Water Supply Regulation
WS(SR)A	Water Supply (Safety and Reliability) Act 2010

1 INTRODUCTION

The Cook Shire Council Drinking Water Quality Management Plan (DWQMP) is a catchment to tap, risk based management plan that addresses the Framework for Drinking Water Quality, as described in the Australian Drinking Water Guidelines 2011. In so doing, this plan also meets the regulatory requirements of the *Water Supply (Safety and Reliability) Act 2008* and associated regulatory guidelines.

The purpose of this plan is to ensure that the drinking water provided by Council to our community and visitors is, at all times, safe and reliable.

1.1 Structure of this Plan

The plan is separated as follows.

Overarching plan

The overarching plan (this volume) includes the information that is common across Cook Shire Council. This includes the service provider details, commitment to drinking water quality management, hazard identification, description of the risk methodology, unmitigated risk assessment, verification monitoring, incident and emergency response plan, employee awareness and training, documentation and reporting, and review and continual improvement including the risk management improvement plan.

The overarching document details the common elements of the plan, but more importantly, is used as a strategic document. This document includes the risk management improvement program, which is closely linked to budget submissions to council, and will be used by council to form the basis of external grant applications.

Site based plans

Each site based plan includes the assessment of the drinking water system, including catchment description, treatment processes, risk assessment, preventive measures, and operational monitoring.

For each scheme, both the overarching plan, and the site based plan are required to fully describe the scheme, but, on a daily basis, it is intended that operators would more closely interact with the site based plan, but consulting the overarching plan as necessary.

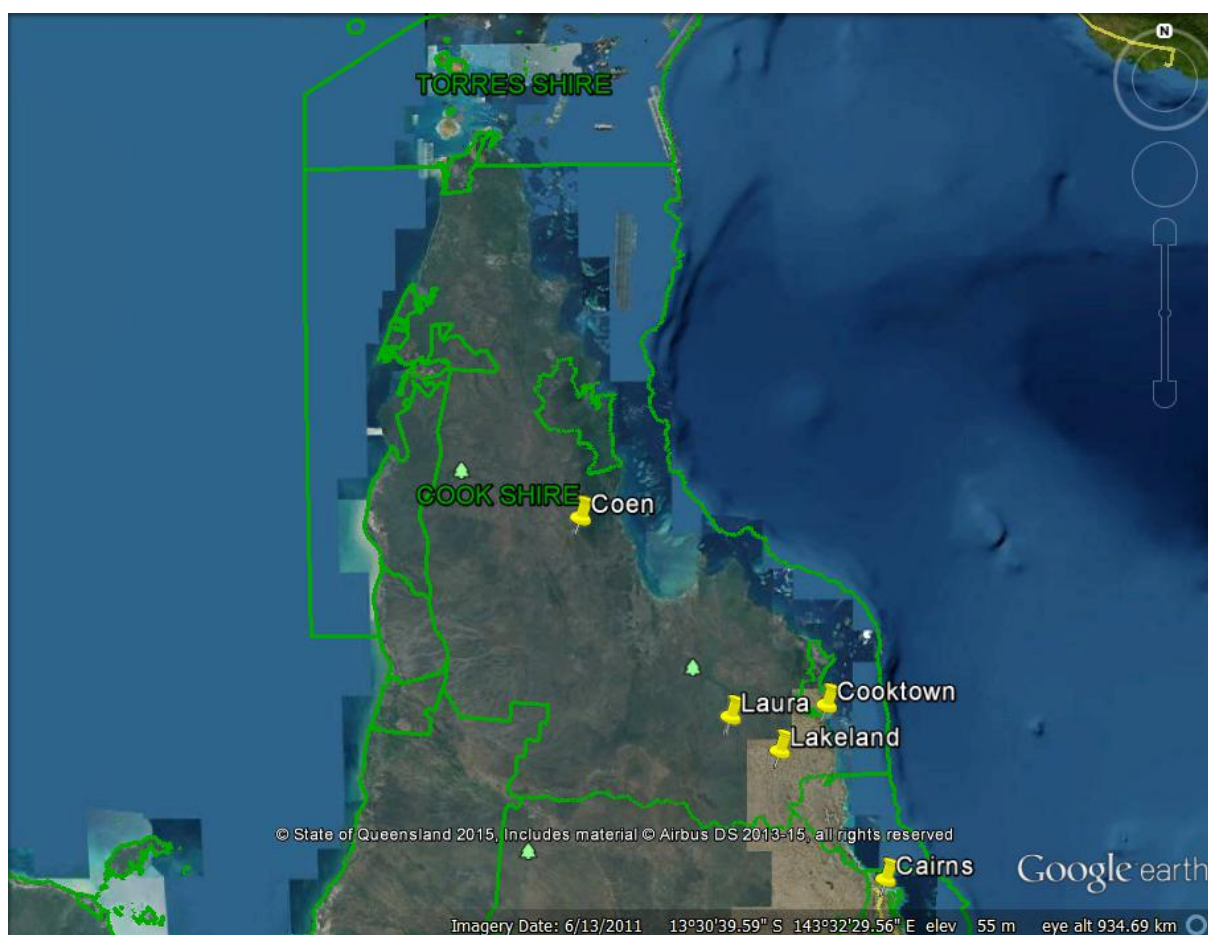
2 REGISTERED SERVICE PROVIDER DETAILS

Cook Shire is the largest shire in terms of land area in Queensland. From the Bloomfield River in the south to just north of the Jardine River it covers over 100 000 square kilometres and occupies 80% of Cape York Peninsula.

Geographically the Cook Shire is the meeting place of the Great Barrier Reef, the Wet Tropics and the Outback. It is the location of many National Parks along with other protected areas and conservation zones.

Cook Shire has a tough and colourful past built around agriculture and mining. Today we still have a vibrant culture and peoples from across the country and around the globe. Approximately 5000 people live in the Shire. The Shire's major township is Cooktown with smaller population centres at Marton, Laura, Lakeland, Coen, Ayton, Rossville and Portland Roads and offshore islands including Lizard Island with significant numbers of people living throughout the Bloomfield and Endeavour valleys.

Figure 1 Cook Shire Council



Cook Shire enjoys a mild tropical climate with the wet season running from January to March being the hottest time of the year. April to December brings a drier period with cooler weather and temperatures averaging around 27 degrees Celsius. During the wet season there are risks of cyclones and flooding.

Cook Shire Council is a drinking water service provider and operates 4 drinking water schemes at Cooktown, Coen, Lakeland and Laura. The current and future populations and demands are listed in Table 1.

Table 1 Scheme populations and demand (as at March 2018)

Scheme Name/ Community served	Current			Projected in 10 years (approximately 1.1% growth and 2.7 people per connection)		
	Population served	Connections	Demand ML/d	Population served	Connections	Demand ML/d
Cooktown	2500	938	1.214	2775	1027	1.329
Coen	330	122	0.216	366	135	0.239
Laura	130	48	0.190	144	53	0.210
Lakeland	116	43	0.094	129	47	0.102

3 COMMITMENT TO DRINKING WATER QUALITY MANAGEMENT

3.1 Drinking Water Quality Policy

Council currently does not currently have a drinking water policy.

3.2 Regulatory and Formal Requirements

Council has a number of regulatory and formal requirements that need to be considered. These are included in the table below.

Table 2 Regulatory and Formal Requirements

Regulatory Requirement	Authority	Primary Obligations
Water Supply (Safety & Reliability) Act 2008 WS(SR) Regulation 2010	Department of Energy and Water Supply (DEWS)	<ul style="list-style-type: none"> Issue notices about monitoring requirements to drinking water service providers. Set water quality criteria for parameters for which no standards have been set by QLD Health. Review and approve Water Service Provider's DWQMPs, enforce notices, undertake investigations and compliance actions.
Water Fluoridation Act 2008	Queensland Health	<ul style="list-style-type: none"> Implement fluoridation of drinking water supply. Meet Code of Practise.
Public Health Act 2005 and Public Health Regulation 2005	Queensland Health	<ul style="list-style-type: none"> Supply safe drinking water. Monitoring and reporting of <i>E. coli</i> and fluoride. Meet water quality guideline values (aesthetic & health) and sampling frequency.
Environment Protection Act 1994, Environment Protection Regulation 2008, Environment Protection Policy 2009	Department of Environment and Science	<ul style="list-style-type: none"> Water treatment is an Environmentally Relevant Activity
Water Act 2000	Department of Energy and Water Supply	<ul style="list-style-type: none"> Service Providers may be required to provide information under Water Act.
Work Health and Safety Act 2011	Department of Justice and Attorney General	<ul style="list-style-type: none"> Generally applicable to all activities.
Plumbing and Drainage Act 2002	Department of Housing and Public Works	<ul style="list-style-type: none"> Prescribes how plumbers are licenced, the framework for compliance assessment, and ensuring that plumbing work is compliant with all requirements.
Standard Plumbing and Drainage Regulation (2003)		<ul style="list-style-type: none"> Provides the mechanism for compliance permits and assessments of plumbing works, including on-site sewerage.
QLD Plumbing & Wastewater Code	Department of Housing and Public Works	<ul style="list-style-type: none"> Compliance with state legislation for backflow & plumbing arrangements.
National Plumbing & Drainage Code AS/NZS 3500:2003	Commonwealth	<ul style="list-style-type: none"> Australian Standard.
Disaster Management Act 2003	Department of Emergency Services	<ul style="list-style-type: none"> Linkages to emergency response plans
Trade Practises Act 1974	Commonwealth	<ul style="list-style-type: none"> Provide water "fit for purpose" intended for human consumption. Note: does not include immune compromised or industries requiring additional water quality needs.
Australian Drinking Water Guidelines 2011	National Health and Medical Research Centre (NH&MRC)	<ul style="list-style-type: none"> Apply Framework for Management of Drinking Water Quality. Meet water quality guideline values (aesthetic & health). Best practice, and auditors audit to this standard.
Other Australian Standards e.g. chemical handling, storage and signage, construction of chlorination stations	Various	

4 KEY STAKEHOLDERS

Table 3 Key Stakeholders

Organisation	Contact Details	Relevance to management of drinking water quality	How the stakeholder is engaged in the DWQMP
Communities of Cooktown, Coen, Lakeland and Laura		Water Consumers, Residential and Commercial	Local Water Quality issues: Consumers Informed of local issues by leaflet or personal notification. Broader Community Water Quality issues: Consumers Informed of broader issues by leaflet, letterbox drop, community radio and ABC Radio
Cooktown State School P-12	Principal Ph 4082 0222	Vulnerable Customers (School Children)	Local Water Quality issues: Schools Informed of local issues by leaflet or personal notification. Planned Water main shutdowns: (which would impact on the listed establishments) are planned to occur outside of school hours, or the respective operating hours
Endeavour Christian College	Principal Ph 4069 5812	Vulnerable Customers (School Children)	as above
Cooktown Barrier Reef Child Care Centre	Director Ph 4069 6440	Vulnerable Customers (Young Children 19mths – 5 Yrs)	as above
Cooktown Kindergarten	Co-ordinator Ph 4069 5182	(Young Children 3 – 5 Yrs)	as above
Lakeland State School	Principal: Ph 4060 2147	Vulnerable Customers	as above
Laura State School	Principal Ph 4060 3232	Vulnerable Customers	as above
Coen State School	Principal Ph 4060 1132	Vulnerable Customers	as above
Coen Kindergarten	Co-ordinator Ph 4060 1160	(Young Children 3 – 5 Yrs)	as above
Sunbird Cottages (Senior Aged & Specialist Care facility)	Administered by Cooktown Hospital 4043 0100	Vulnerable Customers (Aged Pensioners / Special Care requirements)	Local Water Quality issues: Aged Care establishments Informed of local issues by leaflet or personal notification. Planned Water main shutdowns: (which would impact on the listed establishments) Establishments are notified with 48 Hrs (min) notice, Larger jobs would be broken down into smaller separate jobs to minimise the inconvenience, or if that was not an option, then a temporary alternate water supply line would be installed to maintain the water supply to the establishment
Coral Sea Units (Senior Independent Aged Care)	Administered by Cooktown RSL 4069 5780	Vulnerable Customers (Aged Pensioners)	As above
Endeavour Lodge (Senior Independent Aged Care)	Administered by Cook Shire 4069 5444	Vulnerable Customers (Aged Pensioners)	As above
Cooktown Hospital	Director of Nursing 4043 0100	Vulnerable Customers (Patients)	As above Note: can have water supplied from 2 different directions by opening/closing appropriate valves

Organisation	Contact Details	Relevance to management of drinking water quality	How the stakeholder is engaged in the DWQMP
Cooktown Multi Purpose Health Service	Nurse Manager 4043 0170	Vulnerable Customers (Patients)	Note: can have water supplied from 2 different directions by opening/closing appropriate valves
Laura Clinic	Director / Manager: 4060 3320	Vulnerable Customers (Patients)	Local Water Quality issues: Aged Care establishments Informed of local issues by leaflet or personal notification. Planned Water main shutdowns: (which would impact on the listed establishments) Establishments are notified with 48 Hrs (min) notice, Larger jobs would be broken down into smaller separate jobs to minimise the inconvenience, or if that was not an option, then a temporary alternate water supply line would be installed to maintain the water supply to the establishment
Coen Health Clinic	Director / Manager: 4060 1166	Vulnerable Customers (Patients)	Local Water Quality issues: Health Based establishments informed of local issues by leaflet or personal notification. Planned Water main shutdowns: (which would impact on the listed establishments) Establishments are notified with 48 Hrs (min) notice.
Apunipima (Chronic Health Illnesses)	Director / Manager: 4060 1166	Vulnerable Patients	As above
Coen Well Being Centre – RFDS Qld	4212 7300	Vulnerable Patients General counselling for SEWB issues / stressful life events Drug and Alcohol services	As above
D&R Services (HACC)	Director / Manager: 0457 101920	Preparation of Meals, Personal Care & Social Support (Hygiene , grooming, community outings, respite, Assistant to attend appointments - transport etc)	As above
Home Dialysis Patients	Paul Gibson 4069 5231	Vulnerable Customers (Requires frequent home Dialysis)	Local Water Quality issues: Home Dialysis Consumers Informed of local issues by personal notification. Planned Water main or Water service shutdown to be planned with the dialysis patients, and performed on days when patients not using Dialysis equipment. Dialysis register kept at Council
FNQROC (Far North Qld Regional Organisation of Councils)	FNQ Regional Organisation of Councils Ph 07 4044 3408 Mob 0428 486 447	Designed and orchestrated the supply of chemical contracts for all the Northern Councils in the aftermath of the 2011 QLD floods and Cyclone "Yasi"	FNQROC Have developed the "FNQROC" development manuals which include Water & Sewerage. They are also looking at other areas where they may assist in a reduction of costs to Council

Organisation	Contact Details	Relevance to management of drinking water quality	How the stakeholder is engaged in the DWQMP
Bay Chemicals	Bay Chemicals P/L 63 Wills St PO Box 1124 Townsville Qld 4810 Ph 07 4721 6150	Supplier of Bulk Alum to CSC with a recently signed 3 yr contract	Full confidence in this supplier to supply a quality locally produced chemical
Elite Chemicals, (GE Power & Water)	GE Power & Water Ph 074035 5699 Mob 0428101190	Supplier of Sodium Hypochlorite to CSC with a recently signed 3 yr contract	Full confidence in this supplier to supply a quality chemical as GE Power & Water are a large reputable Company
Cook Shire Council	Director Engineering Services 07 4069 5444	Responsible for overall budget, planning and implementation, operation and maintenance of the water supplies and distribution	Kept informed of Water quality issues / or operational problems through a monthly report to Council. Notified personally, by phone, or email of more urgent situations
Water Planning and Regulation (DEWS)	1300 596 709	Regulator of Qld Water Suppliers	Incidents reported to DEWS
Queensland Health	Environmental Health Service Cairns Public Health Unit, Tropical Regional Services Ph 07 4226 5589 Mob 0427 679385	Over arching regulator of Health related issues in Qld Drinking waters	Conducts regular audits for Fluoride, as well as advice in the advent of a drinking water quality incident, or in the aftermath of the QLD floods and Cyclone "Yasi" Qld Health were involved in developing an "Action Plan" when nil Sodium Hypochlorite was available.
Cairns Regional Council Water Quality Laboratory	38 MacNamara St Manunda Qld 4870 Ph 07 4044 8344 Fax 07 4044 8333	Verification Testing	Analyses the samples collected and forwarded to them for verification and effectiveness of the treatment processes

5 RISK METHODOLOGY

Cook 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.

This review of the DWQMP has ensured that the consequence descriptors have been consistently applied, and this has resulted in a change in most risk ratings.

5.1 Definitions

The tables below define the likelihood, consequence and uncertainty.

Table 4 Consequence definitions

Consequence	Descriptor
Catastrophic	Potential acute health impact, significant community illness (> 4 people) expected
Major	Potential acute health impact, no community illness expected
Moderate	Repeated breach of chemical health guideline value
Minor	Isolated breach of chemical health guideline value, or widespread occurrence of parameter above aesthetic guideline
Insignificant	Potential isolated occurrence of aesthetic parameter above guideline value.

Table 5 Likelihood definitions

Likelihood	Descriptor
Almost Certain	Occurs more often than once per week
Likely	Occurs more often than once per month, and up to once per week
Possible	Occurs more often than once per year, and up to once per month
Unlikely	Occurs more often than once every 5 years, and up to once per year
Rare	Occurs less than once every 5 years

The likelihood is considered as a daily unit. This is applied in the following way. If a hazard occurs for 52 days in a year, it is considered as almost certain. So, whilst an algal bloom at Annan Weir has not occurred for 10 years, it lasted for several weeks, taking the likelihood to possible. This more rigorous application of the likelihood descriptors was considered necessary in our schemes as the remoteness requires a higher level of self-sufficiency due to the difficulty in accessing spare parts and specialist skills.

Table 6 Uncertainty definitions

Uncertainty Level	Descriptor
Certain	The processes involved are thoroughly understood and supported by extensive on site knowledge and continual to weekly data
Confident	The processes involved are well understood and supported by extensive operational experience, 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.
Estimate	The process is reasonably well understood, and is supported by some water quality data.
Unreliable	The process is not well understood, and there is little to no water quality data.

5.2 Public Health Risk Matrix

Table 7 Public Health Risk Matrix

Public Health Risk Matrix					
	Insignificant	Minor	Moderate	Major	Catastrophic
Almost Certain	Medium 6	High 10	High 15	Extreme 20	Extreme 25
Likely	Medium 5	Medium 8	High 12	High 16	Extreme 20
Possible	Low 3	Medium 6	Medium 9	High 12	High 15
Unlikely	Low 2	Low 4	Medium 6	Medium 8	High 10
Rare	Low 1	Low 2	Low 3	Medium 5	Medium 6

5.3 Methodology

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

- 1) Hazard identification, and
- 2) Unmitigated risk assessment, and
- 3) Mitigated (scheme specific) risk assessment.

The hazard identification was based on the previous approved DWQMP, but expanded to consider additional scheme specific hazards, and in some cases, the differences in unmitigated risks between schemes. For example, additional biological hazards (e.g. Amoeba) were considered, and the cyanobacterial risk in the Annan Weir was considered separately to the Coen Dam.

After a hazard is identified, the likely sources of the hazard to a type of scheme (surface water, or bore) are considered.

For each hazard, an unmitigated risk was determined by first determining the consequence of the hazard, strictly adhering to the definitions, 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 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 chlorine or trace level pesticides, will have either minor or moderate consequences. Once the consequence and likelihood were assigned, the Public Health Risk was determined using the risk matrix. An uncertainty is also assigned to demonstrate the level of confidence in the assessment.

Cook 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, as detailed in the individual scheme based plans.

For the mitigated (scheme specific) risk assessments, 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. Again, an uncertainty is assigned. If the mitigated risk remains unacceptable, a risk management improvement item is identified.

Table 8 Hazard identification and risk assessment teams

Name	Position Description	Expertise and system knowledge	Risk Workshop		
			Original	2015	2018
Robert Fenn (since retired)	Manager Water & Sewerage	28 Yrs Exp. in Water & Sewerage with CSC Cert. 3 Water Treatment, Diploma of Water Operations, Fluoride Ticket	X	X	
Wal Welsh	Assistant Manager Water & Sewerage	23 Yrs Exp. in Water & Sewerage with CSC	X	X	X
Cathy Hocking	Admin. Officer Water & Sewerage	5 Yrs Exp. in Water & Sewerage with CSC	X	X	X
Ron McConnell (Since Resigned)	Foreman Water & Sewerage	12 Yrs Exp. in Water & Sewerage with CSC Cert. 3 Water Treatment, Fluoride Ticket	X		
Laurie Downs (Since resigned)	Ganger Water & Sewerage	8.5 Yrs Exp. in Water & Sewerage with CSC	X		
Malcolm Smith (Since Resigned)	Treatment Plant Operator	4 Yrs Exp. in Water & Sewerage with CSC Cert. 3 Water Treatment, Fluoride Ticket	X		
John Hewerdine (Since Resigned)	Treatment Plant Operator	16 Yrs Exp. in Water & Sewerage with CSC Cert. 3 Water Treatment, Fluoride Ticket	X		
Michael Lawrence	Facilitator, Consultant, Bligh Tanner	WQMS Auditor, Former drinking water regulator, 10+ years in water industry		X	
Robyn Maddalena	Manager Water & Sewerage	19 Yrs Exp. in Water & Wastewater (5 years with CSC) Cert. 3 Water Treatment, Cert .3 in Wastewater Treatment, Diploma of Water Operations, Fluoride Ticket Applied Science degree, Hon, PhD			X

Name	Position Description	Expertise and system knowledge	Risk Workshop		
			Original	2015	2018
Les Treloar	Team Leader Treatment	28 Yrs experience in water and wastewater. (12 years with CSC) Cert III in Water Operations Fluoride ticket			X

5.4 Hazard Identification and Unmitigated Risk

Table 9 Hazard identification and unmitigated risk assessment

Hazard	Type of Hazard	Sources of Hazard	Unmitigated Risk			Uncertainty	Comments	Treatment Barrier/s
			Consequence	Likelihood	Risk			
Bacteria/Virus	Biological	Surface Water Schemes Annual wet season causing ingress of animal faeces	Catastrophic	Likely	Extreme 20	Certain	More likely than protozoa, but low risk of human pathogenic forms.	coagulation/sedimentation (or DAF)/filtration/ MF/ disinfection
Bacteria/Virus	Biological	Bore Schemes contamination of bore	Catastrophic	Likely	Extreme 20	Certain	Bore integrity can be improved. Disinfection in all schemes	coagulation/sedimentation (or DAF)/filtration/ MF/ disinfection
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, positive pressure in mains, mains break procedures.
Cyanobacteria	Biological	algal bloom - Annan River	Minor	Possible	Medium 6	Confident	When Annan River stops flowing, blooms initiate quickly. However, does not stop every year.	filtration would remove algal cells
Cyanobacteria	Biological	algal bloom - Coen Dam	Minor	Likely	Medium 8	Confident	Coen Dam has blooms, but not annually. Aerator assists, and Copper Sulphate used.	filtration would remove algal cells
Cyanobacterial toxins	Chemical	algal toxin - Annan River	Major	Unlikely	Medium 8	Confident	has not been an issue	chemical oxidation (with disinfection process), investigate PAC
Cyanobacterial toxins	Chemical	algal toxin - Coen Dam	Major	Possible	High 12	Confident	<i>Cylindrospermopsis</i> blooms occur annually, could be toxic	alternate sources used
Protozoa	Biological	faecal contamination (septics contaminating bores Laura/ Lakeland)	Catastrophic	Likely	Extreme 20	Confident	Laura has septic in close proximity to bores	bore casing to 70m (Bore 1), microfiltration
Protozoa	Biological	faecal contamination of bore water	Catastrophic	Likely	Extreme 20	Confident	Bore integrity can be improved, disinfection ineffective.	coagulation/ filtration
Protozoa	Biological	faecal contamination of surface water	Catastrophic	Likely	Extreme 20	Confident	Surface water sources can become contaminated, but no high risk sources in catchment.	coagulation/ filtration
Protozoa	Biological	Ingress into reservoirs/ water mains	Catastrophic	Likely	Extreme 20	Reliable	Any holes in reservoirs could result in protozoa	reservoir integrity, mains repair procedure

Hazard	Type of Hazard	Sources of Hazard	Unmitigated Risk			Uncertainty	Comments	Treatment Barrier/s
			Consequence	Likelihood	Risk			
Amoeba (<i>Naeglaria</i> , <i>Acanthamoeba</i> etc)	Biological	Ingress into reservoirs/ water mains, insufficient residual disinfection	Catastrophic	Rare	Medium 6	Estimate	if present likely impact to only single person	residual disinfectant, mains repair procedure
Alkalinity	Chemical	potential change in ratio of surface runoff to springs	Minor	Unlikely	Low 4	Reliable	alkalinity required for coagulation at ratio of 0.45 alkalinity/1 alum	routine jar tests
Aluminium	Chemical	Overdose coagulant, poor floc formation	Minor	Possible	Medium 6	Confident	Annan treatment plant operated during work hours, operator present and observing SCADA. Coen DAF observed by operators.	Sedimentation/ floatation
Chlorate	Chemical	chemical breakdown	Moderate	Likely	High 12	Unreliable	Currently not a guideline value. Will have moderate consequence if in ADWG. Will not be able to meet guideline if continue using sodium hypochlorite as 5 months storage required in remote schemes in wet season.	nil at present
Chlorine	Chemical	chemical overdose	Moderate	Almost Certain	High 15	Confident		SCADA monitoring
Colour	Physical	naturally occurring	Minor	Possible	Medium 6	Confident	Surface water only	Coagulation/ sedimentation
Copper	Chemical	added to Coen Dam as algaecide	Moderate	Rare	Low 3	Reliable		calculate suitable dose
DBPs	Chemical	elevated organics and long detention times	Moderate	Possible	Medium 9	Reliable	Coen dam has higher organics, currently lots of lilies in dam	
DBPs (bore water)	Chemical	elevated organics and long detention times	Moderate	Rare	Low 3	Reliable	low organics in bore water, small schemes with no significant detention for DBP formation	
Fluoride	Chemical	Fluoridation	Moderate	Likely	High 12	Reliable		system design with multiple interlocks
Heavy metals	Chemical	natural geology	Moderate	Rare	Low 3	Reliable	baseline metals are all well below guideline levels	nil required
Heavy metals (e.g. Sb, Hg)	Chemical	tailings dam overflow (Annan River catchment)	Moderate	Unlikely	Medium 6	Reliable	mine overflow did not result in any increase in heavy metals due to high dilution.	nil required
Hydrocarbons	Chemical	illegal disposal of fuel etc	Moderate	Likely	High 12	Confident	Coen Dam, pump on bank, cars disposed in tailings catchment.	

Hazard	Type of Hazard	Sources of Hazard	Unmitigated Risk			Uncertainty	Comments	Treatment Barrier/s
			Consequence	Likelihood	Risk			
Hydrocarbons	Chemical	illegal disposal of fuel etc	Moderate	Possible	Medium 9	Confident		
Iron	Chemical	Surface water natural geology, sediment	Minor	Possible	Medium 6	Reliable		coagulation/ sedimentation
Iron	Chemical	Laura, natural geology, sediment	Minor	Almost Certain	High 10	Reliable		aeration with chlorine oxidation, MF
Lead	Chemical	natural geology, pipework	Moderate	Rare	Low 3	Reliable	not believed to be any lead pipes or old PVC that would contain stabilisers	
Manganese	Chemical	natural geology	Moderate	Rare	Low 3	Reliable	has not been an issue	
Pesticides	Chemical	agricultural use in catchment	Moderate	Rare	Low 3	Reliable	Some organic banana plantations near Lakeland, but pesticide use generally low in catchments.	nil required
Pesticides		Dumped drums and contaminated site in Lakeland	Moderate	Unlikely	Medium 6	Estimate	Testing of Army bore indicated no pesticides above ADWG, but annual monitoring continues.	biannual testing at Lakeland
pH	Chemical	interaction with concrete	Minor	Almost Certain	High 10	Confident	as pH increases in concrete mains, residual disinfection becomes less effective	
Scaling	Chemical	TDS or organics in raw water	Minor	Likely	Medium 8	Confident		CIP for Memcor membranes
Taste and odour	Chemical	algae blooms	Minor	Likely	Medium 8	Confident		Filtration
Taste and odour	Chemical	biofilm in reticulation	Minor	Likely	Medium 8	Confident		
Temperature	Physical	seasonal	Minor	Likely	Medium 8	Certain	chlorine consumption, regrowth	nil required
Treatment chemicals	Natural disaster	no chemical delivery resulting in inability to treat water	Catastrophic	Possible	High 15	Confident	Sufficient chemicals retained on site	Annual preparedness for wet season
Turbidity	Physical	river flooding	Minor	Almost Certain	High 10	Certain		
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		nil required

Hazard	Type of Hazard	Sources of Hazard	Unmitigated Risk			Uncertainty	Comments	Treatment Barrier/s
			Consequence	Likelihood	Risk			
Inability to access schemes	Whole of System	Annual road closures in wet to Coen,	Catastrophic	Likely	Extreme 20	Reliable	Difficult to get key skills to Coen to manage breakdowns/ incidents	Building system resilience, maintaining suitable spares on site, staff training to be self-sufficient where possible.
Inability to access schemes	Whole of System	Laura and Lakeland can be cut off for shorter periods	Catastrophic	Possible	High 15	Reliable	in wet seasons , there can be a week or more where it is difficult to access Lakeland and Laura.	Building system resilience, maintaining suitable spares on site, staff training to be self-sufficient where possible.
Failure of supply	Whole of System	drought	Catastrophic	Rare	Medium 6	Reliable	bores	
Failure of supply	Whole of System	cyclone	Catastrophic	Possible	High 15	Confident	Specific actions in each scheme	Generators, cyclone preparedness plans, DMP.
Failure of supply	Whole of System	loss of power	Catastrophic	Likely	Extreme 20	Confident	Generators in Cooktown, Coen	
Operator error	Whole of System	untrained/ overworked/ mistake	Catastrophic	Almost Certain	Extreme 25	Confident	Need better procedures, or tighter SCADA control to prevent errors.	Only Cert 3 trained operators employed, on-site training
Sabotage	Whole of System	Any chemical or microbiological hazard	Catastrophic	Possible	High 15	Estimate	Sabotage tends to be opportunistic and low level. Has been issue at Laura, but "on camera" signs effective at moment.	Cooktown/Coen daily inspections, Lakeland, Laura, weekly.
WTP fire	Whole of System	electrical fire	Catastrophic	Unlikely	High 10	Reliable	old power boards	
Loss of Key staff	Whole of System	Budget constraints, restructuring	Catastrophic	Likely	Extreme 20	Reliable	Obtaining and Retaining quality staff is a major challenge to Local Authorities whilst the Mines offer lucrative packages	
Infrastructure limitations / Ageing	Whole of System	Some switchboards at capacity	Major	Almost Certain	Extreme 20	Reliable	Some electrical switchboards are very old, and may limit ability to upgrade processes in some cases	Planned upgrades
reduced supply/ restrictions	Whole of System	membrane fouling, WTP issues, bore collapse etc	Minor	Likely	Medium 8	Reliable	annual cleaning of membranes, other asset management	asset management
Chemicals from dump	Chemical	Coen Dump adjacent to dam,	Moderate	Possible	Medium 9	Confident	In separate sub-catchment, but may have connecting groundwater?	continue to observe

6 PREVENTIVE MEASURES AND OPERATIONAL MONITORING

Preventive measures and operational monitoring are scheme specific and are detailed within the site based plans.

7 VERIFICATION MONITORING

Verification monitoring is undertaken both internally by CSC and externally using a contract laboratory (contract periodically renewed, previously has been either SGS or Cairns Regional Council).

Verification monitoring locations are detailed in each of the site based plans as the water treatment operators are responsible for ensuring that the samples are taken.

Each calendar year, a schedule, such as that included overleaf, is prepared and provided to all relevant operators. This ensures that appropriate verification monitoring samples, based on the risks to the service, are collected. If the general frequency of sampling, parameters monitored, and monitoring locations do not change, we do not consider that it is necessary to amend the DWQMP to annually update this calendar, as the only real change is the date of each sampling week.

However, It is important to note that accessibility constraints can limit our ability to undertake this schedule exactly. For example, in most years, there will be periods of time where flooding will prevent sampling. In these cases, we will do our best to return to the annual schedule as soon as possible.

[illegible]

8 INCIDENT AND EMERGENCY RESPONSE PLAN

Cook Shire Council definitions for an incident and an emergency are detailed below:

Levels of Incident are as defined below:

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

Table 11 Management of incidents and emergencies

Alert Level	Description	Key management response(s)	Position(s) responsible
High: Declared Disaster	<ul style="list-style-type: none"> • Declared disaster. Examples include a significant cyclone, flood, drought, bushfire and terrorism. 	Activate disaster management plan.	CEO/ Director, Engineering Services
Medium: Incidents and Emergencies	<ul style="list-style-type: none"> • Exceedance of ADWG health guideline value • Outbreak of waterborne disease • Detection of a parameter with no water quality criteria that may have an adverse effect on public health. • An event which is beyond the ability of MRC to control and may have an adverse effect on public health. • Loss of water supply for >6 hours. 	Activate incident response plan. Ensure all control measures identified in the DWQM Plan are functioning effectively.	Manager Water and Wastewater Assistant Manager Water and Wastewater
Low: Operational Action	<ul style="list-style-type: none"> • Exceed operational limit <p>Effectively managed by the water treatment team undertaking operational actions in line with our DWQMP.</p>	Ensure all barriers are functioning effectively. Check and act upon operations and maintenance records and procedures. Take appropriate actions to rectify situation.	Plant Operators

Table 12 Incident and emergency summary of actions

Alert Level	Key management response(s)	Brief summary of actions	Documented Plans & Procedures
High: Declared Disaster	Activate disaster management plan.	<ul style="list-style-type: none"> • Notify CEO • Coordinate internal notification, investigation and response of water related aspects • Consider what community notification is needed (if any) e.g. do not drink alert, boil water alert or bottled/emergency water distribution • Notify WSR 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 functioning effectively.	<ul style="list-style-type: none"> • Notify Manager of Water and Wastewater • Notify WSR of any reportable incidents immediately (within 3 hours). • Ensure all control measures identified in the 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 where required 	Incident response plan (this document) CSC DWQMP
Low: Operational Action	Ensure all operational steps identified in the DWQMP are functioning effectively. Check and act upon operations and maintenance records and procedures.	<ul style="list-style-type: none"> • Notify Manager Water and Wastewater. • Review operations and maintenance records for anomalies • Commence investigation to determine cause, if not identifiable through operational records • Investigate immediate remediation actions • Increase operational monitoring frequency where required 	Operations and maintenance records and procedures. CSC DWQMP. Routine monitoring

8.1 Low - Operational Action

At the low alert level, operational actions are required to manage the issue and prevent escalation. Issues at this level are normally identified through operational monitoring.

Corrective actions will be taken to ensure processes are brought back to target levels, a record made in the plant diary, and the action communicated to the Manager Water and Wastewater, and escalated if necessary.

Note: Exceedances of upper and lower alarms that result in WTP shutdown are considered to be within the scope of normal operation of the management plan, and do not automatically escalate beyond Level 1 unless the situation warrants. For example, a high chlorine alarm that shuts down the Coen treatment plant before the chlorine level exceeds the water quality criteria is dealt with as a Level 1 action. If the water quality criteria are exceeded, the issue is a Level 2 incident.

8.2 Medium - Incident or Emergency

At the medium alert level, there is a potential for an adverse public health impact.

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 in accordance with the escalation procedure.

A medium alert level incident or emergency is likely to be managed by the Manager Water and Wastewater, and/or council management in line with our DWQMP. In some cases, it may require coordination across other CSC departments and external resources and support, such as from QWSR or more likely, Queensland Health. There is the possibility of customer complaints.

Appropriate corrective actions will be identified, and implemented as soon as practicable to minimise the effect of the incident. Examples for typical actions that we will normally take for the detection of a parameter above the water quality criteria (such as *E. coli*) follow.

Medium alert level incidents and emergencies are normally reportable to the regulator.

CSC will inform the Regulator within 3 hours of becoming aware of the incident (3 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 required.

Resampling: A resample will be arranged for any parameter where the initial sample did not meet the ADWG health guideline value.

8.3 High - Declared Disaster

The CEO activates the Disaster Management Plan/ a Disaster is declared by the State Government. Requires coordination across Council and requires external resourcing and support from agencies, such as Department of Emergency Services, Department of Energy and Water Supply, Department of Health, local disaster management groups, emergency responders like QFRS, 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.

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. For example, in the event of a major cyclone, it is likely that communication will be lost for some time.

8.4 Example incident response

8.4.1 Exceedance of Water Quality Criteria

Verification monitoring data is reviewed by CSC as soon as possible. Where water quality does not meet the water quality criteria, the following steps are normally undertaken:

- 1) Define the extent of the problem:
Determine the potentially affected locations and number of customers impacted – e.g.
 - whole scheme, or
 - the end of a reticulation line
- 2) Define the water quality at the time of sampling:
Confirm the following at the sampling location, and upstream of the sampling location (e.g. an upstream reservoir, WTP or Bore):
 - disinfection residual,
 - turbidity
- 3) Identify if any parameter is outside the normal range for this location.
- 4) Confirm correct operation of water treatment processes.
- 5) Consider need/ ability to isolate source:
 - (e.g. could a potentially contaminated reservoir be bypassed?)
- 6) Consider ability to flush reticulation network
- 7) CSC officer to go on site to confirm turbidity, and disinfection levels
- 8) Flush if appropriate:
 - If any water quality parameter is outside the normal range for that area, flush until normal residual disinfection is re-established.
 - For *E. coli* detection at any sample location, flush to achieve disinfection residual of ~ 0.5 mg/L. (for example, this may require hand dosing of sodium hypochlorite into reservoirs, or increasing disinfection dose rate).
- 9) Resample

These incidents are reported to the Regulator within 3 hours of becoming aware.

As many of the above steps are undertaken as possible prior to reporting so that relevant information can be provided. Upon resolution of the incident, the causes for the failure are identified, and the relevant aspects of the DWQMP are reviewed to determine whether the DWQMP is appropriate to prevent the issue from reoccurring.

9 INFORMATION MANAGEMENT

“CM9” software is now the official Records and Electronic Document Management System for Cook Shire Council. Documents Stored in CM9 can be accessed by all Office Staff.

Cook Shire Water & Sewerage previously stored all its data in multiple MS Access Databases from which we could generate reports or trends. However, this has been replaced with SWIM Local.

SWIM Local is a user friendly program that streamlines reporting requirements. The reporting module allows reports to be generated over any time period which will fit in with our monthly reporting requirements.

Table 13 Details of Records kept for Cooktown Scheme

	Information/ Document	Format	Where stored	Position Responsible	Comments
Annan Treatment Plant	Daily Treatment Plant Rounds	Hardcopy / Electronic	Last 2 months at the Annan WTP, balance scanned & archived.	Plant operators (Annan T/P)	Also transferred into SwimLocal
	Fluoride Daily Rounds	As above	As above	As above	As above
	Testing of Raw & Treated water Results	As above	As above	As above	As above
	Daily testing of Fluoride water Results (Form 4C)	As above	As above	As above	As above
	Chemicals delivered	Hardcopy / Electronic	Stored in CM9	Admin/Technical officer	
	Chemical Batching Records	Hardcopy / Electronic	Last 2 months at the Annan WTP, balance scanned & archived.	Plant operators (Annan T/P)	
	Fluoride Maintenance Performed Sheets	Hardcopy	Annan WTP	Maintenance Technician	
	Waste Tracking Data	Electronic	Annan WTP	Plant operators (Annan T/P)	Regulator CONNECT system
	Retic sampling Records	Electronic Spreadsheet	Last 2 months at the Annan WTP, balance scanned & archived.	Plant operators (Annan T/P)	Also transferred into Swim Local and in Sky Drive
	E.coli sampling Records	Hardcopy / Electronic	As above	As above	As above
	General Plant Maintenance	Electronic	Database in Maint. Tech. Laptop – Copy Admin Office	Plant operators (Annan T/P) & Maintenance Technician	Entered into MS Access Database
	Treatment Plant Faults	Electronic	Annan WTP	Plant operators (Annan T/P)	Swim Local
	Water Sampling Schedule	Hardcopy / Electronic	Water T/Plants and Depot Reticulation Office	Plant operators (Annan T/P)	Sky Drive
Cooktown Reticulation	NPS Daily Records	Hardcopy / Electronic	Depot Achieve room & Scanned into CM9	Team Leader Retic/Admin & Technical officer	Also transferred into Swim Local
	Furneaux St P/Stn Daily Records	As above	As above	As above	As above
	4 Mile Hill Daily Records	As above	As above	As above	As above
	F/Stn Reservoir Daily Records	As above	As above	As above	As above
	Water mains Repairs	As above	As above	As above	As above
	Water Service Repairs	As above	As above	As above	As above
	E.coli & Coliforms Sampling info	As above	As above	As above	Also transferred into Swim Local and in Sky Drive
	Reticulation water Sampling Spreadsheet	Spreadsheet	Sky Drive	Team Leader Reticulation	For Generating Sampling I.D. No's
	Change of water meter details	Hardcopy / Electronic	Depot Achieve room & Scanned into TRIM	Team Leader Retic/Admin & Technical officer	Also transferred into Swim Local
	Power Consumption Readings	As above	As above	Team Leader Retic/Admin & Technical officer	As above
	Water Sampling Schedule	Hardcopy / Electronic	Water T/Plants and Depot Reticulation Office	Manager W&WW	Sky Drive

	Information/ Document	Format	Where stored	Position Responsible	Comments
Laura Treatment Plant	Daily Monitoring	Hardcopy / Electronic	Depot Achieve room & Scanned into CM9	Team Leader Treatment	Also transferred into Swim Local
	Water Sampling Records	As above	As above	As above	As above
	Power Consumption Readings	As above	As above	Team Leader Treatment/Admin & Technical officer	As above
	E.coli Sampling Records	As above	As above	Team Leader Treatment/Admin & Technical officer	As above
Laura Reticulation	Laura Water Retic. Sampling Records	Hardcopy / Electronic	Depot Archive room Scanned into CM9	Team Leader Retic/Admin & Technical officer	Also transferred into Swim Local
	Water mains Repairs	As above	As above	As above	As above
	Water Service Repairs	As above	As above	As above	As above
	E.coli & Coliforms Sampling info	As above	As above	As above	As above
	Change of water meter details	As above	As above	As above	As above
	Water Sampling Schedule	Hardcopy / Electronic	Water T/Plants and Depot Reticulation Office	Manager W&WW	
Lakeland Compound	Daily Monitoring	Hardcopy / Electronic	Depot Achieve room & Scanned into CM9	Team Leader Retic/Admin & Technical officer	Also transferred into Swim Local
	Water Sampling Records	As above	As above	As above	As above
	Power Consumption Readings	As above	As above	As above	As above
	E.coli Sampling Records	As above	As above	As above	As above
Lakeland Reticulation	Lakeland Water Retic. Sampling Records	Hardcopy / Electronic	Depot Archive room Scanned into TRIM	Team Leader Retic/Admin & Technical officer	Also transferred into Swim Local
	Water mains Repairs	As above	As above	As above	As above
	Water Service Repairs	As above	As above	As above	As above
	E.coli & Coliforms Sampling info	As above	As above	As above	As above
	Change of water meter details	As above	As above	As above	As above
	Water Sampling Schedule	Hardcopy / Electronic	Water T/Plants and Depot Reticulation Office	Manager W&WW	
Coen Treatment Plant	Daily Treatment Plant Rounds	Hardcopy / Electronic	Depot Achieve room & Scanned into CM9	Team Leader Treatment/Admin & Technical officer	Also transferred into Swim Local
	Testing of Raw & Treated water Results	As above	As above	As above	As above
	Source water Records	As above	As above	As above	As above

	Information/ Document	Format	Where stored	Position Responsible	Comments
	Power Consumption Readings	As above	As above	As above	As above
Coen Reticulation	Water mains Repairs	Hardcopy / Electronic	Depot Achieve room & Scanned into CM9	Team Leader Retic/Admin & Technical officer	Also transferred into SwimLocal
	Water Service Repairs	As above	As above	As above	As above
	E.coli & Coliforms Sampling info	As above	As above	As above	As above
	Change of water meter details	As above	As above	As above	As above
	Power Consumption Readings	As above	As above	As above	As above
	Water Sampling Schedule	As above	Water T/Plants and Depot Reticulation Office	Manager W&WW	
Water & Wastewater Admin Office	All Water Sampling Results (NATA Analysed)	Hardcopy / Electronic	Depot Achieve room & Scanned into CM9	Admin & Technical officer	Also transferred into SwimLocal
	All Water Sampling Results (CSC Analysed)	As above	As above	As above	As above
	Water Quality Complaints Form	As above	As above	As above	As above
	New water connection Application Forms	As above	As above	As above	As above

- All Water & Sewerage operational, maintenance, and sampling results are kept for the required retention time in accordance with the *Public Records Act 2002* then disposed of. (See Table Below)
- CM9 is the document control system which has the latest documentation. Council Workplace Health and Safety Officers are working on a document control system for Council's Standard Operating Procedures.
- All Equipment manuals relating to the equipment at the Water Treatment Plant are stored at the Water Treatment Plant
- All Equipment manuals relating to the equipment within the Cooktown Reticulation are stored at the Cooktown Depot Plumbers Shed.

Table 14 Document Retention Times

Records relating to the operational monitoring of processes and equipment	Retain for 5 Yrs after last action
Records relating to the monitoring of the local government water supply to verify the quality of water distributed and supplied by the local government, in accordance with the Australian Drinking Water Guidelines issued by the National Health and Medical research council	Retain for 15 years after last action.
The activity of repairing, servicing and preserving of specifically designed and/or purpose built buildings, structures, plant and equipment used for the storage, treatment and supply of water	Retain for 3 years after last action.

10 RISK MANAGEMENT IMPROVEMENT PROGRAM

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 risk assessments for each scheme, and have been collated in this document.

The items have been prioritised as 17/18 FY, 18/19 FY, 19/20 and beyond actions. Items identified for 17/18 are incorporated in the current budget cycle, and will be undertaken as soon as possible, 18/19 FY items will be included in budget submissions for the 16/17 FY, but this will also be contingent on budget approval. Items that are identified for 19/20 FY and beyond will be introduced as items in following budgets in order to secure funding. External funding is also sort.

Where any RMIP items are not approved by council for the following financial year, the item will either remain on the improvement program as is, or alternative measures may be introduced.

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 result in a similar reduction of the risk, these alternate actions may take the place the identified items.

Cooktown Water

Process Step	Hazardous Event	Hazards managed by same barriers	Unmitigated Risk	Primary preventive measure	Other Preventive Measures	Mitigated			Uncertainty	Comments	Risk Management Improvements		
						Consequence	Likelihood	Risk			Immediate (17/18 FY)	2018/19 FY	19/20 FY or later
Catchment	Animals in catchment	bacteria and virus	Extreme 20	disinfection	coagulation filtration	Catastrophic	Rare	Medium 6	Certain	considered as whole of treatment in absence of failure			
	Present in catchment - animals	protozoa	Extreme 20	filtration	coagulation	Catastrophic	Rare	Medium 6	Confident	considered as whole of treatment in absence of failure			
	Annan stops flowing, and algal bloom	taste and odour	Medium 8	coagulation/ filtration		Moderate	Rare	Low 3	Reliable	doesn't happen every year, but can then be present for weeks at a time			investigate taste and odour removal
Bores	Ingress into bore	bacteria and virus	Extreme 20	disinfection	borehead sealed	Catastrophic	Rare	Medium 6	Certain	backup supply, rarely used. Inspection program every three months.			
	Ingress into bore	protozoa	Extreme 20	borehead sealed	Inspection program every three months	Catastrophic	Rare	Medium 6	Confident	backup supply, rarely used. Inspection program every three months.			
	Bore switchboard failure	failure of supply	High 10			Major	Unlikely	Medium 8	Reliable	backup supply, but could be required in Disaster. 6 separate bores		Investigate Reinstatement of borefields to use in emergency	

Cooktown Water

Process Step	Hazardous Event	Hazards managed by same barriers	Unmitigated Risk	Primary preventive measure	Other Preventive Measures	Mitigated			Uncertainty	Comments	Risk Management Improvements		
						Consequence	Likelihood	Risk			Immediate (17/18 FY)	2018/19 FY	19/20 FY or later
	Bore pump failure	Failure of supply	High 10	Multiple bores, would still be able to supply		Major	Rare	Medium 5	Certain				
Raw Water Feed	Raw water main break	Failure of supply	High 10	5 ML in treated water reservoirs - multiple days supply	mains break procedure	Moderate	Rare	Low 3	Confident	Crews available to fix critical issues			
	Raw water pump failure	Failure of supply	High 10	5 ML in treated water reservoirs - multiple days supply	duty standby	Major	Rare	Medium 5	Certain	routine maintenance			
Coagulation	Underdose alum	Protozoa, turbidity	Extreme 20	coagulation	Sedimentation basin monitoring, EDAC alarm on NTU over 15 from Sed basin. Filtration	Minor	Possible	Medium 6	Confident	plant run when operators on site, wet season consumption low. SCADA Alarms to operators if NTU over 15 from sedimentation basin.			
	Overdose alum	Aluminium	Medium 6	Sedimentation tank monitoring	EDAC alarm on NTU over 15 from Sed basin. Filtration	Minor	Possible	Medium 6	Confident	SCADA Alarms to operators if NTU over 15 from sedimentation basin.			

Cooktown Water

Process Step	Hazardous Event	Hazards managed by same barriers	Unmitigated Risk	Primary preventive measure	Other Preventive Measures	Mitigated			Uncertainty	Comments	Risk Management Improvements		
						Consequence	Likelihood	Risk			Immediate (17/18 FY)	2018/19 FY	19/20 FY or later
	poor floc due to low alkalinity	Protozoa	Extreme 20	soda ash dosing when required	Filters still pick up floc	Major	Unlikely	Medium 8		SCADA alarm for combined turbidity from filters			
	Bypass	Protozoa	Extreme 20	bypass not used in normal operations	direct filtration	Catastrophic	Rare	Medium 6		Requires manual opening of bypass valves. Wouldn't do maintenance in Wet season when risk higher			
Filtration	Filter breakthrough	Protozoa	Extreme 20	combined filtrate monitored on SCADA continuously, daily checks	Combined filtrate will ring EDAC above 1.5NTU	Major	Unlikely	Medium 8	Reliable	SCADA monitoring and alarms through autodialler. EDAC alarm on Sedimentation basin lowers the risk.			
	Filter breakthrough	turbidity	Medium 6	continuous clarifier monitoring	EDAC alarm on combined filters	Minor	Possible	Medium 6	Confident				
	Asset ageing	System failure	Extreme 20	Maintenance		Catastrophic	Rare	Medium 6	Estimate	Filters have been recoated internally to prevent concrete			

Cooktown Water

Process Step	Hazardous Event	Hazards managed by same barriers	Unmitigated Risk	Primary preventive measure	Other Preventive Measures	Mitigated			Uncertainty	Comments	Risk Management Improvements		
						Consequence	Likelihood	Risk			Immediate (17/18 FY)	2018/19 FY	19/20 FY or later
										degradation			
Disinfection	Overdose	Chlorine	High 15	Daily checks at WTP and Reservoirs.	EDAC alarm in place for high chlorine over 2.5mg/L	Moderate	Rare	Low 3	Confident	SCADA monitoring, and daily monitoring at plant, 25 km of pipeline, pumps would struggle to reach 5 mg/L.			
	insufficient dose	bacteria/virus	Extreme 25	Daily checks at WTP and Reservoirs. Filters	EDAC alarm in place for low chlorine under 0.8mg/L	Major	Unlikely	Medium 8	Reliable	Duty/Standby pumps available with automatic change over			
	ineffective disinfection due to turbidity	bacteria	High 10	disinfection, redosing at High level reservoir	Filtration. EDAC alarms.	Major	Unlikely	Medium 8	Confident	EDAC alarms on sedimentation basin and combined filters to alert operators to turbidity issues			

Cooktown Water

Process Step	Hazardous Event	Hazards managed by same barriers	Unmitigated Risk	Primary preventive measure	Other Preventive Measures	Mitigated			Uncertainty	Comments	Risk Management Improvements		
						Consequence	Likelihood	Risk			Immediate (17/18 FY)	2018/19 FY	19/20 FY or later
	chemical breakdown	chlorate	High 12			Moderate	Likely	High 12	Unreliable			Begin THM sampling of final water	If chlorate is found, investigate solutions.
	overdose fluoride	fluoride	High 12	fluoride interlocks, auto shutdown, daily monitoring		Moderate	Rare	Low 3	Reliable	interlocks, and design makes this nearly impossible			
Treated water storage/ Reservoirs	Ingress into reservoirs	bacteria/virus	Extreme 20	Integrity and sealing	residual chlorine	Catastrophic	Unlikely	High 10	Confident	Reservoirs all sealed	Seal leaks temporarily	4 mile reservoir and fire station reservoirs to be repaired/replaced. Leaking floor joints. GHD report.	Need to replace roof on High Level Res. Recoat High Level Res and Annan res.
	Ingress into reservoirs	Protozoa	Extreme 20	Integrity and sealing		Catastrophic	Unlikely	High 15	Reliable	Reservoirs all sealed	Seal leaks temporarily	4 mile reservoir and fire station reservoirs to be repaired/replaced. Leaking floor joints. GHD report.	Need to replace roof High Level Res. Recoat High Level Res and Annan res.
	ingress of amoeba	amoeba	High 12	disinfection as above items	integrity	Major	Unlikely	Medium 8	Reliable				
Reticulation	ingress of contaminated water / mains breaks	bacteria/virus	Extreme 20	network pressure, residual disinfection	mains break procedure	Major	Unlikely	Medium 8	Confident	daily network disinfection tests, flushing initiated if low	Mains replacement Program for 10 years. See capital program	Funding secured for main replacement program for 18/19	mains replacement program – 10 year program

Cooktown Water

Process Step	Hazardous Event	Hazards managed by same barriers	Unmitigated Risk	Primary preventive measure	Other Preventive Measures	Mitigated			Uncertainty	Comments	Risk Management Improvements		
						Consequence	Likelihood	Risk			Immediate (17/18 FY)	2018/19 FY	19/20 FY or later
	ingress of contaminated water	protozoa	Extreme 20	network pressure	mains break procedure	Major	Unlikely	Medium 8	Reliable				
	biofilm growth	opportunistic pathogens	Medium 6	Flushing program and SOP for flushing on low residual		Major	Rare	Medium 5	Reliable				
	change in flow rate, reservoir run low, disturbing sediment in pipe	turbidity	Medium 6	mains break procedure, pressure constant		Insignificant	Possible	Low 3	Confident				
	Failure of storage capacity	loss of supply	High 15	restrictions can be imposed to manage supply		Major	Unlikely	Medium 8	Reliable	5 ML in treated water reservoirs - multiple days supply		Investigate reinstatement of Borefield for backup supply	
	turbidity from resuspending lime in reservoir	turbidity	Medium 6	annual reservoir clean	minimum operating level	Minor	Unlikely	Low 4	Confident	ladder for access is deteriorating , needs replacement as WHS issue	replace ladder in Annan and High level Reservoir		
	long water age	DBPs	Medium 9	Coagulation to take our organics	disinfection	Moderate	Unlikely	Medium 6	Confident	high consumption in hot weather when temperature might increase			

Cooktown Water

Process Step	Hazardous Event	Hazards managed by same barriers	Unmitigated Risk	Primary preventive measure	Other Preventive Measures	Mitigated			Uncertainty	Comments	Risk Management Improvements		
						Consequence	Likelihood	Risk			Immediate (17/18 FY)	2018/19 FY	19/20 FY or later
	backflow	protozoa	Extreme 20	system integrity, backflow prevention on meters. Meters installed over past 25 years		Catastrophic	Rare	Medium 6	Estimate				replacement of meters with Taggle style automated meters
	ageing hydrants/valves	Infrastructure issues	High 15	system maintenance		Moderate	Possible	Medium 9	Reliable			hydrant and valve replacement Capital program	
System Wide	Power failure	Failure of supply	High 15	Generator at Annan can produce water, mobile generators can be put on rechlorination		Catastrophic	Rare	Medium 6	Confident				
	WTP Fire	Failure of supply	Medium 6	Activate DMP.		Catastrophic	Rare	Medium 6	Reliable				
	Drought	Failure of supply	High 10	Restrictions leading to Wet season if supply low.	Happened twice in 28 years, weir has stopped overflowing	Catastrophic	Rare	Medium 6	Reliable				
	Flood	Failure of supply	High 10	Generally only impacts raw water quality	Coagulation, flocculation, sed basin and filtration.	Catastrophic	Rare	Medium 6	Reliable				
	Cyclone	Failure of supply	High 15	DMP		Catastrophic	Rare	Medium 6	Reliable		Need to investigate reinstating	Need to investigate reinstating	

Cooktown Water

Process Step	Hazardous Event	Hazards managed by same barriers	Unmitigated Risk	Primary preventive measure	Other Preventive Measures	Mitigated			Uncertainty	Comments	Risk Management Improvements		
						Consequence	Likelihood	Risk			Immediate (17/18 FY)	2018/19 FY	19/20 FY or later
											borefield. Identifying equipment required and costings.	borefield as contingency supply. Applying for funding in 2018/2019 if approved by Council.	
	operator error	any	High 12	training, experience, mentoring	All Operators have a Certificate III in water operations	Major	Unlikely	Medium 8	Estimate				
	Missing procedures	All	Extreme 25	SCADA limits partially mitigate	Staff have Cert III in water operations and are trained on the job.	Moderate	Possible	Medium 9	Reliable	Need to take staff offline to write procedures to mitigate risks	Procedures currently being written		

Coen Water

Process Step	Hazardous Event	Hazards managed by same barriers	Unmitigated Risk	Primary preventive measure	Other Preventive Measures	Mitigated			Uncertainty	Comments	Risk Management Improvements		
						Consequence	Likelihood	Risk			Immediate (17/18 FY)	2018/2019 FY	19/20 or later
Coen Dam Catchment	Animals in catchment	bacteria and virus	Extreme 20	disinfection	Coen Dam fenced, DAF, filtration, MF	Catastrophic	Rare	Medium 6	Certain	considered as whole of treatment in absence of failure			
	Present in catchment - animals	protozoa	Extreme 20	MF	Coen Dam fenced DAF, filtration, MF	Catastrophic	Rare	Medium 6	Confident	considered as whole of treatment in absence of failure			
	cross contamination from Coen Landfill.	hazardous waste	Medium 9	Landfill is in a different catchment area		Moderate	Unlikely	Medium 6	Estimate	Groundwater contamination most likely issue.			
	hydrocarbons in Coen Dam	hydrocarbons	High 12			Moderate	Rare	Low 3	Estimate	Car bodies, pump and drums previously in catchment area have been removed			
	Cyanobacterial bloom	Cyanobacteria	Medium 8	DAF and coagulation, flocculation	filtration, MF, disinfection	Minor	Rare	Low 2	Reliable	small blooms most years, but not every year			
	Cyanobacterial toxins	Toxins	High 12	multiple supplies, oxidation (chlorine)		Moderate	Rare	Low 3	Reliable	toxin not common			
Lankelly Creek Catchment	Animals in catchment	bacteria and virus	Extreme 20	disinfection	(DAF) filtration, MF	Catastrophic	Rare	Medium 6	Certain	considered as whole of treatment in absence of failure			

Coen Water

Process Step	Hazardous Event	Hazards managed by same barriers	Unmitigated Risk	Primary preventive measure	Other Preventive Measures	Mitigated			Uncertainty	Comments	Risk Management Improvements		
						Consequence	Likelihood	Risk			Immediate (17/18 FY)	2018/2019 FY	19/20 or later
	Present in catchment - animals	protozoa	Extreme 20	MF	(DAF) filtration	Catastrophic	Rare	Medium 6	Confident	considered as whole of treatment in absence of failure			
Bores	Ingress into bore	bacteria and virus	Extreme 20	disinfection	borehead sealed	Catastrophic	Rare	Medium 6	Certain	backup supply, rarely used			
	Ingress into bore	protozoa	Extreme 20	Bore-head sealed		Catastrophic	Rare	Medium 6	Confident		Inspection program		
	Bore pump failure	Failure of supply	High 10	multiple supplies		Major	Rare	Medium 5	Confident				
Recharge	Bore Recharge	chemical	Medium 6	Recharge on Lankelly only		Moderate	Unlikely	Medium 6		chemical risks minimal			
	Bore Recharge	protozoa	Extreme 20	Recharge on Lankelly only		Catastrophic	Rare	Medium 6	Reliable	Need procedure to only use when Lankelly AND roughing plus MF.	develop recharge procedure		
Raw Water Feed	Raw water main break	Failure of supply	High 10	3 sources.	mains break procedure,	Catastrophic	Rare	Medium 6	Confident	Crews available to fix critical issues			
	Raw water pump failure	Failure of supply	High 10	3 sources.	duty standby	Catastrophic	Rare	Medium 6	Certain	spare pumps available on site			
DAF	Under dose alum	Protozoa, turbidity	Extreme 20	Coagulation available in plant	clarifier monitoring, MF	Major	Unlikely	Medium 8	Confident			Investigate online turbidity meter	
	Overdose alum	Aluminium	Medium 6	clarifier monitoring	MF	Minor	Possible	Medium 6	Confident				

Coen Water

Process Step	Hazardous Event	Hazards managed by same barriers	Unmitigated Risk	Primary preventive measure	Other Preventive Measures	Mitigated			Uncertainty	Comments	Risk Management Improvements		
						Consequence	Likelihood	Risk			Immediate (17/18 FY)	2018/2019 FY	19/20 or later
	poor floc due to low alkalinity	Protozoa	Extreme 20	soda ash dosing when required		Catastrophic	Rare	Medium 6		not used all the time - changes depending on raw water. Operators monitor alkalinity and determine when required.			
	overflow of DAF sludge into raw water tank	Protozoa	Extreme 20	daily monitoring	Roughing filter and MF treatment following DAF	Moderate	Possible	Medium 9	Estimate	undertake investigation to determine how to rectify this		Install an overflow pipe to the side of the sludge tank	
	Bypass	Protozoa	Extreme 20	Manual change valves. Valve configuration documented.	MF	Catastrophic	Rare	Medium 6	Reliable	When supply from Lankelly can bypass DAF and maintain water quality. Rely on operator experience to not use when Coen Dam water is in use.			
Roughing Filtration (when MF operating)	Filter breakthrough	Protozoa	Extreme 20	MF	roughing filter	Catastrophic	Rare	Medium 6	Reliable	Serves as a prefilter. Main barrier is MF.			

Coen Water

Process Step	Hazardous Event	Hazards managed by same barriers	Unmitigated Risk	Primary preventive measure	Other Preventive Measures	Mitigated			Uncertainty	Comments	Risk Management Improvements		
						Consequence	Likelihood	Risk			Immediate (17/18 FY)	2018/2019 FY	19/20 or later
	Filter breakthrough	turbidity	Medium 6	MF	roughing filter	Minor	Rare	Low 2	Confident				
	Filter bypass	Protozoa	Extreme 20		MF	Catastrophic	Rare	Medium 6	Reliable				
Roughing filter (No MF)	Filter breakthrough	Protozoa	Extreme 20	conventional filtration		Catastrophic	Rare	Medium 6	Reliable	Online turbidity meter. Current daily monitoring.		online monitoring of process with autodialler callouts	
	Filter breakthrough	turbidity	Medium 6	disinfection	roughing filter	Minor	Unlikely	Low 4	Confident				
	Filter bypass	Protozoa	Extreme 20	Valve configurations are documented		Major	Unlikely	Medium 8	Reliable				
Microfiltration	Filter breakthrough	Protozoa	Extreme 20	membrane integrity (Pressure decay tests), Roughing filter	TMPs monitored	Catastrophic	Rare	Medium 6	Confident	Annual servicing of membranes. Membranes replaced in 2016/2017 financial year			
	Filter breakthrough	turbidity	Medium 6	membrane integrity (Pressure decay tests)		Minor	Rare	Low 2	Confident	as above			
Disinfection	overdose	Chlorine	High 15	Daily checks at WTP and Reservoirs. Online analyser.	, PLC plus SCADA/autodialler for high chlorine	Minor	Unlikely	Low 4	Confident				

Coen Water

Process Step	Hazardous Event	Hazards managed by same barriers	Unmitigated Risk	Primary preventive measure	Other Preventive Measures	Mitigated			Uncertainty	Comments	Risk Management Improvements		
						Consequence	Likelihood	Risk			Immediate (17/18 FY)	2018/2019 FY	19/20 or later
	insufficient dose	bacteria/virus	Extreme 25	Daily checks at WTP and Reservoirs. Online analyser. MF	two pumps, but no auto changeover. PLC plus SCADA/autodialler for low chlorine	Moderate	Unlikely	Medium 6	Confident				
	Dosing pump failure	bacteria/virus	Extreme 25	Dual hypo pumps		Moderate	Unlikely	Medium 6	Reliable			Investigate Automatic change over	
	ineffective disinfection due to turbidity	bacteria	High 10	disinfection	filtration	Catastrophic	Rare	Medium 6	Confident				
	chemical breakdown	chlorate	High 12			Moderate	Likely	High 12	Unreliable			Begin THM sampling of final water	If chlorate is found, investigate solutions.
Bore Disinfection	overdose	Chlorine	High 15	Daily checks , fixed rate dosing		Moderate	Unlikely	Medium 6	Confident				
	insufficient dose	bacteria/virus	Extreme 25	Daily checks at WTP and Reservoirs.	Sealed bores	Moderate	Unlikely	Medium 6	Confident	dosing line should be put inside PVC pipe to protect from sunlight/ breakage.	reconfigure dosing line	Additional SCADA EDAC autodialler	
	Dosing pump failure	bacteria/virus	Extreme 25	Daily checks, spare on site	Sealed bores	Moderate	Possible	Medium 9	Reliable	spare pump available at Coen, Additional SCADA will include free		Additional SCADA EDAC autodialler	

Coen Water

Process Step	Hazardous Event	Hazards managed by same barriers	Unmitigated Risk	Primary preventive measure	Other Preventive Measures	Mitigated			Uncertainty	Comments	Risk Management Improvements		
						Consequence	Likelihood	Risk			Immediate (17/18 FY)	2018/2019 FY	19/20 or later
										chlorine concentration at the reservoir			
Treated water storage/ Reservoirs	Ingress into reservoirs	bacteria/virus	Extreme 20	Integrity and sealing	residual chlorine	Catastrophic	Rare	Medium 6	Confident				
	Ingress into Bore 10 Tank	bacteria/virus	Extreme 20	Integrity and sealing	residual chlorine	Catastrophic	Rare	Medium 6	Confident	bore 10 tank is compromised, relies on disinfection to manage risk	seal reservoirs, inspection program Replace bore 10 tank (in capital for this year)		
	Ingress into reservoirs	Protozoa	Extreme 20	Integrity and sealing		Catastrophic	Rare	Medium 6	Reliable	main treated water reservoir is new, and integrity is good.	seal reservoirs, inspection program		
	Ingress into reservoirs	Protozoa	Extreme 20	Integrity and sealing		Catastrophic	Possible	High 15	Reliable		seal reservoirs, inspection program Replace bore 10 tank (in capital for this year)		
	ingress of amoeba	amoeba	High 12	disinfection as above items	integrity	Major	Rare	Medium 5	Reliable				

Coen Water

Process Step	Hazardous Event	Hazards managed by same barriers	Unmitigated Risk	Primary preventive measure	Other Preventive Measures	Mitigated			Uncertainty	Comments	Risk Management Improvements		
						Consequence	Likelihood	Risk			Immediate (17/18 FY)	2018/2019 FY	19/20 or later
Reticulation	ingress of contaminated water	bacteria/virus	Extreme 20	network pressure, residual disinfection	mains break procedure	Major	Unlikely	Medium 8	Confident				
	ingress of contaminated water	protozoa	Extreme 20	network pressure	mains break procedure	Major	Unlikely	Medium 8	Reliable				
	biofilm growth	opportunistic pathogens	High 15	flushing program		Moderate	Rare	Low 3	Confident				
	Power failure	Failure of supply	High 15	Coen has independent power supply (generators) but can still lose for short periods	1-2 days treated water supply available to gravity feed	Moderate	Rare	Low 3	Confident	Ergon responsible.			
	change in flow rate, reservoir run low, disturbing sediment in pipe	turbidity	Medium 6	mains flushing		Minor	Possible	Medium 6	Confident				
	long water age	DBPs	High 12	coagulation/ filtration	Disinfection. Three water sources, 2 with low risk of THMs.	Minor	Unlikely	Low 4	Reliable	THMs unlikely in Coen dam as used when high water demand meaning formation unlikely to be above guideline.			

Coen Water

Process Step	Hazardous Event	Hazards managed by same barriers	Unmitigated Risk	Primary preventive measure	Other Preventive Measures	Mitigated			Uncertainty	Comments	Risk Management Improvements		
						Consequence	Likelihood	Risk			Immediate (17/18 FY)	2018/2019 FY	19/20 or later
	backflow	protozoa	Extreme 20	system integrity, backflow prevention on new installations		Catastrophic	Rare	Medium 6	Estimate	Has not happened, will replace meters over time.			Taggle meters
System Wide	WTP Fire	Failure of supply	high 10	Activate DMP.		Catastrophic	Rare	Medium 6	Reliable	Coen probably highest risk			
	Drought	Failure of supply	High 10	3 sources		Catastrophic	Rare	Medium 6	Estimate				
	Flood	Failure of supply	High 10	Generally only impacts raw water quality		Catastrophic	Rare	Medium 6	Reliable				
	Cyclone	Failure of supply	High 15	DMP		Catastrophic	Rare	Medium 6	Reliable				
	Operator error	any	Extreme 25	training, experience, mentoring	operational limits documented	Moderate	Unlikely	Medium 6	Estimate	Operators are Cert II and III trained			
	Complete plant bypass	protozoa and bacteria	Extreme 25	Staff training	Valve configuration plans available on site	Major	Unlikely	Medium 8	Confident	Has not happened accidentally, bypass used in case of major failures.	Consider manually locking valve to prevent accidental opening		
	Missing procedures	All	Extreme 25	SCADA limits partially mitigate.		Moderate	Possible	Medium 9		Procedures need to be updated.	Procedures need to be updated.		

Lakeland Water

Process Step	Hazardous Event	Hazards managed by same barriers	Unmitigated Risk	Primary preventive measure	Other Preventive Measures	Mitigated			Uncertainty	Comments	Risk Management Improvements		
						Consequence	Likelihood	Risk			Immediate (17/18 FY)	2018/2019 FY	19/20 or later
Bores	Ingress into bore	bacteria and virus	High 16	disinfection	bore head sealed and inspection program	Major	Rare	Medium 5	Reliable	Bore heads sealed and disinfection will generally mitigate though.			
	Ingress into bore	protozoa	High 16	Bore head sealed	bore head sealed and inspection program	Major	Rare	Medium 5	Confident	Bore heads sealed and an inspection program implemented			
	Septic contamination of aquifer	bacteria and virus	High 12	disinfection	bore head sealed and inspection program	Major	Unlikely	Medium 8	Certain	considered as whole of treatment in absence of failure			
	Contamination of aquifer through SE bore	protozoa	Extreme 25	SE bore disconnected		Moderate	Rare	Low 3	Reliable	Investigate options for SE and NE bores for refurbishment or replacement.		Investigate new bore in the future	
	Bore pump failure	Failure of supply	Medium 6	More than one bore	Restrictions	Moderate	Possible	Medium 9	Confident	3 active bores, Army bore supplies bulk of water in Lakeland.		Investigate new bore in the future if demand requires	

Lakeland Water

Process Step	Hazardous Event	Hazards managed by same barriers	Unmitigated Risk	Primary preventive measure	Other Preventive Measures	Mitigated			Uncertainty	Comments	Risk Management Improvements		
						Consequence	Likelihood	Risk			Immediate (17/18 FY)	2018/2019 FY	19/20 or later
	Aquifer contamination from buried chemical drums	Pesticides	High 12	Annual Monitoring		Moderate	Unlikely	Medium 6	Estimate	Known source, buried pre 2005. Annual monitoring has detected no contamination.	continue to monitor	continue to monitor	continue to monitor
Disinfection	overdose	Chlorine	Medium 8	Target 0.5-0.8 mg/L critical at 4 mg/L	SCADA monitoring. EDAC system will call out at 1.5mg/L. Pump can be turned off remotely via SCADA.	Moderate	Possible	Medium 9	Confident	Recirculation system gives a good indication of chlorine residual due to good mixing.			
	insufficient dose	bacteria/viruses	Extreme 16	Target 0.5-0.8 mg/L	Dose not below 0.3mg/L for a number of years. SCADA monitoring and EDAC system will call out at 0.3mg/L.	Catastrophic	Rare	Medium 6	Confident	Source water is bore water which is more likely to be free of bacteria than surface water	Dual hypo pumps are currently being installed		
	ineffective disinfection due to turbidity	bacteria	High 10	disinfection		Moderate	Rare	Medium 6	Estimate	bore water low turbidity			
	chemical breakdown	chlorate	High 12			Moderate	Likely	High 12	Unreliable			Begin THM sampling of final water	If chlorate is found, investigate solutions.
Treated water storage/Reservoirs	Ingress into reservoirs	Protozoa	Extreme 16	Brand New reservoir	Reservoir inspection program every three months	Catastrophic	Rare	Medium 6	Reliable				

Lakeland Water

Process Step	Hazardous Event	Hazards managed by same barriers	Unmitigated Risk	Primary preventive measure	Other Preventive Measures	Mitigated			Uncertainty	Comments	Risk Management Improvements		
						Consequence	Likelihood	Risk			Immediate (17/18 FY)	2018/2019 FY	19/20 or later
	ingress of amoeba	amoeba	High 12	disinfection	Brand new reservoir	Major	Unlikely	Medium 8	Reliable	Disinfection maintained in reticulation.			
Reticulation	ingress of contaminated water	bacteria/viruses	Extreme 20	network pressure, residual disinfection	mains break procedure	Major	Unlikely	Medium 8	Reliable	weekly reticulation monitoring	develop procedure to flush on low chlorine		
	ingress of contaminated water	protozoa	Extreme 20	network pressure	mains break procedure	Major	Unlikely	Medium 8	Reliable		develop procedure to flush on low chlorine		
	biofilm growth	opportunistic pathogens	High 15	flushing program		Major	Rare	Medium 5	Estimate	disinfection maintained			
	Power failure	Failure of supply	High 15	Generator		Moderate	Unlikely	Medium 6	Confident	3 phase power and generator back up			
	change in flow rate, reservoir run low, disturbing sediment in pipe	turbidity	Medium 6			Insignificant	Possible	Low 3	Confident				
	backflow	protozoa	Extreme 20	system integrity, backflow prevention on new installations		Major	Rare	Medium 5	Estimate				Taggle meters
System Wide	WTP Fire	Failure of supply	High 10	DMP		Catastrophic	Rare	Medium 6	Reliable				
	Cyclone	Failure of	High 10	DMP		Catastrophic	Rare	Medium 6	Reliable				

Lakeland Water

Process Step	Hazardous Event	Hazards managed by same barriers	Unmitigated Risk	Primary preventive measure	Other Preventive Measures	Mitigated			Uncertainty	Comments	Risk Management Improvements		
						Consequence	Likelihood	Risk			Immediate (17/18 FY)	2018/2019 FY	19/20 or later
		supply											
	operator error	any	Extreme 25	training, experience, mentoring		Major	Unlikely	Medium 8	Estimate	All Operators have a Certificate III in water operations			
	Missing procedures	All	Extreme 25	SCADA limits partially mitigate.		Moderate	Possible	Medium 9		Need to take staff offline to write procedures to mitigate risks	Procedures currently being written		

Laura Water

Process Step	Hazardous Event	Hazards managed by same barriers	Unmitigated Risk	Primary preventive measure	Other Preventive Measures	Mitigated			Uncertainty	Comments	Risk Management Improvements		
						Consequence	Likelihood	Risk			Immediate (17/18 FY)	2018/2019 FY	19/20 or later
Bores	Ingress into bore	bacteria and virus	High 16	Microfiltratio/ disinfection	borehead sealed and inspection program	Major	Rare	Medium 5	Reliable	Final water has passed through microfiltration			
	Ingress into bore	protozoa	High 16	microfiltration	borehead sealed and inspection program in place	Major	Rare	Medium 5	Confident				
	Septic contamination of aquifer	bacteria and virus	High 12	Disinfection	Microfiltration	Major	Unlikely	Medium 8	Certain				
	Septic contamination of aquifer	protozoa	Extreme 16	microfiltration	CED sewerage system operational in Laura	Major	Unlikely	Medium 8	Confident	Laura Wastewater CED scheme is operational. Septic tanks now overflow into CED system			
	Bore pump failure	Failure of supply	Medium 6	Back up bore	Water restrictions can be implemented	Minor	Possible	Medium 6	Confident	Laura - heavily reliant on bore 1, bore pump 2 operates, and can supply with restrictions			

Laura Water

Process Step	Hazardous Event	Hazards managed by same barriers	Unmitigated Risk	Primary preventive measure	Other Preventive Measures	Mitigated			Uncertainty	Comments	Risk Management Improvements		
						Consequence	Likelihood	Risk			Immediate (17/18 FY)	2018/2019 FY	19/20 or later
Aeration	Under dose chlorine	Iron	High 10	Chlorine addition	aerator will remove some iron in absence of chlorine, MF will remove a large percentage of iron	Minor	Possible	Medium 6	Confident	Water has good turbidity but high in colour in event of aeration failure			
Microfiltration	Filter breakthrough	Protozoa	Extreme 20	TMP monitored.	Membranes replaced in 2016	Moderate	Unlikely	Medium 6	Reliable	Annual servicing of membranes			
	Filter breakthrough	turbidity	Medium 6	Monthly turbidity monitoring	TMP monitored	Minor	Possible	Medium 6	Reliable	On-line turbidity meter on the final water			
	membrane fouling	restrict supply	Medium 8	Daily production monitored	CIPs done weekly	Minor	Unlikely	Low 4					
Disinfection	overdose	Chlorine	High 15	Target 0.5-1.3 mg/L critical at 4 mg/L and on-line analyser	Alarms and auto dialler	Minor	Possible	Medium 6	Confident	SCADA monitoring, and EDAC call outs			
	insufficient dose	bacteria/viruses	High 10	Target 0.5-1.3 mg/L	On-line analyser plus on screen alarms and EDAC call out	Moderate	Unlikely	Medium 6	Confident	Laura has 2 locations for chlorination plus bore water source (not surface water)			
	ineffective disinfection due to turbidity	bacteria	High 10	Microfiltration	Disinfection plus low turbidity in raw water (bore water)	Minor	Rare	Low 2	Estimate	Iron floc can be cause of turbidity if			

Laura Water

Process Step	Hazardous Event	Hazards managed by same barriers	Unmitigated Risk	Primary preventive measure	Other Preventive Measures	Mitigated			Uncertainty	Comments	Risk Management Improvements		
						Consequence	Likelihood	Risk			Immediate (17/18 FY)	2018/2019 FY	19/20 or later
										membrane failed.			
	chemical breakdown	chlorate	High 12			Moderate	Likely	High 12	Unreliable			Begin THM sampling of final water	If chlorate is found, investigate solutions.
Treated water storage/ Reservoirs	Ingress into reservoirs	bacteria/ virus	Extreme 20	Integrity and sealing	disinfection	Major	Unlikely	Medium 8	Confident	Reservoirs have been sealed			Laura reservoir to be considered for replacement after Lakeland
	Ingress into reservoirs	Protozoa	Extreme 20	Integrity and sealing	Reservoir inspection program	Major	Unlikely	Medium 8	Estimate	Reservoirs have been sealed			
	ingress of amoeba	amoeba	High 12	disinfection as above items	integrity	Major	Unlikely	Medium 8	Reliable	disinfection maintained in reticulation			
Reticulation	ingress of contaminated water	bacteriavirus	Extreme 20	network pressure, residual disinfection	mains break procedure	Major	Unlikely	Medium 8	Reliable	weekly reticulation monitoring	develop procedure to flush on low chlorine		
	ingress of contaminated water	protozoa	Extreme 20	network pressure	mains break procedure	Major	Unlikely	Medium 8	Reliable		develop procedure to flush on low chlorine		

Laura Water

Process Step	Hazardous Event	Hazards managed by same barriers	Unmitigated Risk	Primary preventive measure	Other Preventive Measures	Mitigated			Uncertainty	Comments	Risk Management Improvements		
						Consequence	Likelihood	Risk			Immediate (17/18 FY)	2018/2019 FY	19/20 or later
	Stagnant water in Laura High level reservoir	bacteria	Extreme 20	turnover through nightly shutdown of retic pumps	One reservoir off line	Major	Unlikely	Medium 8	Estimate	Currently do not meet minimum pressure overnight.	Install sampling point to monitor chlorine to ensure sufficient disinfection residual		
	biofilm growth	opportunistic pathogens	High 15	flushing program		Major	Rare	Medium 5	Estimate	Disinfection maintained.			
	Power failure	Failure of supply	High 12	Generators can run pressure pumps to get water to town	Water to town will come from elevated tanks is generator is not on	Moderate	Possible	Medium 9	Confident	SWER line more at risk			Generators may be required to run supply
	change in flow rate, reservoir run low, disturbing sediment in pipe	turbidity	Medium 6	Disinfection residual		Insignificant	Possible	Low 3	Confident				
	backflow	protozoa	Extreme 20	system integrity, backflow prevention on new installations		Major	Rare	Medium 5	Estimate				Taggle meters
System Wide	WTP Fire	Failure of supply	High 10	DMP		Catastrophic	Rare	Medium 6	Reliable				
	Cyclone	Failure of supply	High 10	DMP		Catastrophic	Rare	Medium 6	Reliable				

Laura Water

Process Step	Hazardous Event	Hazards managed by same barriers	Unmitigated Risk	Primary preventive measure	Other Preventive Measures	Mitigated			Uncertainty	Comments	Risk Management Improvements		
						Consequence	Likelihood	Risk			Immediate (17/18 FY)	2018/2019 FY	19/20 or later
	operator error	any	Extreme 25	training, experience, mentoring	All operators have Cert III in water operations	Major	Unlikely	Medium 8	Estimate	Checklists in place for operations at plant. Procedures currently being developed			
	Missing procedures	All	Extreme 25			Major	Possible	Medium 9		need to take staff offline to write procedures to mitigate risks			

11 EMPLOYEE AWARENESS AND TRAINING

11.1 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. In an effort to ensure the DWQMP is implemented effectively, much of the development of these plans was done in conjunction with the operators.

It is intended that the drinking water quality management plan becomes a useful document within council that is implemented by the operators, but equally used by the Manager to demonstrate the need for change, and justify budgetary expenditure. It is an expectation of Council and the Manager of Water and Wastewater that this plan is understood and implemented by relevant staff.

Operators will also be encouraged to assist with the expansion of the excursions – operationally monitored parameters table to develop in house procedures, as identified in the RMIP.

11.2 Employee training

CSC normally intends to use Certificate III trained water treatment operators for all schemes (trainees under supervision are employed as necessary). We train staff to ensure that they have sufficient training to perform their jobs safely, and in accordance with this plan.

12 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 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 on the Council website.

13 RESEARCH AND DEVELOPMENT

Council does not formally undertake research and development activities. However, some activities, such as the testing and optimisation of new equipment prior to placing it into service can be considered to fit under this element. Similarly, the expansion of the verification monitoring program to include parameters that have not previously been monitored routinely can be considered as research to determine whether there are additional risks to the service that have not been identified.

Nonetheless, Council recognises that there is further scope to formalise activities such as the validation of existing barriers, as is likely to be required when the Australian Drinking Water Guidelines moves to Health Based Targets.

It is intended that in the long term, as the drinking water quality management plan becomes embedded into normal activities that more focus can be placed on this element.

14 REVIEW AND CONTINUAL IMPROVEMENT

14.1 Continual Improvement

The primary improvement strategies are identified in the RMIP. The purpose of the drinking water quality management plan is to identify and manage risks to the services. Improvements are continually

being made to water schemes 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.

14.2 Reviews and amendments

Formal reviews of this plan ensure that the plan remains relevant to the schemes. The review is the time to evaluate the appropriateness of the management plan, update the plan to include changes made such as through the risk management improvement program, and identify whether the plan is delivering appropriate outcomes. If changes are made following review, an amendment application will be made to the regulator.

Additional reviews above those required by the regulator may be necessary in specific circumstances. For example, commissioning new treatment processes will require risk assessment, and where the risk profile changes, a plan amendment.

To provide clarity, council would not consider a maintenance activity such as changing the filter media in a treatment plant a sufficient change to require an amendment, even if the media was different to that described in the plan. Similarly, the annual update of the verification monitoring program is an operational change that will not trigger an amendment where the sampling locations and frequency of monitoring are consistent with the verification monitoring program detailed in this plan.

However, if the decision is taken to replace the MF barrier at Coen with bag filters, this will result in an amendment to the plan as the change in the barrier may change the risks to the service.

15 AUDIT

The drinking water quality management plan will be audited in accordance with the regulators requirements, as stated in the Information Notice for the Decision. Regulatory audit reports will be provided to the Regulator, and the outcomes of the audits will be considered in the next review of the drinking water quality management plan.

We may also choose to undertake voluntary internal audits. If undertaken, these are to inform our progress in implementing the DWQMP, and the outcomes will be considered in reviews of the plan. These will not be reported on in the annual report, nor will they be provided to the Regulator.