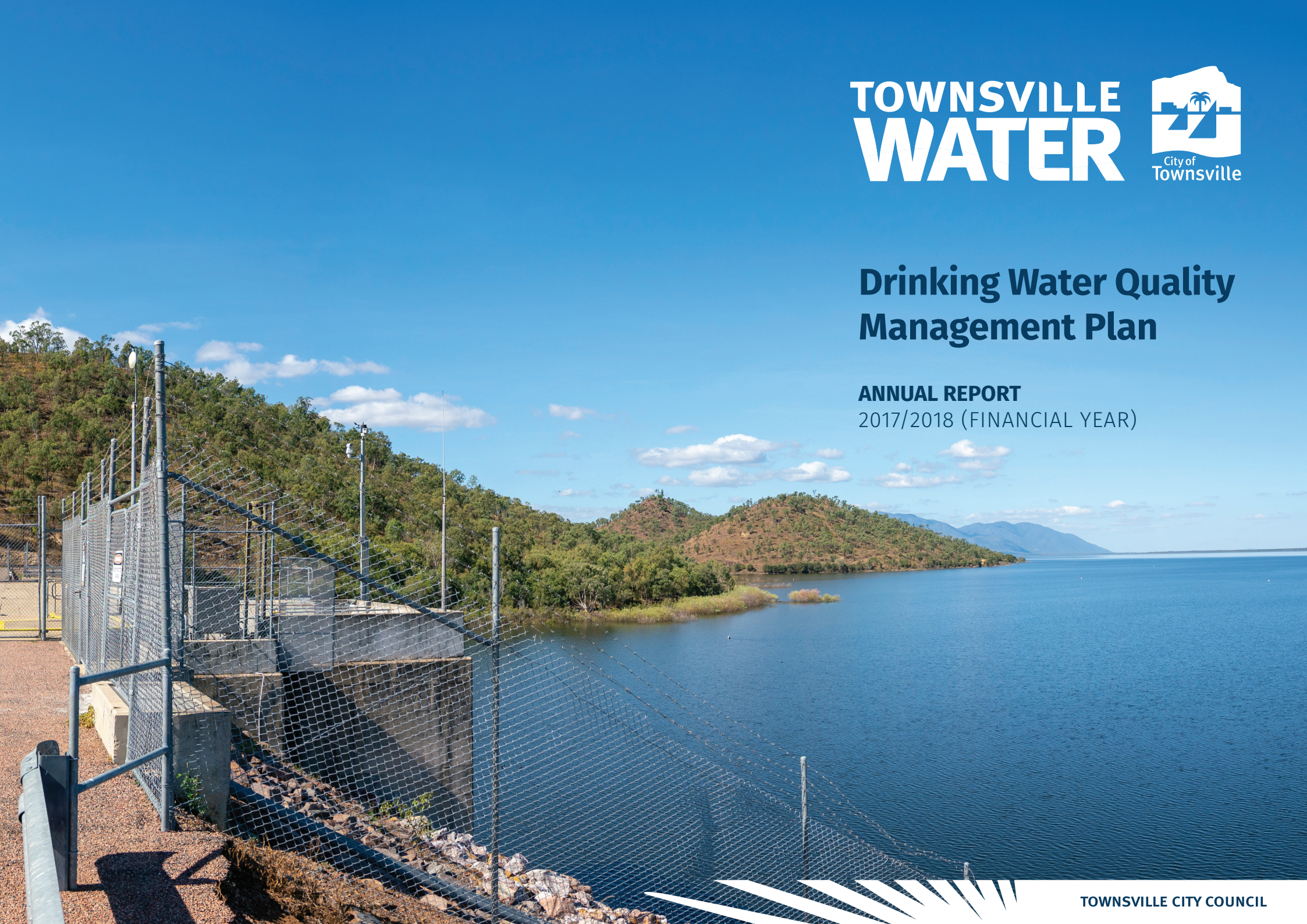


TOWNSVILLE WATER

City of Townsville

Drinking Water Quality Management Plan

ANNUAL REPORT
2017/2018 (FINANCIAL YEAR)

TOWNSVILLE CITY COUNCIL

SPID	506
Postal Address	Townsville Water, PO Box 1268, QLD 4810
Principal Contact	Laura Shiels, Drinking Water Quality Officer
Report Prepared by	Laura Shiels, Drinking Water Quality Officer
Report contains	Activities undertaken over the 2017/2018 financial year in operating Townsville City Council's (TCC) drinking water service. Summary of drinking water quality for Townsville's three drinking water schemes. Summary of TCC's performance in implementing their approved Drinking Water Quality Management Plan (DWQMP).

Ross River Dam June 2018

Contents

ABBREVIATIONS AND ACRONYMS

Acronym	Definition	Acronym	Definition
ADWG	Australian Drinking Water Guidelines	TCC	Townsville City Council
CCP	Critical Control Point	THM	Trihalomethanes
DNRME	Department of Natural Resources, Mines and Energy	TLS	Townsville Laboratory Services
DWQMP	Drinking Water Quality Management Plan	T&O	Taste and Odour
GAC	Granular Activated Carbon	WTP	Water Treatment Plant
LIMS	Laboratory Information Management System		
NATA	National Association of Testing Authorities		
OS	Owner's Side		

APPROVALS

In signing this approval:

I agree that the report meets the standards required and approve the report to be submitted to Water Supply Regulation, Department of Natural Resources, Mines and Energy.

Stephen Martin
Team Manager – Water and Wastewater

1. Executive Summary

Townsville City Council's (TCC) Drinking Water Quality Management Plan (DWQMP) was approved in August 2012. Included in the approval notice was the requirement to submit an annual water quality report to outline the performance of Townsville Water against their DWQMP as required under the *Water Supply (Safety and Reliability) Act 2008.*

Townsville Water has met all requirements under its DWQMP, the Australian Drinking Water Guidelines 2011 (ADWG) and the *Public Health Regulation 2005* for the 2017/2018 financial year.

The main water quality issue for the first half of the reportable period was the drought-imposed water restrictions and the management of these. Water quality (and supply) required increased management by the Water Quality Team especially with regards to water age through increased monitoring, targeted flushing, managing reservoir levels and managing chlorine residuals. Rainfall in March 2018 increased Ross River Dam level to 93% and water restrictions were eased back to level 2 from level 3. The resultant small increase in water usage has increased water turnover and reduced water age.

Overall annual compliance for *Escherichia coli (E.coli)* for Townsville, Giru/Cungulla and Paluma drinking water schemes was in compliance with the *Public Health Regulation 2005* with 100% compliance for all three schemes.

The boil water advisory for Paluma was lifted in April 2018 after the commissioning of the Paluma Water Treatment Plant (WTP). Paluma WTP uses screening, coagulation, ultrafiltration, Granular Activated Carbon (GAC) filtration and disinfection with both UV and sodium hypochlorite. The water is treated to ADWG standards bringing Paluma's water quality in line with the rest of Townsville.

Five notifications of non-compliance were submitted to the Office of the Water Supply Regulator (the Regulator):

- 3 disinfection-by-product exceedances
- 1 chlorine exceedance, and
- 1 lead exceedance.

There were 107 customer complaints regarding drinking water quality:

- 69 dirty water
- 4 milky water
- 8 taste/odour
- 3 suspected illness
- 20 owner's side issues, and
- 3 vexatious complaints.

A complete review of the plan with updated risk assessments was undertaken from September 2017 through to January 2018 and submitted to the Regulator. The amendments were approved with conditions in April 2018. This is the current plan under which TCC operates.

This report is made available to our customers through our website, upon request through email enquiries@townsville.qld.gov.au or for inspection upon request at the Customer Service Centre, 103 Walker Street, Townsville City.

Paluma Water Treatment Plant

2. Overview

Townsville Water is a business unit of TCC and is responsible for the management of the city's potable water network and provision of safe and reliable water to the residents of Townsville, Paluma township and Cungulla township.

TCC's DWQMP was submitted to the Regulator on 21 June 2011. It was approved with conditions on 29 August 2012. Townsville's first DWQMP Audit was undertaken in July 2016. The plan was reviewed, with significant amendments made in January 2018. The amendments were approved with conditions on 23 April 2018.

Townsville Water services a population of 188,000 with 85,500 connected properties, in three drinking water schemes: Townsville Drinking Water Scheme, Paluma Drinking Water Scheme and Giru/Cungulla Drinking Water Scheme.

Table 1. Summary of Townsville's Drinking Water Schemes

Scheme Name	Water Treatment Plant	Water Source	Treatment Processes	Treatment Capacity	Towns Supplied
Townsville Drinking Water Scheme	Douglas Water Treatment Plant (Angus Smith Drive)	Ross River Dam (with water supplemented from the Burdekin Dam through the Haughton Pipeline when required)	Conventional treatment with chlorine disinfection	232 ML/D	Townsville
Townsville Drinking Water Scheme	Northern Water Treatment Plant (Kinduro)	Paluma Dam Crystal Creek	Microfiltration with chlorine disinfection	40 ML/D	Townsville
Giru/ Cungulla Drinking Water Scheme	Giru Water Treatment Plant	Haughton River	Conventional treatment with chlorine disinfection	2 ML/D	Cungulla township
Paluma Drinking Water Scheme	Paluma Water Treatment Plant	Paluma Weir	Ultrafiltration with UV and chlorine disinfection	90 KL/D	Paluma township

Giru Water Treatment Plant also supplies water to Giru township through agreement with the Burdekin Shire Council. Management of Giru's drinking water quality is covered under the Burdekin Shire Council's DWQMP.

45,971ML of potable water was produced in the 17/18 financial year. Townsville Water maintains 2 dams (Ross River Dam and Paluma Dam), 2 weirs (Paluma Weir and Blacks Weir), 23 water pumping stations, 18 chlorinators, 41 reservoirs (treated water storage facilities) and 2,609 km of water distribution mains.

Ross River Dam radial gates

3. Actions taken to implement the DWQMP

The DWQMP is managed and maintained by the Drinking Water Quality Officer. Both the Water Treatment Engineer and Water Quality Officer's role is to monitor, regulate and improve water quality for Townsville. They deal with all water quality non-compliances, water quality complaints/queries from customers, monitor all Critical Control Points (CCPs), the water sampling plan and the subsequent data it generates. They are part of a broader Water Quality Team which also includes the Water Operations Engineer, Commercial Compliance Officer, Bulk Water Maintenance Officer and the Water Operators.

Trility are engaged to operate Douglas Water Treatment Plant and Northern Water Treatment Plant under a managed contract with TCC. The contract is managed through informal weekly operations meetings, formal monthly operational management team meetings and formal quarterly contract management committee meetings. Any issues arising between these times are dealt with through phone calls, emails, face to face and ad hoc meetings.

The Water Quality Team hold a weekly water quality meeting, with water quality also discussed at weekly planning meetings and at toolbox meetings with staff as required. A water quality governance meeting is held with management every two months, and is chaired by the Drinking Water Quality Officer.

There were no hazards or hazardous events that affected water quality during the financial year.

A formalised review of the plan was undertaken from September 2017 through to January 2018. A complete review of the plan including the review of 20+ years of water quality data plus updating of the risk assessments for the three schemes was undertaken. The plan was differentiated into three separate plans for the three schemes. The amendments were submitted to the Regulator for approval in January 2018. The amendments were approved with conditions on 23 April 2018. This is the current plan under which TCC operates.

Paluma Water Treatment plant was installed and commissioned in April 2018. Paluma WTP uses screening, coagulation, ultrafiltration, GAC filtration and disinfection with both UV and sodium hypochlorite. The water is treated to ADWG standards bringing Paluma's water quality in line with the rest of Townsville.

The risk management improvement program implementation plan is included in Table 2 overpage.

Table 2. Risk management improvement program implementation status

	Component	Improvement Actions	Target Date	Actions taken to date	Status and revised target date	Responsible Officer	Complete
TOWNSVILLE DWS	Douglas WTP **Turbidity** (Common and Modules 1 &2)	**Pre-Treatment Clarifier** – Confirm the design envelope for the clarifiers and ensure that this is utilised.	Design in 17/18 financial year with construct in 19/20 financial year.	Design has commenced.	End 17/18 financial year for design.	Manager Water and Waste	Dec 2020
		Sludge Handling – Confirm the amount of time available to 'stop' recycle to ensure that criticality is appropriate for the supernatant recycle system.		Supernatant return standard operating procedure to be developed in 2019.	July 2019	Trility Operations Manager	
		Reservoirs – The reservoir cleaning program has stalled, for a number of reasons, but should be re-instated and prioritised.		Reservoir cleaning program has been reinstalled with first reservoirs to be cleaned in January 2019. From then on the reservoirs will be cleaned on a rotation with approx. 16 reservoirs cleaned each year. Budget allocated.	Jan 2019	Water Treatment Engineer and Drinking Water Quality Officer	Ongoing
		Data is required to be assembled and reviewed to validate that the reactivator has been optimised.		Data readily available via online and daily grab sample results. Jar tests regularly conducted and alarms in place on reactivator clear water turbidity meter.	Dec 2018 Summary of performance data and activities to be submitted Dec 2018. PCP to be added to WQP.	Trility Operations Manager	
	Douglas WTP **Turbidity** Modules 3&4 Direct Filtration	**Pre-Treatment and Filtration –** Performance trials are planned to confirm the raw water range under which the system can operate to produce safe water.		Operations Modification Program 5 has trialled under some conditions but not all. – Performance criteria agreed with TCC.	Aim to complete further trials in 2019, subject to suitable raw water conditions.	Water Treatment Engineer, Contract Compliance Officer Trility Operations Manager	Parked until adequate rainfall occurs (2019?)
	Douglas WTP **Pathogens** - Crypto	Modelling is being undertaken to help clarify the likelihood of the presence of Crypto. and Giardia in 2017. This is to be used to increase certainty.		Modelling complete with RRD report from GHD finalised Feb 2018. Requirement for clarifier/UV to conform to HBTs.	Feb 2018	Drinking Water Quality Officer	Yes
		Filtration - Compare performance against ADWG value of 0.20 and HBT guideline of 0.15NTU as 95 percentiles. Contract uses higher turbidity targets.		Performance checked as part of the RRD Crypto report. Shows that the plant meets for Mod 1 & 2.	Feb 2018	Drinking Water Quality Officer	Yes
		Sludge Handling - Confirm the control around returning supernatant. Including turbidity target.		Supernatant alarms 4.5 NTU H, 5 NTU HH and shutdown on High trip 10 NTU as per WQ plan. 10 minutes at or above these limits will trigger alarm, the trip will trigger a shutdown.	Complete 20 November 2018	Trility – Operations Support Engineer	Yes

	Component	Improvement Actions	Target Date	Actions taken to date	Status and revised target date	Responsible Officer	Complete
TOWNSVILLE DWS	Douglas WTP **Pathogens** – *E.coli* and Virus	**Disinfection point Chlorination** - Complete tracer testing to confirm modelling of C.t.		Tracer study completed November 2017, report complete with executive summary review and report submission to client by end of November.	December 2018	Operations Manager	
		Disinfection point Chlorination - Investigate dedicated C.t chlorine analyser (prior to trim dose).		Options to be investigated in FY 2019 R&R plan.	March 2019		
		Review Disinfection Control Plan to make sure that control philosophy is locked in and that there is no opportunity to control in a way that would jeopardise the C.t.		Chlorine disinfection system upgraded for stable monitoring, control and alarms (PSDs). Baffles installed increasing C.t.	Online C.t. calculation planned early 2019.		
	Pathogens – N.fowleri	Investigate and confirm the response of N.fowleri to settling. **Pipes/reservoirs** - Need to investigate the prevalence of N.fowleri. **Pipes/reservoirs** - High and low turnover - Investigate options to increase the chlorine residual above 0.5 mg/L (reservoirs, lines, dead ends) to ensure effective barrier to N.fowleri.		Research project to be undertaken in Townsville, Paluma and Cungulla.	June 2019	Drinking Water Quality Officer	
	Organics and colour	**Pipes/reservoirs** – Documentation of system 'age' optimisation is required to ensure continuity. Currently this is primarily undertaken by one person.		Further people to be trained and documentation of procedures to occur.	June 2019	Water Treatment Engineer	
	High Chlorine	Investigate Julago system cut-off to ensure that it minimises the risk of over-dosing chlorine.			June 2019	Water Treatment Engineer	
	Water Emergency Response Plan	Updated copy to be included in DWQMP.	Jan 2019	Undergoing updates and changes currently.	Jan 2019	Manager Water Operations	
	HACCP	Requires updating (last updated 2009). This will be included in Trility's Water quality plans due to be finalised 2018.		Critical control points regularly reviewed and tested as part of water quality management system. Undertake review of HACCP and consider consolidating HACCP and WQP.	Dec 2019	Trility - Operations Manager	
	Chlorates in Network	Investigate replacing Sodium Hypochlorite dosing system with a chlorine gas dosing system.	2020	Design to be undertaken in 2018 financial year.	End 2020		
	Network Schematic	Requires updating to include recent infrastructure.	Jan 2019		Jan 2019	Drinking Water Quality Officer	
	Crypto Model	Clarification and UV required at Douglas Water Treatment Plant to reduce Cryptosporidium risk.	2020	Design to be undertaken in 2018 financial year, with construction completed by end 2020.	End 2020		

	Component	Improvement Actions	Target Date	Actions taken to date	Status and revised target date	Responsible Officer	Complete
TOWNSVILLE DWS	NWTP Turbidity	Filtration Node – False positives have been identified in the past and an investigation into sample preparation to eliminate false positives is underway.		Trility have replaced turbidity meters (with a different brand) to see if this eliminates false positives. Ongoing monitoring to see if this has been successful.			Ongoing
	Pathogens - Crypto	Modelling is being undertaken to help clarify the likelihood of the presence of Cryptosporidium and Giardia in 2017.		GHD Cryptosporidium report submitted August 2018. Confirms the requirement for UV addition on NWTP to conform to HBTs.		Drinking Water Quality Officer	Complete
	Pathogens – *E.coli* and Virus	Confirm virus removal capability of the membrane and whether coagulant is or is not required to claim virus removal with the membranes.		Confirmed the virus log removal of the membranes is 4.0 without coagulant. Supporting documentation provided to TCC.	29/11/2018		Complete
		Confirm the C.t (max flow, min level, chlorine minimum (1)) available at the WTP and compare this to the typical target C.t of 15 mg.min/L.		Supporting data and calculations to be provided.	1/2/2019	Operations Support Engineer	
	Geosmin (Taste and Odour)	Consider measuring the level of geosmin in the open channel between Paluma and Crystal creek intake to confirm the source of geosmin as well as continuing to investigate the source water.	June 2019	Dependent upon geosmin being detected in concentrations high enough to cause an issue.	Parked	Drinking Water Quality Officer	Parked
		Treatment strategies to remove geosmin are to be investigated, including PAC dosing even though this was noted as having a negative impact on membrane performance/life.		Trility have engaged Hunter H2O to investigate the removal of geosmin and MIB with PAC at both DWTP and NWTP.		Team Manager Water Operations	
	Iron	Confirm iron results in raw and treated water. There is a discrepancy between the numbers in the raw (soluble) and the performance of the membranes. Essentially all of the soluble should pass through the membranes but the monitoring suggests that the membranes are pulling out 'soluble' iron. This could mean that the iron is colloidal and not 'true' soluble. Include event-based monitoring to investigate iron spikes in the raw water.	June 2020	As this is not causing an issue with water quality it has been pushed out to June 2020. Monitoring will be ongoing to enable the collection of sufficient data.			
	HACCP	Requires updating (last updated 2009). This will be included in Trility's Water quality plans due to be finalised 2018.		As per DWTP HACCP.			
	Crypto Model	UV may be required for NWTP. This requires investigating and funding if required.		Report August 208 shows UV is required for NWTP to meet HBTs. Design specs for UV funded for this financial year.	June 2019	Manager Water and Wastewater	

	Component	Improvement Actions	Target Date	Actions taken to date	Status and revised target date	Responsible Officer	Complete
GIRU/CUNGULLA DWS	Turbidity	Incorporate routine supernatant monitoring to add certainty to the performance of residuals handling.	June 2019	Reclaim lagoon water quality is monitored monthly.	June 2019	Water Treatment Engineer	
		Coagulation Control needs to be documented to ensure that everyone is targeting the same thing.	January 2019	Procedure written but not formalised.	Jan 2019	Water Treatment Engineer	
		Confirm the correct location for the filtered water outlet turbidity meter (individual filter turbidity (IFE) is the benchmark).	December 2018	Filtered water turbidity meter was installed in December. This is monitored.	Dec 2018	Drinking Water Quality Officer	
		Align filter turbidity target, alert and critical limits with ADWG and best practice. Supernatant flows monitored, not yet alarmed or online. Opportunity to include allowing for early detection of failure, disturbance, particularly when the wash-water system is stressed.	October 2018	Instrument techs to write code to retain turbidity values only when the plant is operational and to calculate the 95th percentile compliance. Project required to be undertaken.	June 2019	Water Treatment Engineer	
	Pathogens - Cryptosporidium	Operational Control Point (OCP) required to be documented and put into practice to assist in management of supernatant return.	March 2019	Tank, decking and tower due to be replaced this financial year.	June 2019	Water Treatment Engineer	
		High level tank is a risk, budget allocated for tank replacement and action should be pursued. Pressure pumps to be utilised in the interim.	June 2019	Pressure pumps currently installed and being utilised.		Bulk Water Engineer	
	Pathogens – E. coli and Virus	Free chlorine analyser to be installed and alarming incorporated into the system control.	June 2018	Free chlorine analyser has been installed and feedback is on SCADA. Project in place to alarm in SCADA.	April 2019	Water Treatment engineer Water Treatment Engineer	Complete
	Pathogens – N.fowleri	As per E. coli, move towards an online continuous free chlorine analyser to confirm that chlorine has been dosed and a C.t has been achieved and a minimum of 0.5 mg/L free chlorine is maintained leaving the WTP.		As above		Water Treatment Engineer	Complete
		Need to investigate the prevalence of Naegleria fowleri.		Project required to investigate prevalence of Naegleria fowleri.		Drinking Water Quality Officer	
		Investigate options to increase the chlorine residual above 0.5 mg/L (reservoirs, Cungulla Balance Tank, lines and dead ends).		Target limit for chlorine has been increased in the CWS to > 0.5mg/L. Townsville aims to maintain free chlorine in reservoirs and at dead ends through extensive monitoring program and flushing where appropriate. Where required additional re-chlorination is installed i.e. Brookhill Reservoir.		Drinking Water Quality Officer	

	Component	Improvement Actions	Target Date	Actions taken to date	Status and revised target date	Responsible Officer	Complete
GIRU/CUNGULLA DWS	Organics and Colour	Suggest that measuring true colour of filtered water on jar testing will assist in managing coagulation (helps to identify the 'best' dosing regimen).		A palintest kit has been purchased. Training need to be organised and its use implemented.	June 2019	Water Treatment Engineer	
	pH	Ensure that coagulation pH targets are recorded and utilised by all staff.		Coagulation pH range of 6.4 to 7.2 has been established and communicated to operators.	June 2018	Water Treatment Engineer	Complete
		Need to incorporate triggers for operating soda ash, when does it turn on/off.		Too difficult to set an absolute number. Depends upon many factors and the Water Treatment Engineer decides operationally when this is to occur.	June 2018	Water Treatment Engineer	Complete
	Verification of Drinking Water Quality	Undertake project to acquire handheld devices and store all water quality results in Lims1.	September 2019	Project currently underway to get operators recording data in tablets. Then this data can be transferred and stored in LIMS.	September 2019	Bulk Water Engineer	
	Water Emergency Response Plan	Updated copy to be included in DWQMP.	Jan 2019	Response plan is being updated and changed presently.			
	Development of algae/algal toxin Trigger Scenarios	Procedure for detection of algae/algal toxins requires to be developed. This is not of high risk as algal blooms have not been detected in the Haughton River supply but a procedure should still be in place.	December 2019	Considered low risk as previously not detected.	December 2019	Drinking Water Quality Officer	
PALUMA DWS	Pathogens – E. coli and Virus	Need to better document the existing CCP prior to completion of the new WTP.	March 2018	New CCPs set.	April 2018	Water Treatment Engineer	Complete
		Confirm C.t of the reservoir.		Project required.	June 2019		
	Pathogens – N. fowleri	Need to investigate the prevalence of Naegleria fowleri to better understand the risk.		Research project to be undertaken in Townsville, Paluma and Cungulla.	June 2019	Drinking Water Quality Officer	
	Organics and Colour	Continue to monitor after WTP operational to confirm reduction in organics and THMs.	September 2018	Reduction in THM and organic formation has been confirmed. Will continue to monitor for different weather conditions especially high rainfall periods.	May 2019 (to include high rainfall event)	Drinking Water Quality Officer	Ongoing
	Chlorate	Investigate storage conditions (could the age be reduced or the temperature reduced). Investigate the use of 6% hypo which decays more slowly.	September 2018	WTP operational. Water is being treated to high specifications with respect to turbidity and organics. Chlorine dosing has therefore reduced which has also led to a reduction in chlorate formation.	September 2018	Water Treatment Engineer	Complete
	Water Emergency Response Plan	Updated copy to be included in DWQMP.	Jan 2019	Response plan is being updated and changed presently.			
	Water Treatment Plant CCPS	Risk Assessment required.	April 2019	Monitoring of plant operations and water quality data being analysed.	April 2018	Water Treatment Engineer	
		CCPs required to be set for the new plant.	April 2018	CCPs set and operational. Plant working within setpoints.			Complete

DRINKING WATER QUALITY AUDIT OPPORTUNITIES FOR IMPROVEMENT

Scheme Name	Component	Opportunity for Improvement	Target Date	Actions taken to date	Status and revised target date	Responsible Officer	Complete
Paluma DWS		Although the catchment is of low density, the presence of septic systems and human habitation means that the absence of a treatment barrier to protozoan pathogens for Paluma township is a potential concern. A more formalised and rigorous 'CCP-like' approach to protecting the catchment and/or an upgrade to the treatment plant to provide a protozoan barrier is warranted.	April 2018	Paluma WTP commissioned and operational April 2018		Water Treatment Engineer	Complete
All	Spare Parts	TCC staff had ensured that the majority of parts, and particularly the more sensitive parts, were retained indoor and undercover. However, some large pipes and fittings remained exposed outdoors. TCC should consider looking to store all potentially vulnerable parts that may form part of the drinking supply network undercover.	October 2019	Project required to move spare parts to Douglas WTP and secure capital expenditure to cover all large pipes and fittings. Work being undertaken currently to cap all large pipes.		Bulk Water Engineer	
All		The standard of vermin proofing and run-off protection was high across the inspected treated water tanks. Minor weaknesses that could be improved included the absence of mesh on whirly birds on the Douglas WTP Reservoirs (such mesh was present at other sites) and possible run off entry slits at Brookhill Reservoir.		Capital funding has been allocated for reservoir renewals. A program of works to renew the most important (risk rated) reservoirs first. Ongoing maintenance of reservoir roofs and structures is an ongoing process.	Ongoing	Bulk Water Engineer	Ongoing
All		There were some single valve raw water bypasses on treatment plants and there is value in reviewing the robustness of the valves to seepage and protection against accidental valve operation.		A project is required to review if this would be advantageous and minimise risk. Raw water bypass on Giru WTP. Bypass is painted red and locked. Risk of being operated accidentally is minimal.			Complete

4. Research Activities

No research activities were undertaken in the 17/18 financial year.

Mount Low Reservoir

5. Information supplied to the regulator regarding non-compliances and prescribed incidents

There were five non-compliances with water quality criteria reported for the 17/18 financial year, compared to 12 reported in the previous year. There were no prescribed incidents.

Table 3. Incidents reported to the Regulator

Incident Date and Number	Water Scheme and Location	Parameter and Issue	Corrective and Preventative Actions
January – March 2018 DWI-7-506-00054	Townsville Drinking Water Scheme	Chlorates >700 µg/L (Townsville Water's self-imposed limit).	Townsville has ongoing issues with chlorates in hot weather; compounded for the past few years by higher chlorine set points due to water restrictions. All mitigation measures available have been put in place. Old stock replaced with new stock, reducing the size of storage tanks, stock emptied before refilling, keeping chlorine residuals as low as possible, lowering of reservoir levels to turn over reservoirs. Chlorates reduced as the temperatures cooled. Investigations are underway to convert Douglas WTP to chlorine gas to reduce chlorate formation.
February – May 2018 DWI-7-506-00055	Townsville Drinking Water Scheme Wulguru	THMs (271 µg/L and 289 µg/L) at Wulguru and Dahl reservoir. THMs were then detected across much of the network in February.	THMs were detected across much of the network in February due to high rainfall which resulted in low usage. Chlorine set-point was high to ensure adequate disinfection to the outlying areas. TCC reduced set-points at Douglas WTP from 5mg/L in February due to the rain and low usage to 3.2mg/L in May due to increased usage across the network. TCC were also able to reduce chlorine set-points at re-chlorination points. This coupled with the lowered temperatures and increased demand across the network lowered THMs across the region.
March 2018 DWI-7-506-00056	Paluma Drinking Water Scheme	Chlorates >700 µg/L (Townsville Water's self-imposed limit).	The Paluma site was being prepared for the delivery of the water treatment plant and the township was running off a temporary tank. As there were no provisions for dosing the temporary tank, the raw water was being dosed at the weir. Due to distance travelled and the higher dose, higher chlorate concentrations were detected in the water at the township. Paluma residents and visitors were drinking bottled water supplied by TCC due to the boil water advisory. The Paluma WTP was installed and commissioned in April 2018. Although TCC still use sodium hypochlorite as its disinfectant, the water treatment plant is ultrafiltration with GAC, removing most of the particles and organics from the water and so the chlorine set point has reduced significantly. This is resulting in the formation of less chlorates. Chlorates are the lowest they have been in Paluma since testing began in 2013.
24 April 2018 DWI-7-506-00057	Townsville Drinking Water Scheme Dahl Reservoir	Total chlorine 5.31 mg/L, free chlorine 4.66 mg/L.	High chlorine was a result of the chlorine pump setting being manually increased over the weekend, coupled with a fresh sodium hypochlorite delivery. The pumps and chlorinator were turned off to allow the chlorine to decay overnight. Within two days the chlorine was back within operational limits. The pump was reset (lower dose rate). Operator error resulted in the pump setting being increased by mistake. Training with the operator was undertaken. Fatigue management was also looked at as the incident occurred on a Friday afternoon. House sample showed free chlorine 3.9mg/L. There were no customer taste or odour complaints.
1 May 2018 DWI-7-506-00058	Townsville Drinking Water Scheme	Lead 0.037mg/L Lead was detected on TCC's side of the meter. Lead was not detected in the house sample. Further investigations and sampling detected lead in a few older suburbs in Townsville. All samples taken were on TCC's side of the network.	A wide range of sampling was carried out to ensure this was not a widespread issue. Over 600 other locations were sampled. It must be noted that bad sampling technique was used and it is thought that due to no flushing occurring and meters being removed that contamination of samples occurred. Resamples (using correct technique) returned results with no lead breaches. To err on the side of caution all affected services were replaced. Lead was detected in two further samples in August. All services and meters were replaced with no lead detected upon retesting. Lead continues to be monitored throughout the network. No further lead has been detected in over 350 samples. Townsville has an ongoing capital works program to replace all old services and this will continue to be funded. This incident was not closed before the end of the financial year.

6. Compliance with water quality criteria for drinking water

Townsville Water has a comprehensive sampling regime "from catchment to tap" which covers raw water supply, water treatment and water distribution. Over 100,000 tests are taken over the year for various parameters including but not limited to chlorine, pH, turbidity, alkalinity, metals, chemical, pesticides and microbiological.

Where possible treated water samples are taken from dedicated sample points in Council owned parks and open spaces. These sample points are housed in secure vandal proof casings. The replacement program has been ongoing for three years with next financial year seeing all sample points being transferred over from house sample points.

All samples are taken and analysed by Townsville Laboratory Services (TLS) which are National Association of Testing Authorities (NATA) accredited. Results are emailed to the Water Quality Team as soon as they are verified and finalised by the laboratory. The Water Quality Team also have access to the Laboratory Information Management System (LIMS) to obtain results as required. All results above ADWG limits are called through immediately to the Water Quality Officer (Water Treatment Engineer if Water Quality Officer is not available). All water quality data is monitored and trends analysed throughout the year by the Water Quality Officer.

Townsville Water has been largely compliant with the water quality criteria for the financial year, having five water quality incidents as outlined in Table 3. Three reportable incidents were due to disinfection by-products above the ADWG limit. Water restrictions have meant greater management of the system with regards to maintaining chlorine residuals to the endpoints in the network to ensure disinfection is not compromised balanced against reducing disinfection by products. The long hot dry summer also compounded the issue. With the rains in March 2018 and the dam filling to 93% water restrictions were eased back to level 2 and the resultant slight increase in water usage has improved water quality by increasing turnover and reducing water age. It has also enabled TCC to reduce chlorine set-points both at the WTPs and at the re-chlorination points.

There have been no failures to meet sampling frequencies and all locations have been sampled.

Overall annual compliance for *E.coli* for each scheme was in compliance under the *Public Health Regulation 2005.*

Overall compliance for *E.coli* for each scheme was as per the Table 4 below.

Table 4: E.coli compliance for Townsville Water's drinking water schemes

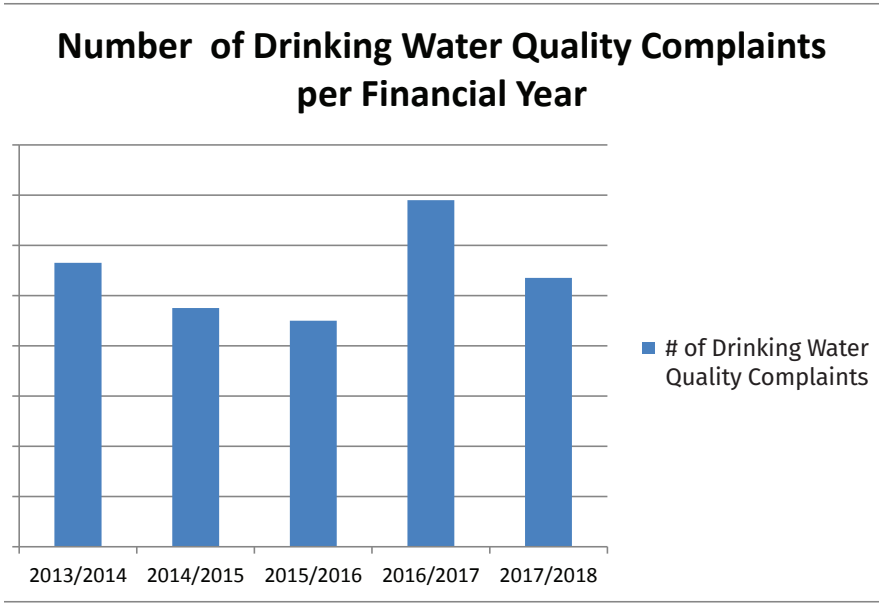
Drinking Water Scheme	No. of samples taken	% Annual Compliance
Townsville	3,385	100%
Paluma	110	100%
Giru/Cungulla	153	100%

Drinking water quality performance (verification monitoring) is included in Appendix A.

Example of Townsville water sample point

7. Details of complaints made to the provider about the drinking water service supplied to customers

All water quality complaints are lodged through the Customer Service Centre, which is a 24hr service. All data is collected and maintained in TCC's secure database. There were 107 drinking water quality complaints with 30 less than in the 2016/2017 year as per Graph 1 below.



Graph 1: Number of drinking water quality complaints per financial year.

This was due to a decrease in dirty and milky water complaints which numbered approx. 20 less than the year previous. There has been a body of work undertaken by Townsville Water to improve flushing practices upon completion of new mains and repair of pipes. This appears to have been largely successful. There were no complaints of geosmin in the northern beaches suburbs nor were elevated geosmin levels detected in routine sampling. All other water quality complaints by type were relatively static with preceding years.

Table 5: Number of dirty water complaints by type

Type of Water Quality Complaint	Dirty Water	Milky Water	Taste/ Odour	Geosmin	Suspected illness/ Customer Concern	Owner's Side (OS)	Vexatious Customer Complaints
# of complaints	69	4	8	0	3	11 flick mix 9 OS	3

There are four main types of water quality complaints in Townsville as outlined below:

DIRTY WATER AND MILKY WATER

Dirty water results when sediments from the bottom of the pipes are stirred up due to works occurring in the area such as pipe repairs, water trucks filling from hydrants and construction works with heavy machinery. It can also be caused by changing velocities in pipes stirring up the sediment. When a dirty water complaint is lodged, a water reticulation crew is dispatched to flush the area until the dirty water is removed and the chlorine residuals are back within specification. Customers are advised to flush their side by running sprinklers. Customers receive a call the following day to ensure water remains clear.

Milky water is caused when air becomes trapped in the water under pressure, forming tiny bubbles. As these air bubbles escape they cause the water to look milky. Milky water occurs following large main repairs or when new mains are commissioned. The issue usually resolves itself once all the air has escaped but if it doesn't the mains are flushed. If this still does not rectify the issue, more air valves are cut in to the mains.

TASTE AND ODOUR (T&O)

T&O complaints in Townsville are generally are caused by

- Dirty water events
- Geosmin
- High chlorine (or sudden changes in chlorine concentration)
- Old or new pipework on customer's side of the meter.

Townsville Water liaises with customers for all T&O complaints, flush where required and take samples for further investigation if warranted.

OWNER'S SIDE

There were twenty owner's side issues this financial year with eleven caused by flick mix taps. Near the end of the life of flick mix taps (after seven to ten years) the inside braided hose degrades and leaves a black oily residue in the water. This issue is rectified through a phone call to customers to explain the issue and the requirement for a private plumber to install new taps.

The remaining nine were for a mix of old pipework on the owner's side and hot water systems nearing the end of their life and the breakdown of the anode inside. Townsville Water analyse samples through TLS where required and communicate with customers through these issues.

SUSPECTED ILLNESS

There were three suspected illness complaints this year which is in line with previous years. In all instances customers were contacted and water from their residence analysed through TLS. In all instances the water met the ADWG limits and was safe to drink.

There were three vexatious complaints this year from the same customer.

Pipework at Veales Road, Deeragun

8. Outcome of review and recommendations of audit

REVIEW

A formalised review of the plan was undertaken from September 2017 to January 2018. This was a complete review of the plan including the review of 20+ years of water quality data, the inclusion of lessons learned from incidents since reporting began in 2009 and the audit opportunities for improvement.

A workshop was held with Hunter H2O and relevant staff which looked at elements 2 and 3 of the DWQMP. The three schemes were looked at separately and included Trility representation. The plan was differentiated into three separate plans for the three schemes. This resulted in a new implementation plan as per Section 3 of this annual report which will be implemented moving forward.

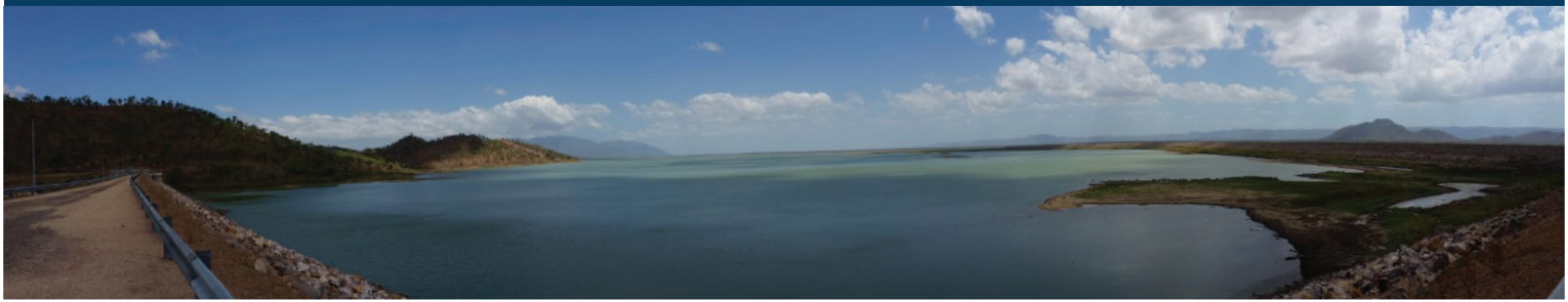
The amendments were submitted to the Regulator for approval in January 2018. The amendments were approved with conditions on 23 April 2018. This is the current plan under which TCC operates.

The next review is due April 2019.

AUDIT

There was no requirement for an audit in the 2017/2018 financial year. The next audit is required in August 2020.

Ross River Dam 2017



9. Appendix A. Drinking water quality performance – verification monitoring

GIRU/CUNGULLA DRINKING WATER SCHEME

Drinking Water Service Provider: Townsville City Council
SPID: 506
Drinking Water Scheme: Giru/Cungulla Drinking Water Scheme
Names of towns, communities or regions serviced by this scheme: Cungulla
Population serviced by this scheme: 288
Reporting year: July 2017 - June 2018
Laboratory name: Townsville Laboratory Services

	Scheme Component	Parameter Category	Parameter	Unit of Measure	Limit of Reporting (LOR)	Count	# of samples detected	# DW Guidelines Value	Min Value	Max Value	Avg Value	95th %tile	Comments
GIRU	**Source Water** Giru Raw Water (Haughton River)	Thermotolerant Coliforms	Total Coliform	org/100ml	1	49	49	0	76	10,020	896	1986	
		Thermotolerant Coliforms	E.coli	MPN/100ml	1	49	15	0	0	3	0	2.6	
		Turbidity	Turbidity	NTU	0.1	47	46	0	0	12.5	2.14	5.92	
		pH	pH	pH Units	1	47	47	0	7.02	9.21	8.11	9.06	
		Metals	Iron, Total	mg/L	0.005	48	48	0	0.01	0.91	0.11	0.29	
		Metals	Manganese, Total	mg/L	0.001	48	47	0	0	0.04	0.01	0.04	
	Water Treatment Plant Giru Clear Water Storage	Thermotolerant Coliforms	Total Coliform	org/100ml	1	49	6	0	0	32	1	2	
		Thermotolerant Coliforms	E.coli	MPN/100ml	1	49	0	0	0	0	0	0	
		Turbidity	Turbidity	NTU	0.1	49	49	0	0.1	1.1	0.27	0.72	
		pH	pH	pH Units	1	47	47	0	6.35	7.67	7	7	
		Metals	Iron, Total	mg/L	0.005	48	6	0	0	0.01	0.001	0.009	
		Metals	Manganese, Total	mg/L	0.001	48	44	0	0	0.02	0.003	0.006	
CUNGULLA	**Transmission** Cungulla Reservoir	Thermotolerant Coliforms	Total Coliform	org/100ml	1	51	0	0	0	0	0	0	
		Thermotolerant Coliforms	E.coli	MPN/100ml	1	51	0	0	0	0	0	0	
		Turbidity	Turbidity	NTU	0.1	51	51	0	0.1	0.8	0.32	0.60	
		pH	pH	pH Units	1	51	51	0	6.61	7.96	7.44	7.89	
		Metals	Iron, Total	mg/L	0.005	50	20	0	0	0.04	0.004	0.01	
		Metals	Manganese, Total	mg/L	0.001	50	16	0	0	0.02	0	0	
		Disinfection Residual	Chlorine (free)	mg/L	0.05	51	51	0	0.97	2.24	1.51	2.13	
		Disinfection Residual	Chlorine (Total)	mg/L	0.05	51	51	0	1.35	2.90	1.9	2.49	
		Disinfection By products	Chlorates	µg/L	15	12	11	0	0	641	308	607	
		Disinfection By products	Trihalomethanes	µg/L	2	50	50	0	35	102	69	90	
	Reticulation Cungulla Houses	Thermotolerant Coliforms	Total Coliform	org/100ml	1	77	0	0	0	0	0	0	
		Thermotolerant Coliforms	E.coli	MPN/100ml	1	77	0	0	0	0	0	0	
		Turbidity	Turbidity	NTU	0.1	26	26	0	0.10	0.60	0.30	0.40	
		pH	pH	pH Units	1	77	77	0	6.76	7.95	7.48	7.87	
		Metals	Iron, Total	mg/L	0.005	25	4	0	0	0.009	0.001	0.006	
		Metals	Manganese, Total	mg/L	0.001	25	4	0	0	0.002	0	0.001	
		Disinfection Residual	Chlorine (free)	mg/L	0.05	77	77	0	0.49	2.19	1.23	1.8	
		Disinfection Residual	Chlorine (Total)	mg/L	0.05	77	77	0	0.89	2.48	1.58	2.12	

GIRU/CUNGULLA DRINKING WATER SCHEME

Drinking Water Service Provider: Townsville City Council
SPID: 506
Drinking Water Scheme: Giru/Cungulla Drinking Water Scheme
Names of towns, communities or regions serviced by this scheme: Cungulla
Population serviced by this scheme: 288
Reporting year: July 2017 - June 2018
Laboratory name: Townsville Laboratory Services

	Scheme Component	Parameter Category	Parameter	Unit of Measure	Limit of Reporting (LOR)	Count	# of samples detected	# DW Guidelines Value	Min Value	Max Value	Avg Value	95th %tile	Comments
GIRU	**Source Water** Giru Raw Water (Haughton River)	Thermotolerant Coliforms	Total Coliform	org/100ml	1	49	49	0	76	10,020	896	1986	
		Thermotolerant Coliforms	E.coli	MPN/100ml	1	49	15	0	0	3	0	2.6	
		Turbidity	Turbidity	NTU	0.1	47	46	0	0	12.5	2.14	5.92	
		pH	pH	pH Units	1	47	47	0	7.02	9.21	8.11	9.06	
		Metals	Iron, Total	mg/L	0.005	48	48	0	0.01	0.91	0.11	0.29	
		Metals	Manganese, Total	mg/L	0.001	48	47	0	0	0.04	0.01	0.04	
	Water Treatment Plant Giru Clear Water Storage	Thermotolerant Coliforms	Total Coliform	org/100ml	1	49	6	0	0	32	1	2	
		Thermotolerant Coliforms	E.coli	MPN/100ml	1	49	0	0	0	0	0	0	
		Turbidity	Turbidity	NTU	0.1	49	49	0	0.1	1.1	0.27	0.72	
		pH	pH	pH Units	1	47	47	0	6.35	7.67	7	7	
		Metals	Iron, Total	mg/L	0.005	48	6	0	0	0.01	0.001	0.009	
		Metals	Manganese, Total	mg/L	0.001	48	44	0	0	0.02	0.003	0.006	
CUNGULLA	**Transmission** Cungulla Reservoir	Thermotolerant Coliforms	Total Coliform	org/100ml	1	51	0	0	0	0	0	0	
		Thermotolerant Coliforms	E.coli	MPN/100ml	1	51	0	0	0	0	0	0	
		Turbidity	Turbidity	NTU	0.1	51	51	0	0.1	0.8	0.32	0.60	
		pH	pH	pH Units	1	51	51	0	6.61	7.96	7.44	7.89	
		Metals	Iron, Total	mg/L	0.005	50	20	0	0	0.04	0.004	0.01	
		Metals	Manganese, Total	mg/L	0.001	50	16	0	0	0.02	0	0	
		Disinfection Residual	Chlorine (free)	mg/L	0.05	51	51	0	0.97	2.24	1.51	2.13	
		Disinfection Residual	Chlorine (Total)	mg/L	0.05	51	51	0	1.35	2.90	1.9	2.49	
		Disinfection By products	Chlorates	µg/L	15	12	11	0	0	641	308	607	
		Disinfection By products	Trihalomethanes	µg/L	2	50	50	0	35	102	69	90	
	Reticulation Cungulla Houses	Thermotolerant Coliforms	Total Coliform	org/100ml	1	77	0	0	0	0	0	0	
		Thermotolerant Coliforms	E.coli	MPN/100ml	1	77	0	0	0	0	0	0	
		Turbidity	Turbidity	NTU	0.1	26	26	0	0.10	0.60	0.30	0.40	
		pH	pH	pH Units	1	77	77	0	6.76	7.95	7.48	7.87	
		Metals	Iron, Total	mg/L	0.005	25	4	0	0	0.009	0.001	0.006	
		Metals	Manganese, Total	mg/L	0.001	25	4	0	0	0.002	0	0.001	
		Disinfection Residual	Chlorine (free)	mg/L	0.05	77	77	0	0.49	2.19	1.23	1.8	
		Disinfection Residual	Chlorine (Total)	mg/L	0.05	77	77	0	0.89	2.48	1.58	2.12	

TOWNSVILLE DRINKING WATER SCHEME

Drinking Water Service Provider: Townsville City Council
Drinking Water Scheme: Townsville Drinking Water Scheme
Population serviced by this scheme:
Laboratory name: Townsville Laboratory Services

SPID: 506
Names of towns, communities or regions serviced by this scheme: Townsville
Reporting year: July 2017 - June 2018

Scheme Component	Parameter Category	Parameter	Unit of Measure	Limit of Reporting (LOR)	Count	# of samples detected	# DW Guidelines Value	Min Value	Max Value	Avg Value	95th %tile	Comments
Source Water Ross River Dam	Thermotolerant Coliforms	Total Coliforms	org/100ml	1	239	239	0	61	39730	2476	10570	
	Thermotolerant Coliforms	Thermotolerant Coliforms	org/100ml	1	80	28	0	0	394	15.79	80	
	Thermotolerant Coliforms	E.coli	MPN/100ml	1	159	91	0	0	88	4.28	17.2	
	Turbidity	Turbidity	NTU	0.1	193	193	0	3.6	93.8	18.72	65.88	
	pH	pH	pH Units	1	240	240	0	6.16	8.79	7.67	8.56	
	Metals	Iron, Total	mg/L	0.005	193	193	0	0.04	2.60	0.72	1.34	
	Metals	Manganese, Total	mg/L	0.001	193	193	0	0.004	0.65	0.04	0.09	
	Anions	Nitrate	mg/L	0.01	193	102	0	0	0.23	0.03	0.11	
Source Water Paluma Dam	Thermotolerant Coliforms	Thermotolerant Coliforms	org/100ml	1	12	4	0	0	560	66.67	340	
	Thermotolerant Coliforms	E.coli	MPN/100ml	1	144	76	0	0	22	2.03	10.85	
	Turbidity	Turbidity	NTU	0.1	103	103	0	1.1	3.6	1.86	2.70	
	pH	pH	pH Units	1	143	143	0	5.01	7.07	6.08	6.8	
	Metals	Iron, Soluble	mg/L	0.005	104	104	0	0.04	4.30	0.22	0.3	
	Metals	Manganese, Soluble	mg/L	0.001	104	104	0	0.002	0.11	0.02	0.03	
	Anions	Nitrate	mg/L	0.01	104	104	0	0	0.61	0	0.49	
Water Treatment Plant Douglas WTP Raw Water	Thermotolerant Coliforms	Total Coliforms	org/100ml	1	47	47	0	2	281	57	176.2	
	Thermotolerant Coliforms	E.coli	MPN/100ml	1	47	33	0	0	55	5.94	30.6	
	Turbidity	Turbidity	NTU	0.1	349	349	0	0.08	18.4	1.29	2.22	
	pH	pH	pH Units	1	349	349	0	10.33	11.66	10.63	10.85	
	Anions	Sulphate	mg/L	0.5	12	6	0	0	1.30	0.46	1.19	
	Metals	Iron, Total	mg/L	0.005	48	48	0	0.04	0.40	0.16	0.37	
	Metals	Manganese, Total	mg/L	0.001	48	46	0	0	0.01	0.01	0.009	
	Geosmin/ MIB	Geosmin	ng/L	1	12	4	0	0	7.00	1.48	5.35	
	Geosmin/ MIB	MIB	ng/L	1	12	1	0	0	10.90	0.91	4.91	
	Fluoride	Fluoride (Naturally occuring)	mg/L	0.02	48	32	0	0	0.07	0.03	0.05	
	Metals	Arsenic	mg/L	0.001	4	0	0	0	0	0	0	
	Metals	Selenium	mg/L	0.001	4	0	0	0	0	0	0	
	Metals	Mercury	mg/L	0.0006	4	0	0	0	0	0	0	
	Metals	Cadmium	mg/L	0.0001	4	0	0	0	0	0	0	
	Metals	Nickel	mg/L	0.001	4	0	0	0	0	0	0	
	Metals	Chromium	mg/L	0.001	4	0	0	0	0	0	0	
	Giardia	Giardia	cysts/100ml	1	4	0	0	0	0	0	0	
	Cryptosporidium	Cryptosporidium	oocysts/10L	1	4	0	0	0	0	0	0	

Water Treatment Plant Douglas WTP Treated Water	Thermotolerant Coliforms	Total Coliforms	org/100ml	1	61	0	0	0	0	0	0	
	Thermotolerant Coliforms	E.coli	MPN/100ml	1	61	0	0	0	0	0	0	
	Disinfection Residual	Chlorine, free	mg/L	0.05	675	675	0	1	5	3.12	4.2	Chlorine dosing was increased due to high rainfall experienced in this time period. 5mg/L was taken at the clear water storage. This water is fed into Douglas Reservoir (40ML) where it is diluted down and so 5mg/L did not reach customers.
	Turbidity	Turbidity	NTU	0.1	730	730	0	0.01	0.83	0.10	0.14	
	pH	pH	pH Units	1	730	730	0	7.35	7.7	7.53	7.61	
	Anions	Sulphate	mg/L	0.5	24	18	0	0	4.1	2.35	3.89	
	Anions	Nitrate	mg/L	0.01	24	24	0	0.08	0.2	0.14	0.19	
	Metals	Iron, Total	mg/L	0.005	199	15	0	0	0.01	0.001	0.006	
	Metals	Manganese, Total	mg/L	0.001	99	12	0	0	0.01	0	0.002	
	Metals	Aluminium	mg/L	0.005	693	646	0	0	0.11	0.01	0.04	
	Fluoride	Fluoride	mg/L	0.02	730	730	0	0.61	0.78	0.69	0.73	
	Metals	Copper	mg/L	0.002	24	16	0	0	0.005	0	0.003	
	Metals	Zinc	mg/L	0.001	24	0	0	0	0	0	0	
	Metals	Arsenic	mg/L	0.001	8	0	0	0	0	0	0	
	Metals	Selenium	mg/L	0.001	8	0	0	0	0	0	0	
	Metals	Mercury	mg/L	0.0006	8	0	0	0	0	0	0	
	Metals	Cadmium	mg/L	0.0001	8	0	0	0	0	0	0	
	Metals	Nickel	mg/L	0.001	8	0	0	0	0	0	0	
	Metals	Chromium	mg/L	0.001	8	0	0	0	0	0	0	
	Disinfection By-product	Trihalomethanes	ug/L	5	99	99	0	30	179	67	122	
Water Treatment Plant Northern WTP Raw Water	Thermotolerant Coliforms	Total Coliforms	org/100ml	1	48	47	0	0	281	55	176	
	Thermotolerant Coliforms	E.coli	MPN/100ml	1	48	33	0	0	55	6	30	
	Turbidity	Turbidity	NTU	0.1	349	349	0	0	18.43	1.29	2.22	
	pH	pH	pH Units	1	349	349	0	10.33	11.66	10.65	10.85	
Water Treatment Plant Northern WTP Raw Water	Anions	Sulphate	mg/L	0.5	12	6	0	0	1.3	0.46	1.19	
	Metals	Iron, Total	mg/L	0.005	48	48	0	0	0.40	0.2	37.00	
	Metals	Manganese, Total	mg/L	0.001	48	46	0	0	0.01	0.005	0.009	
	Geosmin/ MIB	Geosmin	ng/L	1	12	4	0	0	7	1.48	5.35	
	Geosmin/ MIB	MIB	ng/L	1	12	1	0	0	11	1	4.91	
	Fluoride	Fluoride	mg/L	0.02	48	32	0	0	0.07	0.03	0.05	
	Metals	Arsenic	mg/L	0.001	4	0	0	0	0	0	0	
	Metals	Selenium	mg/L	0.001	4	0	0	0	0	0	0	
	Metals	Mercury	mg/L	0.0006	4	0	0	0	0	0	0	
	Metals	Cadmium	mg/L	0.0001	4	0	0	0	0	0	0	
	Metals	Nickel	mg/L	0.001	4	0	0	0	0	0	0	
	Metals	Chromium	mg/L	0.001	4	0	0	0	0	0	0	
	Giardia	Giardia	cysts/100ml	1	4	0	0	0	0	0	0	
	Cryptosporidium	Cryptosporidium	oocysts/10L	1	4	0	0	0	0	0	0	

Water Treatment Plant Northern WTP Treated Water	Thermotolerant Coliforms	Total Coliforms	org/100ml	1	48	0	0	0	0	0	0	
	Thermotolerant Coliforms	E.coli	MPN/100ml	1	48	0	0	0	0	0	0	
	Disinfection Residual	Chlorine, free	mg/L	0.05	348	348	0	1.67	3.08	2.00	2.32	
	Turbidity	Turbidity	NTU	0.1	349	349	0	0.02	0.08	0.04	0.05	
	pH	pH	pH Units	1	349	349	0	7.38	7.80	7.51	7.59	
	Anions	Sulphate	mg/L	0.5	12	7	0	0	2	1	1.64	
	Anions	Nitrate	mg/L	0.01	12	11	0	0	0.06	0.04	0.06	
	Metals	Manganese, Total	mg/L	0.001	48	24	0	0	0.04	0.001	0.002	
	Metals	Iron, Total	mg/L	0.005	96	6	0	0	0.02	0.001	0.006	
	Metals	Aluminium	mg/L	0.005	333	280	0	0	0.96	0.01	0.029	
	Fluoride	Fluoride	mg/L	0.02	349	349	0	0.61	0.76	0.69	0.72	
	Metals	Copper	mg/L	0.002	12	5	0	0	0.005	0.001	0.004	
	Metals	Zinc	mg/L	0.001	12	0	0	0	0	0	0	
	Metals	Arsenic	mg/L	0.001	4	0	0	0	0	0	0	
	Metals	Selenium	mg/L	0.001	4	0	0	0	0	0	0	
Water Treatment Plant Northern WTP Treated Water	Metals	Mercury	mg/L	0.0006	4	0	0	0	0	0	0	
	Metals	Cadmium	mg/L	0.0001	4	0	0	0	0	0	0	
	Metals	Nickel	mg/L	0.001	4	0	0	0	0	0	0	
	Metals	Chromium	mg/L	0.001	4	0	0	0	0	0	0	
	Disinfection By-product	Trihalomethanes	ug/L	5	48	48	0	9	84	24	48	
Transmission Reservoirs	Thermotolerant Coliforms	Total Coliforms	org/100ml	1	984	6	0	0	201	0.47	0	
	Thermotolerant Coliforms	E.coli	MPN/100ml	1	985	0	0	0	0	0	0	
	Disinfection residual	Chlorine, free	mg/L	0.05	985	984	0	0	4.66	1.25	2.02	
	Disinfection residual	Chlorine, total	mg/L	0.05	985	985	1	0.23	5.31	1.7	2.51	DWI-7-506-00057
	Turbidity	Turbidity	NTU	0.1	984	955	0	0	1.1	0.22	0.40	
	pH	pH	pH Units	1	985	985	0	6.36	8.4	7.4	7.87	
	Metals	Iron, Total	mg/L	0.005	985	462	0	0	0.14	0.006	0.028	
	Metals	Manganese, Total	mg/L	0.001	985	289	0	0	0.01	0.001	0.003	
	Disinfection By-product	Trihalomethanes	µg/L	5	988	988	10	11	310	109	198	DWI-7-506-00055
	Disinfection By-product	Chlorates	µg/L	50	134	108	12	108	1057	327	752	DWI-7-506-00054
Reticulation Houses	Thermotolerant Coliforms	Total Coliforms	org/100ml	1	2134	0	11	0	130	0	0	
	Thermotolerant Coliforms	E.coli	MPN/100ml	1	2134	0	0	0	0	0	0	
	Disinfection residual	Chlorine, free	mg/L	0.05	2132	2113	0	0	3.6	1.03	1.85	
	Disinfection residual	Chlorine, total	mg/L	0.05	2132	2126	0	0	4.3	1.4	2.3	
	Turbidity	Turbidity	NTU	0.1	645	588	0	0	8.6	0.32	0.8	
	pH	pH	pH Units	1	2132	2132	0	6.05	8.40	7.38	7.96	
	Metals	Iron, Total	mg/L	0.005	447	180	0	0	0.5	0.009	0.04	
	Metals	Manganese, Total	mg/L	0.001	447	179	0	0	0.09	0.002	0.01	
	Metals	Lead, Total	mg/L	0.001	386	82	23	0	0.5	0.006	0.02	DWI-7-506-00058
	Fluoride	Fluoride	mg/L	0.02	447	447	0	0.60	0.79	0.7	0.74	
	Disinfection By-product	Trihalomethanes	µg/L	5	551	551	3	10	308	97.5	182.5	DWI-7-506-00055
	Disinfection By-product	Chlorates	µg/L	50	74	64	4	0	869	331.62	701.05	DWI-7-506-00054

TOWNSVILLE WATER

City of Townsville