DRINKING WATER QUALITY MANAGEMENT PLAN ANNUAL REPORT – NPA WATER SUPPLY SYSTEM

Water Quality

Reporting Period July 2020 to June 2021

NPARC
NPA Water Supply System

This report has been prepared in accordance with the Drinking Water Quality Management Plan Report Guidance Note.

Revision history

Date	Rev.	Author	Approved by	Description
16/11/2021	0	N Strazdins	E Quek	Drinking Water Quality Management Plan (DWQMP) Annual Report - NPA Water Supply System 2020/2021
22/11/2021	0		E Quek	Internal Review
24/11/2021	0	N Strazdins	D Ollerton / W Hislop	Review for submission

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ACRONYMS AND DEFINITIONS

Term	Definition
May	Indicates a possible course of action.
Shall	Indicates a mandatory requirement.
Should	Indicates a preferred course of action.
ADWG	Australian Drinking Water Guidelines 6 (2011)
ADWG Framework	ADWG Framework for Management of Drinking Water Quality – the twelve elements
CMF	Continuous Micro Filtration
CCP	Critical Control Point
DLGRMA	Department of Local Government, Racing and Multicultural Affairs
DRDMW	Department of Regional Development, Manufacturing and Water
DILGP	Department of Local Government, Infrastructure and Planning
DWQMP	Drinking Water Quality Management Plan
O&M	Operations and Maintenance
QCP	Quality Control Point
QMS	Quality Management System
NPA	Northern Peninsula Area
NPARC	Northern Peninsula Area Regional Council
R&D	Research and Development
SCADA	Supervisory Control and Data Acquisition
SMT	Senior Management Team
TDS	Total Dissolved Solids
THM	Trihalomethanes
TOC	Total Organic Carbons
WTP	Water Treatment Plant
WQMS	Water Quality Management System
WQIP	Water Quality Improvement Plan (Risk Management Improvement Program)
WQP	Water Quality Plan

1 INTRODUCTION

This Drinking Water Quality Management Plan Annual Report documents the performance of TRILITY's drinking water service with respect to water quality and performance in implementing the actions detailed in the Drinking Water Quality Management Plan (DWQMP), under the requirements of the *Water Supply (Safety and Reliability) Act 2008* (the Act). The information in this report relates to the period 1 July 2020 to 30 June 2021, referred to herein as 'the reporting period'.

The purpose of the Act is to provide for the safety and reliability of water supply throughout Queensland. Under the Act, the Northern Peninsula Area Regional Council (NPARC) (Service Provider Identification Number 492) is defined as a service provider because it owns and operates the water services in the Northern Peninsula Area (NPA). The NPARC – as the Registered Service Provider – is responsible for ensuring service delivery of the Northern Peninsula Area water supply and for ensuring that the associated infrastructure is managed efficiently and effectively. The NPARC has tasked TRILITY Pty Ltd to operate and maintain the scheme on their behalf.

This report has been prepared based on the DWQMP report guidance note published by Water Supply Regulation Natural Resources, Department of Regional Development, Manufacturing and Water (DRDMW), Queensland 2018, accessible at: https://www.resources.qld.gov.au

2 OVERVIEW OF OPERATIONS

The NPA is located near the tip of Cape York Peninsula. The NPA water supply system is integrated to serve all five communities; Bamaga, Injinoo, New Mapoon, Seisia and Umagico. From catchment to tap, the NPA water supply system overview comprises a raw water intake main and storage; a water treatment plant (WTP); individual storage reservoirs; trunk mains between the communities; and the reticulation network inside the communities either up to the service connection's stopcock / water meter (if present) or the boundary of the property supplied by the service.

The NPA water supply sources its water from the Jardine River at a point upstream of tidal influence and approximately 15.4 km southeast of the water treatment plant located at Bamaga. The WTP is fed from a purpose-built raw water storage via a duplicated main. The raw water is dosed with soda ash and caustic soda (optional) seasonally during the wet season with the ability to also dose aluminium chlorohydrate (ACH). It is then pumped to a 15 ML lined raw water open storage near the water treatment plant. The dosing of ACH was implemented in February 2020 and is pending final commissioning. The Jardine River intake pumps are operated to a lagoon level set point.

The raw water is then pumped from the 15 ML reservoir to the Bamaga WTP. The raw water storage is uncovered and will be exposed to rainfall-intrusion during rain events. Soda ash is dosed between the raw water lagoon storage and the inlet strainer for pH correction. The soda ash dosing system was completely replaced in May 2021 to improve dosing and better regulate pH.

Bamaga WTP has a maximum production capacity of 6.0 ML/d, utilising a Continuous MicroFiltration (CMF) process followed by chlorine gas as disinfection. The Bamaga WTP supplies drinking water to six service reservoirs at Injinoo, New Mapoon, Seisia, Umagico and Bamaga (two reservoirs), ranging from 1.6 ML to 2.0 ML. From there the water are directed to the TRILITY operated distribution system.

The drinking water quality is measured against two specifications; contractual specifications outlined in the conditions of contract NPARC – 2411 - 14, and the DRDMW Incident Notification Protocol form WSR503 – Drinking water quality: Incident reporting, adapted from the Australian Drinking Water Guidelines 2011 (ADWG). The individual parameters of these specifications are documented in **Appendix A.**

TRILITY as a supplier of drinking water into the NPA Water supply system will ensure its DWQMP and by association its Water Quality Plan (WQP) for Bamaga WTP and the reticulation network are maintained, ensuring a 'catchment to tap' philosophy aligned to the ADWG framework and safe and reliable supply of drinking water to its customers.

3 OBJECTIVE OF THE DWQMP

The objective of the DWQMP is to assure optimal drinking water quality and to protect public health through a preventive management approach covering all steps in the production of drinking water from catchment to tap. To meet this objective, the DWQMP will:

- Comply with the requirements of the *Water Supply (Safety and Reliability) Act QLD 2008* (the Act).
- Comply with the TRILITY drinking water quality policy and all relevant corporate and HSEQ policies and procedures.
- Comply with the requirements of the Australian Drinking Water Guidelines 2011 (ADWG) including the Framework for Management of Drinking Water Quality – the twelve elements (ADWG Framework).
- Incorporate an incident reporting and management procedure consistent with the DRDMW incident notification protocol.
- Incorporate TRILITY's internal Critical Control Point (CCP) validation process, including but not limited to the implementation of the ADWG Framework.
- Incorporate NPARC requirements for reporting of information and performance in relation to water quality management.
- Incorporate the objective to supply safe drinking water at all times, over the full range of production flows from the WTP.
- Incorporate a preventive risk management approach covering all steps from source to the contractual interface point between TRILITY and NPARC and development of a risk management plan in accordance with the requirements of the ADWG.

4 ACTIONS TAKEN TO IMPLEMENT THE DQWMP

4.1 Operational and Procedure Training

TRILITY operators are required at all times to adhere to agreed protocols and monitor the Bamaga WTP effectively to ensure that the drinking water quality standards are continuously met. The operators are experienced, appropriately trained and understand their responsibilities in ensuring and maintaining drinking water quality. The Bamaga WTP operates intermittently and as such protocols and procedures have been developed to ensure that during start-up and shutdown the Bamaga WTP does not compromise water quality.

Operational procedures and Work Instructions (WIs) for the Bamaga WTP have been developed for all major operational activities. These procedures guide operators in providing safe drinking water of compliant quality. Control procedures and Programmable Logic Controller (PLC) logic is detailed in the control sequence manual for the Bamaga WTP.

All employees are familiar with the location of the WIs and trained in their implementation. A summary of all WIs can be found in the Bamaga operations Work Instructions index on site.

4.2 Operational Monitoring

CCPs have been set and are continuously monitored via the Plant's SCADA system. If any of the CCPs deviate outside of their Critical Limits, an alarm is signalled via a text message to operators. This alarm identifies the CCP that is non-compliant or exceeded its Critical Limit, and at what location. SCADA alarms relating to CCPs are to take operational precedence at all times to ensure water quality compliance.

SCADA alarms relating to CCPs take precedence over all other SCADA alarms as the safety of consumers is at risk. Early warnings also form part of the control system in order to have enough time to rectify a situation in case a parameter gets close to its Critical Limit.

Guidelines for appropriate operational response to these alarms are detailed in Bamaga DWQMP. The general operational monitoring of the Bamaga WTP including the daily Routine Readings & Inspections and water quality sampling are also outlined in the Bamaga WTP DWQMP.

4.3 Corrective Action

TRILITY ensure corrective action is taken in response to water quality non-conformances or NPARC feedback. All corrective actions relating to NPARC breaches is documented in the TRILITY Non-Conformance database on IBM Notes, which also defines responsibilities and authorities, and ensures that staff are trained in appropriate procedures. TRILITY's training management and record keeping is done through the online SitePass system.

Corrective action can result from:

- Water quality exceedances, plant process/performance failures and the outcomes of their respective incident investigations
- Short-term evaluation of drinking water quality monitoring data
- Client and consumer feedback
- Workplace assessments
- Calibration, and;
- Training.

Failure to take immediate or effective action may lead to the escalation of a situation, such as a breach of NPARC protocols, which may require incident response protocols to be implemented.

Should corrective action necessitate amendments to the NPA DWQMP, TRILITY will implement and record such changes.

4.4 Maintenance

Maintenance of plant and equipment is continually undertaken to ensure equipment performs reliably. TRILITY have developed a maintenance plan that outlines preventative maintenance requirements for all plant and equipment. All preventative and corrective maintenance undertaken by TRILITY is documented and reported in the monthly operations reports.

TRILITY also maintains an Asset Management Plan (AMP) BAA-PLN-001 Asset Management Plan that describes the systems, processes and activities related to the maintenance and replacements of assets. This AMP is reviewed on an annual basis.

4.5 Materials and Chemicals

Chemical suppliers are evaluated and selected on their ability to supply chemicals not only in accordance with the required specifications, but also with respect to their security of supply. TRILITY seek from chemical supplier's evidence of how the quality of the chemical against the specification can be assured, and evidence to demonstrate that security of supply can be maintained.

The control of chemicals and chemical delivery systems at the Bamaga WTP is crucial to ensuring drinking water quality. Maintenance of these systems are documented in the AMP. Chemical stock management is managed by the Plant Manager, who is also responsible for the reordering of chemicals. Certificates of compliance are supplied at regular intervals by the supplier or upon request as appropriate. The most recent SDS for each chemical is stored on site.

Chemical delivery contractors, as with all contractors undertaking works on TRILITY sites, are required to complete a site induction that outlines general site OHS hazards and risks. A Job Safety and Environmental Analysis (JSEA) is also required. In addition to chemicals, lubricants and oils used on mechanical equipment could contaminate drinking water. Any contamination is likely to arise during maintenance activities. The management of contamination by lubricants is via approved maintenance procedures and work instructions.

5 PROGRESS AGAINST THE WATER QUALITY IMPROVEMENT PLAN

The Water Quality Improvement Plan (WQIP) is regularly updated to reflect the current status against each action, and others included as they are identified through various processes including risk assessments and audits. The WQIP is maintained in the DWQMP, updated annually, and the August 2021 revision is replicated herein (**Table 1**).

Throughout the reporting period, work continued to address areas for improvement identified in the WQIP.

Table 1 – Updated water quality improvement plan.

Item #	Hazard/ Hazardous Event	Risk Rating	Source	Improvement Actions			Target Date(s)	Actions taken to date (Updated 12/8/2021)	Status	Responsible Party	Source2
				Short term action	Medium term action	Long term action					
ES.4.1		3 High	Audit Recommendation	Complete Risk Management Improvement Plan actions			Ongoing	Various Emergency Action Plans implemented Oct19 to April 20, refresher training provided regarding use of TRILITY Notification Database	Complete	Scheme Manager	DWQMP Audit 2018
	Low chlorine residual	2 Medium	RCA	Short term - Lower reservoir operating levels to improve turnover -				It was determined that reservoirs are unable to operate at lower levels due to water usage. The filling cycles of the reservoirs have been adjusted to reduce water age.	Complete		2018-2019
ES.4.2.f	Low chlorine residual	2 Medium	Audit OFI	Create a system operations procedure including reservoir level and chlorine management, including seasonal management–			Jul-19	It was determined that reservoirs were unable to operate at lower levels due to water usage. The filling cycles of the reservoirs have been adjusted to reduce water age and monitoring of chlorine residual in reticulation system. Chlorine dosing (hypo) was replaced with chlorine gas dosing in Feb 2020.	Complete	Scheme Manager/ Water Quality Team	DWQMP Audit 2018
	High rainfall in river catchment - Colour	2 Medium		Calcium hypochlorite dosing during high colour raw water events. EPANET model and operator decision tool.			Mar-19	Chlorine tablet manual dosing procedure and calculator developed.	Complete	Water Quality Team	2018-2019
11	Due to incorrect chemical dosing, dose too low, There is a risk of inadequate disinfection resulting in a water quality non-conformance.	3 High	Bamaga WQ Risk Assessment - Network		Clarify Procedure for chlorine tablet dosing.		Jul-19	Chlorine tablet manual dosing procedure and calculator developed. Managing water age, continuous monitoring of chlorine residual and chlorine gas dosing implemented has reduced the risk of inadequate chlorine residual in drinking water.	Complete	Water Quality Team	Network risk assessment 2018
13	Due to running out of chlorine residual/variable residence time, There is a risk of inadequate disinfection resulting in a water quality non-conformance.	3 High	Bamaga WQ Risk Assessment - Network		Clarify Procedure for chlorine tablet dosing.		Jul-19	Chlorine tablet manual dosing procedure and calculator developed. Managing water age, continuous monitoring of chlorine residual and chlorine gas dosing implemented has reduced the risk of inadequate chlorine residual in drinking water.	Complete	Water Quality Team	Network risk assessment 2019
16	Due to high DOC in treated water, there is a risk of high chlorine demand and production of disinfection by- products. Inadequate chorine residual at ends of network.	3 High	Bamaga WQ Risk Assessment - Network		Clarify Procedure for chlorine tablet dosing.		Jul-19	Chlorine tablet manual dosing procedure and calculator developed. Managing water age, continuous monitoring of chlorine residual and chlorine gas dosing implemented has reduced the risk of inadequate chlorine residual in drinking water. High colour in raw water has been addressed with dosing ACH in the raw water lagoon seasonally.	Complete	Water Quality Team	Network risk assessment 2020

Item #	Hazard/ Hazardous Event	Risk Rating	Source	Improvement Actions			Target Date(s)	Actions taken to date (Updated 12/8/2021)	Status	Responsible Party	Source2
				Short term action	Medium term action	Long term action					
34	Due to chlorine residual not being maintained, There is a risk of pipeline recontamination resulting in positive bacterial detections.	3 High	Bamaga WQ Risk Assessment - Network		Clarify Procedure for chlorine tablet dosing.		Jul-19	Chlorine tablet manual dosing procedure and calculator developed. Managing water age, continuous monitoring of chlorine residual and chlorine gas dosing implemented has reduced the risk of inadequate chlorine residual in drinking water.	Complete	Water Quality Team	Network risk assessment 2021
	High rainfall in river catchment - Colour	3 High		ACH dosing PWorks project scope and budget prepared for approval in 2018			Mar-19	High colour in raw water has been addressed with dosing ACH in the raw water lagoon seasonally. ACH system still undergoing commissioning due for completion by October 2021	Pending commission	Water Quality Team	2018-2019
ES.4.1.d	High rainfall in river catchment - Colour	2 Medium	Audit OFI		Continue with ACH project		Dec-19	High colour in raw water has been addressed with dosing ACH in the raw water lagoon seasonally. ACH system still undergoing commissioning due for completion by October 2021	Pending commission	Water Quality Team	DWQMP Audit 2018
5	There is a risk of extreme rain the catchment resulting in increased colour (an indicator of dissolved organic content)	3 High	Bamaga WQ Risk Assessment			Implement ACH dosing at plant inlet	Dec-19	High colour in raw water has been addressed with dosing ACH in the raw water lagoon seasonally. ACH system still undergoing commissioning due for completion by October 2021	Pending commission	Water Quality Team	Plant Risk Assessment 2018
ES.4.2.g	There is a risk of extreme rain the catchment resulting in increased colour (an indicator of dissolved organic content)	2 Medium	Audit OFI		Create a jar testing procedure for ACH (future enhancement) Include test frequency		Dec-19	Jar testing WI developed. ACH system still undergoing commissioning due for completion by October 2021	Pending commission	Water Quality Team	DWQMP Audit 2018
18	Due to increased raw water organic content There is a risk of increased trihalomethanes in the network resulting in a breach of ADWG, regulatory or contractual limits.	3 High	Bamaga WQ Risk Assessment - Plant		ACH dosing to be installed to increase colour and organic content removal. Procedure for THM testing to be developed.		Dec-19	High organic in raw water has been addressed with dosing ACH in the raw water lagoon seasonally. ACH system still undergoing commissioning due for completion by October 2021	Pending commission	Water Quality Team	Plant Risk Assessment 2018
20	Due to Low/High residuals There is a risk of delivered water having a chlorine residual that is too high/low due to differing residence times through the network sourced from a single point of chlorination	3 High	Bamaga WQ Risk Assessment - Plant		ACH dosing to be installed to increase colour and organic content removal. Procedure for THM testing to be developed.		Dec-19	High colour in raw water has been addressed with dosing ACH in the raw water lagoon seasonally. ACH system still undergoing commissioning due for completion by October 2021	Pending commission	Water Quality Team	Plant Risk Assessment 2018
36	Due to poor quality materials - old pipes There is a risk of water gets contaminated with chemicals copper, iron lead, old galv wrought iron and unlined steel pipes and hydrant risers, lead joints and service pipes, lead leaching from pre 1990 uPVC, leaching of plasticisers from uPVC, leaching of poor quality cement linings, leaching from plastic coated valves, rubber hoses	3 High	Bamaga WQ Risk Assessment - Network	Proposed to client to consider 30MS testing regime at strategic locations at customer taps to check for metals leaching. Short term - identify cost and frequency for testing and determine if this required			Mar-19	AC replacement project in progress	In progress	NPARC / Water Quality Team	Network risk assessment 2018

Item #	Hazard/ Hazardous Event	Risk Rating	Source	Improvement Actions			Target Date(s)	Actions taken to date (Updated 12/8/2021)	Status	Responsible Party	Source2
				Short term action	Medium term action	Long term action					
37	Due to inadequate maintenance or replacement of ageing and worn pipes, There is a risk of pipe breakages/leaks resulting in a KPI failure for breaks	3 High	Bamaga WQ Risk Assessment - Network	Clarify details of project to replace ageing AC mains			Mar-19	AC replacement project put out to tender, project to commence August 2021	In progress	Scheme Manager	Network risk assessment 2018
8	Due to leaching/corrosion There is a risk of water becoming contaminated and coloured, resulting in customer complaints. There is a risk of asset failure.	1 Low	Bamaga WQ Risk Assessment - Network	Check water corrosivity calculations.			Jan-19	AC replacement project in progress.	Pending	Water Quality Team	Network risk assessment 2018
ES.4.2.e	Due to leaching/corrosion There is a risk of water becoming contaminated and coloured, resulting in customer complaints. There is a risk of asset failure.	2 Medium	Audit OFI		Introduce pH buffering. This can be done using the existing Soda Ash chemical on site.		Dec-19	Soda ash dosing in the raw water. Investigation continues. AC replacement project in progress	Pending, Requires corrosivity calculations	Water Quality Team	DWQMP Audit 2018
	Pollution in river - viruses	2 Medium			Enhanced catchment monitoring for vulnerability assessment (Tier 1) in line with ADWG health-based targets changes.		Jul-19		In progress	Water Quality Team	2018-2019
	Pollution in river - viruses	2 Medium		Preparation of TectaPDS site *E. coli* and Coliform monitoring business case for approval, 2018 implementation			Jan-19	The use of TECTA was investigated in 2019 but was deemed unsuitable. Currently the site is using 100 mL IDEX bottles with dosing of 1 pillow of Ready cult Coliform 100 chemical before incubation for 24 hrs as an indicative test	Complete	Water Quality Team	2018-2019
27	Due to customer overuse of water. There is a risk of customers using too much water resulting in increased restrictions and when coupled with other issues such as power outage, loss of supply.	2 Medium	Bamaga WQ Risk Assessment - Network		Reduce excessive water demand via preparing a Demand Management Program. This program will include (but not be limited to) a public education program, including how it will be implemented and who will be responsible.		Jul-19	Regular communication with communities to educate them in water conservation practices	Ongoing	Regional Operations Manager / NPARC	2018-2019
ES.4.1.a	Due to inadequate operator training There is a risk of false negative sampling results resulting in customer illness	2 Medium	Audit OFI	Continue with competency and assessment training for water quality processes including verification testing,	Laboratory competency and assessment training are currently in development by the WQ and process support team. Add to the internal training program.		Jul-19	Updating sampling work instruction and developing e-training module.	Complete	Water Quality Team	DWQMP Audit 2018
ES.4.1.b	Due to manual system for scheduling verification monitoring, there is a risk of missed monitoring resulting in inadequate trending of water quality	2 Medium	Audit OFI				Jul-19	SAP scheduling has been overhauled and all work orders are auto-scheduled	Complete	Water Quality Team	DWQMP Audit 2018
ES.4.1.c	Due to difficulty accessing online water monitoring data, there is a risk that water quality trends are not tracked adequately resulting in unexpected water quality issues.	2 Medium	Audit OFI		Continue with the MOMS historian project. Consider internet access issues for local staff when implementing.		Jul-19	MOMs historian data collectors implemented.	Complete	Water Quality Team	DWQMP Audit 2018

Item #	Hazard/ Hazardous Event	Risk Rating	Source	Improvement Actions			Target Date(s)	Actions taken to date (Updated 12/8/2021)	Status	Responsible Party	Source2
				Short term action	Medium term action	Long term action					
ES.4.1.e	Due to lack of recording temperature there is a risk of missing seasonal trends resulting in inadequate chemical supply.	2 Medium	Audit OFI		Create a sample sheet when testing and add temperature to pick up seasonal trends. Alternatively, amend the sampling procedure to include having the water bottle label with a space for temperature as the time of the sampling.		Jul-19	Sampling procedure revised and temperatures are recorded.	Complete	Scheme Manager	DWQMP Audit 2018
ES.4.1.g	Due to lack of defined procedure there is a risk of missing filling out results required for performance reporting resulting in incomplete reporting.	2 Medium	Audit OFI		Update water testing procedure to cover filling out manual and online tests on the performance report, -		Dec-19	Continued on-the-job training with process controllers regarding filling out performance report..	Complete	Scheme Manager	DWQMP Audit 2018
ES.4.1.h	Due to lack of procedure for updating setpoints or alarms there is a risk that CCPs are unintentionally changed, risking water treatment performance.	2 Medium	Audit OFI		Create a procedure for updating the set points or alarms.		Dec-19	CCPs have been verified onsite. User access to SPs and alarms has been restricted to managers only.	Complete	Scheme Manager	DWQMP Audit 2018
ES.4.2.a	Due to the lack of a mains flushing procedure, there is a risk of unsafe flushing, resulting in a negative impact on water quality for some customers	2 Medium	Audit OFI		Create a main flushing procedure		Dec-19	Work instruction under development	In progress	Scheme Manager	DWQMP Audit 2018
ES.4.2.b	Due to the lack of a batch certificate supplied with all chemical deliveries there is the risk of supplying incorrect chemical concentration resulting in over or underdosing	2 Medium	Audit OFI		There needs to be a quality assured batch certificate for all chemical deliveries which identifies the concentration of chemical being supplied. Each delivery docket must link to that certificate. The service provider must also be checked for ongoing quality compliance.		Dec-19	Batch certificates are provided by chemical suppliers and have requested certificates for each batch of chemical	Complete	Water Quality Team	DWQMP Audit 2018
ES.4.2.c	Due to the lack of a procedure there is the risk of purchasing equipment and parts that are not suitable for drinking water resulting in water leaching/corrosion.	2 Medium	Audit OFI		A procedure needs to be in place to ensure that all drinking water materials purchased are Standards or are WaterMark approved.		Dec-19	Work instruction under development	In progress	Water Quality Team	DWQMP Audit 2018
ES.4.1.f	Due to lack of regular communication with NPARC, there is a risk of inadequate management of water quality risks	2 Medium	Audit OFI	Investigate contractual management required for reporting to the regulator and ensure that these are back-reported from DILGP (now NPARC) to TRILITY to ensure feedback for a continual improvement process,			Jan-19	TRILITY provides ongoing monthly reports to NPARC and maintains communications with NRARC when notifiable incidents occur.	Complete	Scheme Manager	DWQMP Audit 2018
ES.4.2.d	Due to lack of regular communication with NPARC, there is a risk of inadequate management of water quality risks	2 Medium	Audit OFI		Create a management procedure to ensure that the council is liaised with regularly.		Dec-19	TRILITY provides ongoing monthly reports to NPARC and maintains communications with NRARC when notifiable incidents occur.	Complete	Scheme Manager	DWQMP Audit 2018

Item #	Hazard/ Hazardous Event	Risk Rating	Source	Improvement Actions			Target Date(s)	Actions taken to date (Updated 12/8/2021)	Status	Responsible Party	Source2
				Short term action	Medium term action	Long term action					
ES.4.2.h	Due to lack of preparation, there is a risk of inadequate management of water quality incidents.	2 Medium	Audit OFI	Undertake a mock incident event for a water quality incident. Include management team and external stakeholders in the exercise			Jul-19	Water Quality team is trained with assisting in managing water quality incidents. Mock incident activity under consideration.	In progress	Scheme Manager	DWQMP Audit 2018
ES.4.2.g	Due to lack of a procedure for PAC jar testing, there is a risk of incorrect dose rates resulting in inadequate treatment or negative impact on water quality.	2 Medium	Audit OFI		Create a jar testing procedure for PAC (existing backwash recovery). Include test frequency,		Dec-19	Onsite training completed February 2019 / Jar testing procedure updated.	Complete	Scheme Manager/ Water Quality Team	DWQMP Audit 2018
ES.4.2.i	Due to expired laboratory chemicals, There is a risk of incorrect test results resulting in missed chemical dosing problems.	2 Medium	Audit OFI		Create a procedure to include date checking of lab testing chemicals for expiry.		Dec-19	Weekly stocktake implemented May 2018, lab chemical expiry dates to be added to stocktake form.	Complete	Water Quality Team	DWQMP Audit 2018
13	Due to Failure of online analyser (calibration failure, asset failure etc.) There is a risk of inadequate process monitoring resulting in an undetected breach in treated water pH	3 High	Bamaga Water Quality Risk Assessment		Procedure for benchtop PH analysis to be developed.		Dec-19	Work Instructions developed Feb 19.	Completed	Water Quality Team	Plant Risk Assessment 2018
	Only one clear water storage tank at the WTP, no redundancy in system in the event of tank failure	3 High	AM Condition Assessment 2020	Maintaining tank level at 60% to reduce leak losses	Install a second CWS tank		Jul-21	Proposal has been put to NPARC and DNMRE to install a second CWS tank. NPARC are taking to open tender for works to commence in 2022	In Progress	NPARC	AM Condition Assessment 2020
	Soda ash dosing system is past end of life and asset maintenance is an ongoing liability. Regular failures are 'patched' only, need replacement of system.	3 High	AM Condition Assessment 2020	Continue patching as required	Replace soda ash dosing system		Mar-21	Proposal has been put to NPARC to replace soda ash dosing system	Completed 2021	NPARC	AM Condition Assessment 2020
	THM Action Plan for Bamaga	3 High	RCA for THM exceedance	Continue with weekly monitoring of raw water quality, chlorine and THM monitoring of treated water, adjust tank level to reduce water age	THM Action Plan		Nov-21	Action Plan drafted and undergoing review	In Progress	Water Quality Team	RCA Action 2021

6 AMENDMENTS TO THE DWQMP

Revision 10 was initially updated in December 2020 and submitted with the 2019/20 annual report, the final Revision 10 was submitted to DRDMW with additional changes in September 2021. The revision included:

- Updated schematics to reflect changes to dosing points and provide a more detailed representation of CCP locations
- Updates to raw and treated water trend data included in Section 3 of the DWQMP to the latest dataset
- Updates to the Water Quality Improvement Plan (Appendix B in the DWQMP)
- General review and update including stakeholder details etc

7 COMPLIANCE WITH WATER QUALITY CRITERIA FOR DRINKING WATER

7.1 Bamaga WTP

Table 2 provides a summary of the treated water compliance data between 1 July 2020 to 30 June 2021 supplied from Bamaga WTP.

Table 2 – Summary of Bamaga WTP Outlet Treated Water Data 1 July 2019 to 30 June 2020

Sample Points (QCP)	Parameter	No. samples required	No. samples collected	ADWG Limit	No. non-compliant samples	Percentage of samples that comply	Comments
Bamaga WTP	pH	365	365	6.5 to 8.5	22	94%	Refer to Table 4 28/1/21 to 14/5/21 for root cause and corrective actions
Bamaga WTP	Free chlorine	365	365	0.2 to 5 mg/L	0	100%	No non-compliant samples for the reporting period
Bamaga WTP	*E. coli*	52	47	<1 CFU /100mL	0	100%	No non-compliant samples for the reporting period
Bamaga WTP	THM	52	49	<250 µg/L	0	100%	No non-compliant samples for the reporting period
Bamaga WTP	Aluminium	52	47	<0.2 mg/L	0	100%	No non-compliant samples for the reporting period
Bamaga WTP	Colour	365	356	<15 Pt/Co units	0	100%	No non-compliant samples for the reporting period
Quarterly testing data							
Bamaga WTP	Apparent Colour	4	4	<15 Pt/Co units	0	100%	No non-compliant samples for the reporting period
Bamaga WTP	Calcium	4	4	<200 mg/L	0	100%	No non-compliant samples for the reporting period
Bamaga WTP	Chloride	4	4	<250 mg/L	0	100%	No non-compliant samples for the reporting period
Bamaga WTP	Electrical Conductance	4	4	<2500 µS/cm	0	100%	No non-compliant samples for the reporting period
Bamaga WTP	Fluoride	4	4	<1.5 mg/L	0	100%	No non-compliant samples for the reporting period
Bamaga WTP	ICPMS Aluminium - dissolved	4	4	<0.2 mg/L	0	100%	No non-compliant samples for the reporting period
Bamaga WTP	ICPOES Iron	4	4	<0.3 mg/L	0	100%	No non-compliant samples for the reporting period
Bamaga WTP	ICPOES Manganese	4	4	<0.5 mg/L	0	100%	No non-compliant samples for the reporting period
Bamaga WTP	ICPOES Silicon	4	4	<80 mg/L SiO2	0	100%	No non-compliant samples for the reporting period
Bamaga WTP	Magnesium	4	4	<200 mg/L	0	100%	No non-compliant samples for the reporting period
Bamaga WTP	pH	4	4	6.5 to 8.5	0	100%	No non-compliant samples for the reporting period
Bamaga WTP	Potassium	4	4	NA	0	100%	No non-compliant samples for the reporting period

Sample Points (QCP)	Parameter	No. samples required	No. samples collected	ADWG Limit	No. non-compliant samples	Percentage of samples that comply	Comments
Bamaga WTP	Sodium	4	4	<180 mg/L	0	100%	No non-compliant samples for the reporting period
Bamaga WTP	Sulphate	4	4	<250 mg/L	0	100%	No non-compliant samples for the reporting period
Bamaga WTP	Total Alkalinity	4	4	NA	0	100%	No non-compliant samples for the reporting period
Bamaga WTP outlet	Total Dissolved Salts (calc)	4	4	<600 mg/L	0	100%	No non-compliant samples for the reporting period
Bamaga WTP	Total Hardness	4	4	<200 mg CaCO3 / L	0	100%	No non-compliant samples for the reporting period
Bamaga WTP	Turbidity	4	4	<5 NTU	0	100%	No non-compliant samples for the reporting period

7.2 Distribution System

Table 3 summarises the drinking water compliance data for the communities serviced by the plant. A small number of non-compliant results were reported for pH, *Escherichia coli (e.coli),* free chlorine and Trihalomethanes (THM). These results coincide with seasonally high colour and high organic load in raw water, in conjunction with operational challenges with the chlorine gas and soda ash dosing systems, with the soda ash system being replaced during May 2021. Further information regarding root causes and corrective actions is summarised in **Table 4**.

Table 3 – Summary of Distribution System Drinking Water Compliance Data 1 July 2020 to 30 June 2021.

Sample Points (QCP)	Parameter	No. samples required	No. samples collected	ADWG Limit	No. non-compliant samples	Percentage of samples that comply	Comments
Primary School, Hospital, Injinoo, Umagico, Seisia, New Mapoon	pH	52 at each QCP	52 (36^) at each QCP	6.5 to 8.5	1 at each QCP	97.9%	Refer Table 4 12/2/21 for root cause and corrective actions
Primary School, Hospital, Injinoo, Umagico, Seisia, New Mapoon	*E.coli*	52 at each QCP	52 (36^) at each QCP	0 CFU/100 mL	0 at all QCPs	100%	No non-compliant samples for the reporting period
Primary School, Hospital, Injinoo	Free chlorine	52 at each QCP	52	0.2 to 5 mg/L	0	100%	No non-compliant samples for the reporting period
Umagico, Seisia	Free chlorine	52 at each QCP	52	0.2 to 5 mg/L	6 at each QCP	88.5%	Refer Table 4 29/1/21 to 4/5/21 for root cause and corrective actions
New Mapoon	Free chlorine	52	52	0.2 to 5 mg/L	2	96.2%	Refer Table 4 29/1/21 to 4/5/21 for root cause and corrective actions
Hospital	THM	52	52 (44)#	<250 µg/L	8	85%	Refer Table 4 29/1/21 to 4/5/21 for root cause and corrective actions
Primary School, Injinoo	THM	52 at each QCP	52 (44)# at each QCP	<250 µg/L	10at each QCP	81%	Refer Table 4 29/1/21 to 4/5/21 for root cause and corrective actions

Sample Points (QCP)	Parameter	No. samples required	No. samples collected	ADWG Limit	No. non-compliant samples	Percentage of samples that comply	Comments
Umagico, Seisia, New Mapoon	THM	52 at each QCP	52 (44)# at each QCP	<250 µg/L	12 at each QCP	77%	Refer Table 4 29/1/21 to 4/5/21 for root cause and corrective actions
Quarterly testing data							
Primary School, Hospital, Injinoo, Umagico, Seisia, New Mapoon	Apparent Colour	4 at each QCP	4 at each QCP	<15 Pt/Co units	0	100%	No non-compliant samples for the reporting period
Primary School, Hospital, Injinoo, Umagico, Seisia, New Mapoon	Calcium	4 at each QCP	4 at each QCP	<200 mg/L	0	100%	No non-compliant samples for the reporting period
Primary School, Hospital, Injinoo, Umagico, Seisia, New Mapoon	Chloride	4 at each QCP	4 at each QCP	<250 mg/L	0	100%	No non-compliant samples for the reporting period
Primary School, Hospital, Injinoo, Umagico, Seisia, New Mapoon	Electrical Conductance	4 at each QCP	4 at each QCP	<2500 µS/cm	0	100%	No non-compliant samples for the reporting period
Primary School, Hospital, Injinoo, Umagico, Seisia, New Mapoon	Fluoride	4 at each QCP	4 at each QCP	<1.5 mg/L	0	100%	No non-compliant samples for the reporting period
Primary School, Hospital, Injinoo, Umagico, Seisia, New Mapoon	ICPMS Aluminium - dissolved	4 at each QCP	4 at each QCP	<0.2 mg/L	0	100%	No non-compliant samples for the reporting period
Primary School, Hospital, Injinoo, Umagico, Seisia, New Mapoon	ICPOES Iron	4 at each QCP	4 at each QCP	<0.3 mg/L	0	100%	No non-compliant samples for the reporting period
Primary School, Hospital, Injinoo, Umagico, Seisia, New Mapoon	ICPOES Manganese	4 at each QCP	4 at each QCP	<0.5 mg/L	0	100%	No non-compliant samples for the reporting period
Primary School, Hospital, Injinoo, Umagico, Seisia, New Mapoon	ICPOES Silicon	4 at each QCP	4 at each QCP	<80 mg/L SiO2	0	100%	No non-compliant samples for the reporting period
Primary School, Hospital, Injinoo, Umagico, Seisia, New Mapoon	Magnesium	4 at each QCP	4 at each QCP	<200 mg/L	0	100%	No non-compliant samples for the reporting period
Primary School, Hospital, Injinoo, Umagico, Seisia, New Mapoon	pH	4 at each QCP	4 at each QCP	6.5 to 8.5	0	100%	No non-compliant samples for the reporting period
Primary School, Hospital, Injinoo, Umagico, Seisia, New Mapoon	Potassium	4 at each QCP	4 at each QCP	NA	0	100%	No non-compliant samples for the reporting period
Primary School, Hospital, Injinoo, Umagico, Seisia, New Mapoon	Sodium	4 at each QCP	4 at each QCP	<180 mg/L	0	100%	No non-compliant samples for the reporting period
Primary School, Hospital, Injinoo, Umagico, Seisia, New Mapoon	Sulphate	4 at each QCP	4 at each QCP	<250 mg/L	0	100%	No non-compliant samples for the reporting period

Sample Points (QCP)	Parameter	No. samples required	No. samples collected	ADWG Limit	No. non-compliant samples	Percentage of samples that comply	Comments
Primary School, Hospital, Injinoo, Umagico, Seisia, New Mapoon	Total Alkalinity	4 at each QCP	4 at each QCP	NA	0	100%	No non-compliant samples for the reporting period
Primary School, Hospital, Injinoo, Umagico, Seisia, New Mapoon	Total Dissolved Salts (calc)	4 at each QCP	4 at each QCP	<600 mg/L	0	100%	No non-compliant samples for the reporting period
Primary School, Hospital, Injinoo, Umagico, Seisia, New Mapoon	Total Hardness	4 at each QCP	4 at each QCP	<200 mg CaCO3 / L	0	100%	No non-compliant samples for the reporting period
Primary School, Hospital, Injinoo, Umagico, Seisia, New Mapoon	Turbidity	4 at each QCP	4 at each QCP	<5 NTU	0	100%	No non-compliant samples for the reporting period

52 samples were tested onsite, while an additional 44 confirmation samples were tested by the external laboratory (CRC)
^ 52 samples were tested for presence/absence on site, while 36 additional confirmation samples were tested by the external laboratory (CRC)

8 NOTIFICATIONS TO REGULATOR PER SECTIONS 102 AND 102A OF THE ACT

TRILITY managed all water quality incident and water quality non-complaint according to the *QLD Health Response Protocol: for the management of Physical and Chemical Quality* and the *QLD Health Response Protocol: for the management of microbiological quality of drinking water*. Water quality incident notifications are provided to NPARC as soon as practicable through appropriate contact personnel and reporting to the Regulator are completed by NPARC.

In addition, TRILITY have also developed an Incident Reporting and Management Protocol and all emergencies and WQ incidents are responded to in accordance to this process.

Under section 102 of the Act, these water quality non-compliances were reported and corrective actions were implemented.

Table 4 – Summary of incidents, root causes and actions taken

Incident date	Location	Parameter / Issue	Root cause	Corrective actions
28/1/21 to 14/5/21	Bamaga WTP	Low pH 6.02 to 6.48	The previous soda ash system was very old and antiquated. 3 out the 4 available pumps were unserviceable which made the entire system very unreliable. pH inconsistencies were compounded by the conversion from hypo to gas chlorine, with further operational challenges during the seasonal increase in raw water colour and organic matter.	A completely new soda ash system was designed and installed May 2021, with a temporary system in place during the 2 week installation and commissioning period. Since the installation and successful commissioning of the new soda ash dosing system there has been very few excursions from the setpoint.
12/2/21	Primary School, Hospital, Injinoo, Umagico, Seisia, New Mapoon	Low pH 6.11 to 6.49	The previous soda ash system was very old and antiquated. 3 out the 4 available pumps were unserviceable which made the entire system very unreliable. pH inconsistencies were compounded by the conversion from hypo to gas chlorine, with further operational challenges during the seasonal increase in raw water colour and organic matter.	A completely new soda ash system was designed and installed May 2021, with a temporary system in place during the 2 week installation and commissioning period. Since the installation and successful commissioning of the new soda ash dosing system there has been very few excursions from the setpoint.
29/1/21 to 4/5/21	Primary School, Hospital, Injinoo, Umagico, Seisia, New Mapoon	THM exceedances 251 to 578 µg/L Low chlorine residual 0.06 to 0.19 mg/L	Seasonal increase of colour and organic matter in raw water has led to an increase in chlorine demand. Bamaga WTP is a CMF plant and has limited capacity for removal of colour and organic.	According to the ADWG 2011, action to reduce THM is encouraged, but must not compromise disinfection, as non-disinfected water poses significantly greater risk than THM. Hence, to counter the high chlorine demand, chlorine dosing was increased at the WTP, which led to elevated THM level. Manual dosing of chlorine tablets in drinking water reservoirs when required according to the WI and calculator. Ongoing commissioning work to optimise the ACH dosing in raw water and chlorine dosing at WTP.

9 CUSTOMER COMPLAINTS RELATED TO WATER QUALITY

Under the Act, TRILITY is required to report on the number of complaints, general details of complaints, and the responses undertaken.

During the reporting period, there were no complaints relating to any water quality which includes suspected illness, discoloured water and taste and odour complaints.

10 FINDINGS AND RECOMMENDATIONS OF THE DWQMP AUDITOR

No regulatory audits were conducted during this period 2020/2021.

APPENDIX A - SAMPLING AND TESTING REGIME FOR BAMAGA WTP

Parameter	Sample Frequency	Units of Measure	Limit (ADWG 2011)
Raw Water QCP			
E. coli	Weekly	CFU/100mL	
Total coliforms	Monthly	CFU/100mL	
Heterotrophic plate count	Monthly	CFU/mL	
Sodium	Quarterly	mg/L	≤180
Potassium	Quarterly	mg/L	
Calcium	Quarterly	mg/L	
Magnesium	Quarterly	mg/L	
Total Hardness	Quarterly	mg $CaCO_3$/L	60<TH≤200
Iron	Quarterly	mg/L	≤0.3
Manganese	Quarterly	mg/L	≤0.1
Aluminium (Dissolved)	Quarterly	mg/L	<0.2
Conductivity	Quarterly	µS/cm	
pH	Quarterly		6.5-8.5
Total Alkalinity	Quarterly	mg $CaCO_3$/L	
Colour (Apparent)	Quarterly	Pt/Co units	≤15
Turbidity	Quarterly	NTU	≤5
Sulphate	Quarterly	mg/L	≤250
Chloride	Quarterly	mg/L	≤250
Fluoride	Quarterly	mg/L	≤1.5
THM	Weekly	µg/L	<250
Treated Water - Plant Outlet QCP			
E. coli	Weekly	CFU/100mL	<1
Total coliforms	Weekly	CFU/100mL	<1
Heterotrophic plate count	Monthly	CFU/100mL	
Sodium	Quarterly	mg/L	≤180
Potassium	Quarterly	mg/L	
Calcium	Quarterly	mg/L	
Magnesium	Quarterly	mg/L	<200
Total Hardness	Quarterly	mg $CaCO_3$/L	60<TH≤200
Iron	Quarterly	mg/L	≤0.3
Manganese	Quarterly	mg/L	≤0.5
Aluminium (Dissolved)	Quarterly	mg/L	<0.2

Parameter	Sample Frequency	Units of Measure	Limit (ADWG 2011)
Conductivity	Quarterly	µS/cm	<2500
pH	Quarterly		6.5-8.5
Total Alkalinity	Quarterly	mg $CaCO_3$/L	
Colour (Apparent)	Quarterly	Pt/Co units	≤15
Turbidity	Quarterly	NTU	≤5
Sulphate	Quarterly	mg/L	≤250
Chloride	Quarterly	mg/L	≤250
Fluoride	Quarterly	mg/L	≤1.5
THM	Weekly	µg/L	<250
Treated Water – NPA distribution system quality control points (QCP)			
E. coli	Weekly	CFU/100mL	<1
Total coliforms	Weekly	CFU/100mL	<1
Heterotrophic plate count	Monthly	CFU/100mL	
Sodium	Quarterly	mg/L	≤180
Potassium	Quarterly	mg/L	
Calcium	Quarterly	mg/L	
Magnesium	Quarterly	mg/L	<200
Total Hardness	Quarterly	mg $CaCO_3$/L	≤200
Iron	Quarterly	mg/L	≤0.3
Manganese	Quarterly	mg/L	≤0.5
Aluminium (Dissolved)	Quarterly	mg/L	<0.2
Conductivity	Quarterly	µS/cm	<2500
pH	Quarterly		6.5-8.5
Total Alkalinity	Quarterly	mg $CaCO_3$/L	
Colour (Apparent)	Quarterly	Pt/Co units	≤15
Turbidity	Quarterly	NTU	≤5
Sulphate	Quarterly	mg/L	≤250
Chloride	Quarterly	mg/L	≤250
Fluoride	Quarterly	mg/L	≤1.5
THM	Weekly	µg/L	<250